

**МОЛОДЕЖЬ.
ОБЩЕСТВО.
СОВРЕМЕННАЯ
НАУКА,
ТЕХНИКА
И ИННОВАЦИИ**



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Hello, dear authors!

We would like to greet you again and congratulate with the 20th anniversary of the conference and the journal of the conference. It is also a happy coincidence that the Year of Science and our celebration are at the same time.

We have done much together. First, the number of participants has increased. Twenty years ago, there were only 15 people presenting their research; and the current issue of the conference journal presents approximately 100 researchers sharing their results with the World scientific community.

Second, the quality of the papers has become better, it is proved by the fact: some research possesses Russian Science Citation Index and their authors have been invited to participate in American and German conferences.

It should be highlighted that the University supports the conference sending its materials to e-library, where other scientists could learn more about new generations of the researchers and their studies.

We should also say words of gratitude to the colleagues working for the university and their students as scientific supervisors. They are doing their best practically teaching young scientists how to write about their research. They contribute their efforts to the Russian Science. Due to them, the Russian Federation will never feel any deficiency in innovations in different spheres of our life.

Dear friends, these 2 decades have been extremely productive for our participants, and, we hope, the future looks even brighter. We always believe in your talents, in your interest in scientific research, and your desire to present and share ideas. We are ready to support your efforts as supervisors and honestly think that you will continue studying and innovating.

*Sincerely yours,
Conference Organizing Committee*

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Bachelors and Specialists' Research (Technical Students)

УДК 004

STAGES OF INFORMATION TECHNOLOGIES DEVELOPMENT IN ADVERTISING AND PROSPECTS FOR RUSSIAN SEGMENT OF THE MARKET

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The paper describes the most promising software tools used in advertising. Their strengths, weakness, opportunities and threats are considered.

Keywords: information technology, Google Ads, Facebook Ads, Yandex.Direct, Internet advertising.

ЭТАПЫ РАЗВИТИЯ ИНФОРМАЦИОННЫХ ТЕХНОЛОГИЙ В РЕКЛАМЕ И ПЕРСПЕКТИВЫ ДЛЯ РОССИЙСКОГО СЕГМЕНТА РЫНКА

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В статье описываются перспективные программные средства, используемые в рекламе. Рассмотрены их сильные, слабые стороны, возможности и угрозы.

Ключевые слова: информационные технологии, GoogleAds, FacebookAds, Яндекс.Директ, интернет реклама.

Nowadays, information is the main resource and the main weapon of every person and every business. The paper considers the history, actual developments and perspectives of information technology application in advertising in order to give an overview.

Trends in advertising regularly change. For this reason, information technology used in advertising needs to be regularly updated and improved to adapt to customers' needs. Advertising has been relevant at all times and will be relevant in the future, but to be efficient advertising should change its approaches. The development of advertising passed through several historical stages (Figure 1):

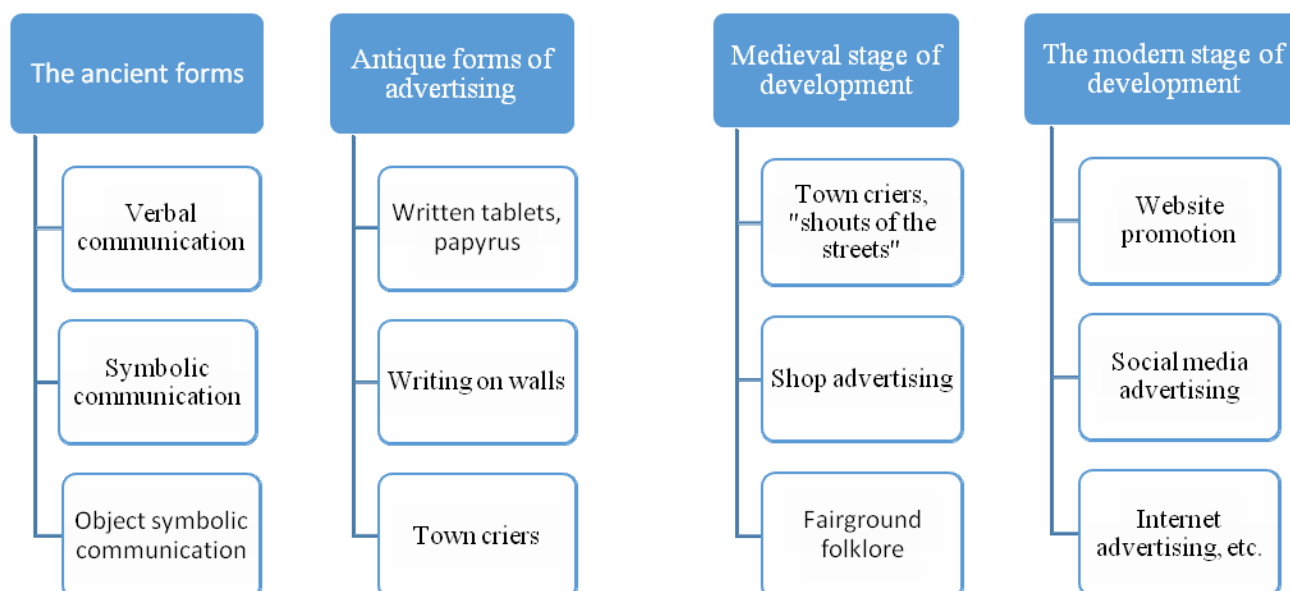


Fig. 1. Types of advertising at different stages of societal development [4]

Internet advertising is currently the most promising approach in advertising. Its key difference from past approaches is the importance of intellectual property. Every sales pitch must be designed with copyright in mind for the components used: music, characters, and film footages.

Next, we should delve into the software tools used in online advertising. On the basis of a S.W.O.T. (Strength, Weaknesses, Opportunities, Threats) analysis of the three leaders in online advertising, we will make a guess about the most promising of them. The positive and negative characteristics are considered both from the perspective of an investor and from that of an ordinary person: the entrepreneur who needs to set up advertising without the services of professionals (Table 1).

The leaders in the advertising services market are:

1. Yandex.Direct [1] – an advertising system that allows you to place contextual ads on Yandex.Search and partner websites of the Advertising Network;
2. Google Ads [2] – a functional method of contextual advertising on the Internet.
3. Facebook Ads [3] – an advertising office that enables access to advertising on Facebook as well as on platforms owned by Facebook.

On the basis of the S.W.O.T. analysis, we can say that Google Ads is the most user-friendly and also the most promising software tool for contextual advertising. However, it is true only for the Russian market. Yandex.Direct could hypothetically become the key software tool for setting up advertising.

Table 1

S.W.O.T. analysis of advertising market leaders

Product	GoogleAds	FacebookAds	Yandex.Direct
Strength	Showing by search phrases (directly to the target audience); Ability to select the audience by location criteria; Payment for direct conversions, not for showing.	High funding for technological developments; Ownership of several platforms (Audience Network, Instagram, etc.); Large reach due to large number of users.	Ability to change ad content at any time; Full performance statistics for each tool; Fee for direct conversions, not for showings.

Weaknesses	The manual selection of negative keywords; Low share of Russian traffic, the system is oriented towards the international market; More fine-tuning, which makes it difficult for newcomers to use.	Criticism over breaches of user privacy; High-profile scandals have tarnished the company's image; Strict moderation: there is a high probability that the ad will be "censored".	Difficult set-up and atypical budgeting system; High cost of effective advertising (regular updates); Competition for high-frequency queries.
Opportunities	Increase of Internet users in the world; Development of the Russian segment of the market; Improvements in technology.	Acquisition of competing projects and platforms; attracting new user segments; Diversification, which began with the acquisition of Oculus VR, which is a virtual reality technology business that can complement social media services.	Market dominance of the entire Russian-speaking segment and entry into the international segment; increase of Internet users in Russia; Development through partner applications (in August 2020 Huawei became a partner of Yandex Advertising Network).
Threats	Problems with the law on user privacy; Rival merger.	Rising operating costs; competition with Google Ads; Regulatory threat. Increase data protection and privacy.	Yandex is used more on computers, while mobile traffic is growing rapidly. There could be a significant drop in reach; Competition with Google Ads. Rising operational costs.

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TERRAFORMING OF MARS

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The prerequisites and the necessary conditions for the terraforming of Mars are enumerated. The opinions of scientists on the issues of terraforming are considered and the stages of the implementation of terraforming and colonization of Mars are described.

Keywords: Mars, terraforming stages, orbital mirrors, asteroid bombardment, greenhouse gases.

ТЕРРАФОРМИРОВАНИЕ МАРСА

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Перечислены предпосылки и необходимые условия терраформирования Марса. Рассмотрены мнения ученых по вопросам терраформирования и описаны этапы реализации терраформирования и колонизации Марса.

Ключевые слова: Марс, этапы терраформирования, орбитальные зеркала, бомбардировка астероидами, парниковые газы.

For many decades mankind has been searching for life as well as for any traces of life in the solar system. Special attention has been focused on Mars. Until now, these studies have not brought the desired results, but nevertheless, the idea of a green Mars has been exciting the minds of the world scientific community for a long time [1].

The extraordinary similarities between the Martian atmosphere and the atmosphere that existed on the Earth more than a billion years ago were proven. When the formation of our Earth began, there was no oxygen on it; it was a desolate and uninhabitable planet.

At the beginning of formation, the Earth's atmosphere consisted of carbon dioxide and nitrogen, but it continued till the photosynthetic bacteria, which were still developing, began to produce enough oxygen for the future development of life, as well as living beings.

As you might guess at the moment a human visit to Mars is not possible, because it is necessary to exploit a huge amount of oxygen and nitrogen in order to live there. Nevertheless, the similarity of the present Mars and the early Earth has led many scientists to the assumption that similar processes that took place on the Earth and converted most of the oxygen dioxide into natural oxygen for breathing can take place on Mars.

In order to do this it is necessary to thicken the atmosphere and recreate the greenhouse effect, which in its turn will heat the planet and provide the necessary habitat for various plants and animals.

One of the most famous propagandists of the colonization of Mars, the founder of the Martian society, American engineer Robert Zubrin claims that the terraforming of the red planet can be realized in just a thousand years. He proposed a multi-stage plan for the transformation of Mars into a planet that would be suitable for human life, similar to our planet. The plan for the implementation of terraforming and colonization of Mars consists of five stages [2].

Like many other scientists who have previously performed research on the terraforming of Mars, Zubrin makes his main bet on heating the planet due to the greenhouse effect, that is, the release of greenhouse gases into the atmosphere, which in its turn can shift the heat balance of the planet.

However, the first step in that plan of Zubrin is different. He offers 5 stages for realizing terraforming and colonizing Mars:

The first stage of terraforming Mars is the construction of orbital mirrors. Orbital mirrors will reflect sunlight and heat the surface of Mars. According to the last calculations, the diameter of such mirrors should be about 250 kilometers; the weight of the entire structure will be about 200 thousand tons, so it is best to assemble it in space, and not on the ground. If this mirror is pointed at Mars, it can raise the temperature of a small area by several degrees. The point of the mirrors is to concentrate them on the polar caps so that the thermal effect can melt the ice and release carbon dioxide, which scientists believe is trapped in the ice.

The second stage is the implementation of the bombardment of Mars by asteroids. The bombardment of Mars by large icy asteroids with high ammonia content will lead to the formation of a ton of greenhouse gases on the Red Planet. It is planned to install rockets with nuclear engines on the asteroids. The rockets will move asteroids at a speed of 4-5 kilometers per second and guide them for ten years, and then shut down and allow the asteroid to "naturally" fall on Mars. The impact energy will also help to release water from the ice. According to Zubrin's calculations, for the proper effect of increasing the temperature on Mars by 4 degrees, mankind will need to drop there about 40 asteroids of 2.5 kilometers in diameter, which will take decades.

The third stage is the construction of plants for the emission of greenhouse gases. Factories for the production of greenhouse gases will be sent to Mars or created directly on the surface of the red planet. Zubrin has a desire to repeat the Earth's experience on Mars, but our native factories produce greenhouse gases as a side effect, and the Martian ones will produce them as the main product. Today, although many believe that the role of humanity in global warming on Earth is greatly exaggerated, the release of a huge amount of these substances into the atmosphere of Mars will undoubtedly create the required blanket for it. Zubrin claims that in just 50 years of developing such factories, the temperature on Mars in the equatorial regions will rise to as much as 10 degrees Celsius.

The fourth stage is connected with Mars itself. The heating of the planet will directly lead to the release of additional gases from the soil, which will increase the temperature by another 10 degrees within 20 years. The ice will begin to melt, the weather will become a little closer to that of the Earth, more clouds will appear, and when the pressure of the atmosphere itself is 1/5 from the earth, and then the colonizers of Mars will be able to stay on the surface without spacesuits. But they will still need oxygen masks.

The last stage is the cultivation of gardens and crops. When colonizers are free to roam Mars without spacesuits, they can safely begin growing gardens and different cultures for their daily lives. Under glass domes-greenhouses, probably already communicating with the atmosphere, the temperature at the equator in these years would have already increased to 32-34 degrees, open reservoirs would have appeared on Mars, and it would have been possible to start growing plants on the planet. But in the natural course of events, lichens and photosynthetic bacteria are the first to oxygenate the atmosphere. Plants change the atmosphere, they absorb carbon dioxide, accordingly the concentration of oxygen in the atmosphere increases, the content of CO² in the atmosphere by 2250 will drop several times from the current 95 %, it is also possible that to saturate the atmosphere with oxygen, people will create genetically modified plants with higher productivity. It

will take a thousand years to wait for the desired results, but people will have to wait actively, growing plants in cities, controlling changes in the atmosphere.

Within the framework of this article, the main stages of the terraforming of Mars were considered. Examining these steps provides a conceptual understanding of the process. As a result, it seems possible to determine particular problems, such as: orbital mirrors, asteroid bombardment, greenhouse gases and others, which is the basis for further research in this area.

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FACEIT STATS

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The paper observes the characteristics, purpose and benefits of the Faceit Stats software.

Keywords: CS:GO, FACEIT, eSports, stats, analysis, computer, software.

FACEITSTATS

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В работе рассмотрены характеристики, назначение и преимущества программного продукта FaceitStats.

Ключевые слова: CS:GO, FACEIT, киберспорт, статистика, анализ, компьютер, программный продукт.

Today, video games are no longer considered entertainment and a way to organize leisure, gradually transforming into a professional sport with their attributes [1; 2].

The most popular game is Counter-Strike: Global Offensive (CS:GO), which had almost 21million unique users in December 2020 alone [3]. The leading esports platforms are the E-Sports Entertainment Association (ESEA)and FACEIT, the latter, in turn, gives all players open access to the competition system, which is a significant advantage over its competitors. [4; 5].

While playingCS:GO on the FACEIT platform, players would need to analyze their game, actions and statistics to improve their competitive performance, skills, professionalism.

It can be difficult for a player to analyze their stats throughout the range of matches played, and therefore there is a need for a third-party software product that will collect, analyze, calculate, and display the necessary information.

In the course ofanalyzing the market status of software products that meet these needs, criteria have been established that will guide the user when choosing an application:

- information about user statistics;
- user interface;
- accessibility;
- saving system resources;
- lack of intrusive advertising.

Based on these criteria, the Faceit Stats product was developed to check CS:GO statistics for any player.

Faceit Stats allows anyone on this platform to check:

- general account information – information about the region, country, player position in the world list, type of subscription on the FACEIT gaming platform, link to FACEIT profile and link to Steam profile;

- level progress with detailed information – information about the current level, the number of ELO points needed to advance to the next level and the schedule of changes to ELO-points for a certain period of matches;

- the main statistics – information about the total number of matches, percentage of wins in the entire history of matches, the current streak of victories, the longest streak of victories, the latest results of victories (defeats) matches, the average ratio of kills/deaths and the average percentage of headshot kills;

- average stats per a certain number of matches – data on the number of matches won, win percentage, average kills, average kills/death ratio, average kill/round ratio, average percentage of headshots, average rating Half-Life TV (HLTV) version 1;

- changes in some parameters in the form of schedules per a certain number of matches, which include:

1. schedule of changes in ELO points (rating);

2. a graph of the change in the ratio of kills/deaths to the ratio of kills/rounds;

3. graph of the change in kills to the percentage to kills via headshots;

- game preferences on cards – data on all games on the cards and average statistics on them;

- matchhistory.

As a result of using this app, the user gets the opportunity to:

- save time spent on calculating statistics;

- get and compare more detailed statistics about accounts as opposed to competing software products;

- change and view the average statistics for a certain number of matches in the form of a block of information and/or graphs.

Therefore, these capabilities meet the needs of FACEIT platform players.

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INFORMATION SYSTEMS IN THE PROCESS OF ENTERPRISE MANAGEMENT

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This article is devoted to the study of the development stages of the marketing information systems (MIS) over the years and their need in the process of successful enterprise management. The authors conclude that these systems are the most important components of the enterprise management information system.

Keywords: marketing information system, information, enterprise management, production.

ИНФОРМАЦИОННЫЕ СИСТЕМЫ В ПРОЦЕССЕ УПРАВЛЕНИЯ ПРЕДПРИЯТИЕМ

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Данная статья посвящена изучению этапов развития маркетинговых информационных систем (МИС) на протяжении многих лет и их необходимости в процессе успешного управления предприятием. Авторы делают вывод, что эти системы представляет собой важнейшую составную часть информационной системы управления предприятием.

Ключевые слова: маркетинговая информационная система, информация, управление предприятием, производство.

Information systems are currently one of the main ways to ensure the successful management process in almost all enterprises of machine-building production. A marketing information system (MIS) is a set of constantly functioning techniques and resources for collecting, classifying, analyzing, evaluating and disseminating relevant information in order to use it in making effective marketing decisions [2].

In modern conditions, the success of an enterprise is largely determined by the ability to quickly solve the problem of collecting, processing, analyzing information and making relevant decisions on this basis.

The use of modern computer systems for accounting and management decision support significantly improves the quality and reduces the time required to solve this problem, increasing production efficiency and reducing costs. An information system is a set of information and personnel data, procedures, software and hardware organized by regulated relationships for the implementation of targeted activities.

The marketing information system includes the following items:

- information processing system (including the use of modern information technologies for data collection, forecasting and analysis);
- information about the internal capabilities of the enterprise for their further effective usage;
- information on the results of special studies conducted at the enterprise in order to obtain additional data of an original nature;
- information on the development of external conditions for the development of operational and strategic decisions of the company's activities in the market.

The resources required by the enterprise to gather information are the following:

- specialists who are qualified in the field of information collection, processing and analysis, implementation;
- methods of working with information, as the methods of data collecting and processing affect their quality;
- special equipment (devices that allow the recording information during the study).

The stages of information system development are known to be the following [1]:

The first information systems appeared in the fifties. They were designed for processing invoices and calculating salaries, and were implemented on Electromechanical accounting machines. This led to some reduction in the cost and time required to prepare paper documents.

The sixties are marked by a change in attitudes to information systems. The information obtained from them has been used for periodic reporting on many parameters. To do this, organizations needed broad-purpose computer equipment that could serve a variety of functions, not just process invoices and calculate the salaries.

In the seventies and early eighties, information systems began to be widely used as a means of management control, supporting and accelerating the decision-making process.

By the end of the eighties, the concept of using information systems has changed again. They became a strategic source of information and were used at all levels of the organization of any profile. Information systems of that period, providing the necessary information in time, helped the organization achieve success in its activities, create new products and services, find new sales markets, secure worthy partners, organize the production of products at a low price, and much more.

Nowadays the marketing information system itself is not a tool for making managerial decisions. Decisions are always made by people. But the control system itself can present the information in a more convenient form for making the right decisions.

Thus, correctly presented information to employees is part of a better workflow, which makes it possible to simplify the process of enterprise management by one and a half to two times. MIS is the most important component of the enterprise management information system. A distinctive feature of the MIS is the fact that it, using external and internal sources of information, ensures the development of relations between the enterprise and the market.

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APPLICATION OF FUNDAMENTAL LAWS OF NATURE IN CREATING MATHEMATICAL MODELS.

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This article describes the stages of creating mathematical models and fundamental laws of nature which can be applied in the process of their creation.

Keywords: mathematical model, object, conservation law, circumstance, approach.

ПРИМЕНЕНИЕ ФУНДАМЕНТАЛЬНЫХ ЗАКОНОВ ПРИРОДЫ ПРИ ПОСТРОЕНИИ МАТЕМАТИЧЕСКИХ МОДЕЛЕЙ

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Данная статья описывает этапы создания математических моделей, а также фундаментальные законы природы, которые могут применяться при их создании.

Ключевые слова: математическая модель, объект, закон сохранения, обстоятельство, подход.

The process of creating a mathematical model starts with a verbal description of an object or phenomenon. Atop of gathering general information about an object, this step may also include various assumptions and theories. After that, all irrelevant and inconsequential factors that don't affect the behavior of an object in any significant way are discarded. The next step is choosing or formulating a law that would describe the behavior of an object. It is important to remember that choosing an appropriate law even for seemingly simple objects may turn out to be a very difficult task. Last step in creating a mathematical model is "equipping" it. For example, it is necessary to state the initial condition of an object: it's speed, mass or other characteristics. Finally, the research goal of creating a particular mathematical model is being formulated.

Created model is being studied by all available research methods. Most complex models can't be fully analyzed theoretically and it is necessary to apply computational and practical methods. This circumstance is important in studying nonlinear objects as their behavior is usually unknown. If the end results are found to be flawed the whole mathematical model should be either discarded or modified accordingly.

The most common method for creating mathematical models is applying fundamental laws of nature to a particular situation. These laws are widely accepted, proven by experiments and serve as a base for lots of scientific and technical achievements. Because of that their validity is unquestionable which – among other things – gives researchers confidence in their work. The main problem is to decide which law to apply and how to do it.

a) The law of energy conservation

The law of energy conservation states that energy can neither be created, nor destroyed – only converted from one form of energy to another. This means that a system always has the same amount of energy, unless it's added from the outside.

b) The law of mass conservation

For example, there is a small amount of radioactive matter surrounded by the thick layer of lead – a case typical for storing fissile materials or their use in energetics. Here, “small amount” means that fission products don't collide with atoms of matter itself while leaving area ‘I’. “Thick layer” means that all fission products are absorbed in area ‘II’. So, everything that's leaving area ‘I’ is absorbed in area ‘II’ and the total mass of substance in these two areas stays constant. If at some point in time masses of two substances were $M_1(t_0)$ $M_2(t_0)$ then at any given point in time the equation $M_1(t_0)+M_2(t_0) = M_1(t_1) + M_2(t_1)$ will be valid.

c) The law of momentum conservation

Motionless boat in still water will start to move forwards if you would take a couple steps from it's bow to it's stern. The reason for this is the law of impulse conservation which states: for a collision occurring between object 1 and object 2 the total momentum of the two objects before the collision is equal to the total momentum of the two objects after the collision. That is, the momentum lost by object 1 is equal to the momentum gained by object 2.

This example also demonstrates the rule followed in the beginning stages of mathematical modelling of complex objects: if an object fails to achieve the required characteristics even when being put in perfect conditions you need to either change the approach or soften the requirements. If these requirements can be achieved in no possible way then your next steps should be dedicated to research of how an object is being affected by other additional complicating factors.

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PHILOSOPHY OF TECHNOLOGY. THE IMPORTANCE OF PHILOSOPHY IN TECHNICAL SCIENCES

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The article introduces the basic concept of philosophy of technology and describes the relationship of philosophy to the technical sciences.

Keywords: philosophy, technology, science, society, study.

ФИЛОСОФИЯ ТЕХНИКИ. ЗНАЧЕНИЕ ФИЛОСОФИИ В ТЕХНИЧЕСКИХ НАУКАХ

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В статье приведено основное понятие философии техники, описана связь философии с техническими науками.

Ключевые слова: философия, техника, наука, общество, изучение.

Nowadays, the question of studying such science as philosophy in technical disciplines is relevant. Every person, starting to study philosophy, asks the question "What is it for?", but not everyone finds the answer to this question. So what is philosophy of engineering and what is the significance of studying philosophy?

Philosophy is the science of the world, the place of man in this world, the laws of development of nature, society and thinking. Its goal is the improvement of man through the development of his outlook on world, cultivating his spiritual, moral and aesthetic values. Thus, the well-established philosophical knowledge is the ultimate general knowledge, which guides a person in finding problems, solving problems, understanding regularities, comparing phenomena.[1]

Technology is a set of means aimed at improving, simplifying and serving the non-productive needs of man. Knowledge and experience that were accumulated in the process of society's development have materialized in technology. The main purpose of technology is to simplify and increase the efficiency of labor, as well as to expand its capabilities.

So, after adopting such definitions for each of the elements, let us clarify the basic understanding of the philosophy of technology. It is a discipline that studies nature, characteristics, specificity of technical knowledge, studying the evolution of technology as a domain of human activity, as well as the role of technology as one of the most important factors influencing the development of society. Man lives in the natural and artificial world, created by himself, and his life aspirations cannot but correlate with the world of technology. Philosophical discussion of the world

of technology is related to the nature of man and his way of existence, more precisely, to the interaction and coexistence of nature, man and technology. This special field of research has emerged only at the end of the nineteenth century. Ernest Kapp introduced the term "philosophy of technology" and created one of its first concepts. The industrial revolution in European countries was the reason for bringing the attention to the problems that, in turn, gave rise to the research in the philosophy of technology. Rapid industrial progress caused a high degree of public interest in technical development. Under these conditions, Ernest Kapp introduces technology into the circle of philosophical research and associates the cultural development of mankind with the appearance of technology. Similarly, Karl Marx, in his work "Capital," explains the development of society by human activity. Thus, it is possible to say from the above-mentioned facts and definitions that philosophy is the basis and the reason for appearance and development of technology.

We have conducted a survey among students to determine the awareness of the importance of philosophy in the study of technical sciences, the variants of answers to which are as follows:

1) "There is no need to study philosophy if I am focused on studying technical sciences".

2) "Philosophy is not an important science when studying engineering. It is only studied for self-improvement."

3) "Philosophy is an essential and important element in the study of engineering."

66 % of respondents believe that philosophy is a secondary science in the study of technology, which they study only for self-improvement. 19 % are convinced that there is no need to pay attention to philosophy when studying technology. The smallest part of votes, amounting to 15 %, is given to the statement that philosophy is the basis for the study of technology.

Analyzing the results of the survey, one can see that the respondents are not fully aware of the relationship between philosophy and technology, which indicates a one-sided approach to the study of specialized, field – related sciences. Deepening into the study of the origin of technology, finding out about the interrelation with such science as philosophy, relying on its knowledge, it is possible to determine the future direction of development of technology, which is not an insignificant factor in the history of development of society. Exclusion of the fact about insignificance of philosophy can be achieved by studying the root causes of the emergence of technology, technical sciences and specialties. We believe that after reading this article, most of the voters will change their minds.

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THE AVAILABLE NEURAL NETWORK SIMULATION SOFTWARE

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Machine learning is actively developing in the field of scientific research. The relevance of choosing a suitable library for working with neural network modeling is due to a wide variety of functions, customization options and interface features of this software toolkit.

Keywords: neural networks, machine learning libraries, intelligent system, machine learning.

ДОСТУПНОЕ ПРОГРАММНОЕ ОБЕСПЕЧЕНИЕ ДЛЯ МОДЕЛИРОВАНИЯ НЕЙРОННОЙ СЕТИ

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Машинное обучение активно развивается в области научных исследований. Актуальность выбора подходящей библиотеки для работы с нейросетевым моделированием обусловлено большим разнообразием функций, возможностями настройки и особенностями интерфейса данного программного инструментария.

Ключевые слова: нейронная сеть, библиотеки машинного обучения, интеллектуальные системы, машинное обучение.

The growth of machine learning has reached a meteoric rate over the past few years. This is due to the accumulation of huge amounts of information in various fields of human activity, with the ability to collect and process data faster, easier and cheaper, as well as the development of methods for identifying patterns from these data, in accordance with which physical, biological, economic and other processes proceed. In cases where it is rather difficult to determine such patterns using analytical methods, researchers and applied specialists turn to neural networks, in particular to deep learning.

Neural networks are very extensive in their applications: economics and business, industrial automation, geological exploration and much more. For the formation of neural networks and work with them, there are many software tools that, to one degree or another, automate the process of neural network modeling. Both common commercial software products and non-commercial software tools are known that allow using neural networks to solve practical problems. The effectiveness of solving problems using artificial neural networks is largely due to the choice of suitable software tools that allow building high-quality neural network models [1].

Let's briefly review the tools for designing neural network models. Let's consider the software libraries Caffe, Pylearn2, Torch and Theano, learn about the basic capabilities of each of them, and

also compare the quality and speed of the modules of these libraries for solving the problem of classifying handwritten numbers.

Caffe is a library that implements deep learning algorithms, designed with an emphasis on characteristics such as maintaining the level of data purity, their readability and processing speed. The library is implemented using the C++ language, and the product itself fully supports writing custom algorithms in Python / NumPy, and is also compatible with MATLAB. Caffe developers offer a wide range of tools for creating and applying modern deep learning algorithms. In addition, this library is successfully used to solve problems of image and speech recognition, as well as in the fields of astronomy and robotics.

Torch is defined as an open source Lua machine learning library using C and CUDA. Developers use the Lua scripting language in conjunction with SSE, OpenMP, CUDA technologies, which allows maintaining good speed compared to other libraries. Using the container mechanism, Torch allows you to create complex neural networks. A container is a standard unit of software that packs an application with all the dependencies it needs to run – application code, launcher, system tools, libraries, and settings. A neural network component can be not only fully connected or convolutional layers, but also activation or error functions, as well as ready-made containers.

Theano is a numerical computation library in Python that allows you to efficiently evaluate mathematical expressions containing multidimensional arrays. Designed by LISA to support the rapid development of machine learning algorithms. The library includes a compiler that translates mathematical expressions written in Python into efficient C or CUDA code.

Finally, let's take a look at the Pylearn2 library, which helps simplify machine learning research. It is implemented in Python. Pylearn2 provides a wrapper for an extremely efficient GPU-powered convolutional network library. This wrapper allows you to use Theano's symbolic distinction and other features with minimal overhead [2].

Let's compare the quality and speed of the libraries when constructing the same topologies of neural networks for solving the problem of classifying handwritten numbers.

Computational experiments were carried out on fully connected and convolutional neural networks of the following structure: three-layer fully connected neural network (MLP) and convolutional neural network (CNN) [3].

Based on the experiments carried out on the structures of neural networks for each library, let us pay attention to the allotted time for training networks on the CPU implementation: MLP (CNN): Caffe = 51 (8.3), Pylearn2 = 59 (20.7), Theano = 54 (16.4), Torch = 19 (2.3), and on GPU implementations: MLP (CNN): Caffe = 5.5 (1.1), Pylearn2 = 18.7 (5.7), Theano = 8.9 (1.5), Torch = 5.1 (3) [4]. Note that Pylearn2 shows the worst performance compared to other libraries. To compare the training time of a neural network with the use of other libraries, let's turn to the network structure. For networks running on a CPU, the best library is Torch, and for networks running on a GPU, Caffe has the best result.

Having considered the classification time of one image on the CPU already on trained MLP (CNN) models: Caffe = 12.3 (1.28), Pylearn2 = 4.2 (21.2), Theano = 2.34 (5.86), Torch = 1.01 (0.72), we note that the Torch library is ahead of other libraries on both test neural networks.

Based on the results of the study of the functionality of the selected libraries and the analysis of the performance of the constructed neural network models using the example of the problem of classifying handwritten numbers, each library was assessed on a scale from 1 to 3 according to such criteria as: the learning rate shows the training time for neural network models; the classification rate reflects the classification time of one image; ease of use allows you to estimate the time spent on studying the library; flexibility is responsible for setting up links between layers, setting method parameters and having different data methods; the functional represents the presence of the implementation of typical deep learning methods; documentation allows you to assess the availability and usability of documentation and training materials.

Having analyzed the libraries for each criterion, let us arrange the places from the first to the third (Table 1). The Caffe library leads the way in computational experiments and is also quite user-friendly. Pylearn2 turned out to be the most functional library, but it requires an understanding of the

internals to use it. Torch developers provide quite detailed and understandable material. The Theano library has shown the best results in terms of flexibility.

Table 1

Comparison results of libraries (places from 1 to 3 for each criterion)

	Learning rate	Classification speed	Convenience	Flexibility	Functional	Documentation	Amount
Caffe	1	2	1	3	3	2	12
Pylearn 2	3	3	2	3	1	3	15
Torch	2	1	2	2	2	1	10
Theano	2	2	3	1	2	2	12

To summarize, we can say that the Torch library wins in the ranking of the reviewed libraries on average. However, the Caffe and Theano libraries should not be excluded from further use, because they also have a good rating.

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EDUCATIONAL SOFTWARE FOR WORKING WITH BINARY SEARCH TREES

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This article deals with the concept of a binary search tree, its areas of application, and also observes the educational software designed to work with this data structure.

Keywords: binary trees, searching, education.

ОБУЧАЮЩЕЕ ПРОГРАММНОЕ ОБЕСПЕЧЕНИЕ ПО РАБОТЕ С БИНАРНЫМИ ДЕРЕВЬЯМИ ПОИСКА

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В данной статье рассматривается понятие бинарного дерева поиска, сфер его применения, а также описывается обучающее ПО, предназначенное для работы с этой структурой данных.

Ключевые слова: двоичные деревья, поиск, структуры данных, образование.

To work with information, you need a suitable representation of it, aimed at solving the necessary tasks – the data structure. There are many such representations, and they may include a structure like a binary search tree.

A binary tree is a type of connected acyclic graph, characterized by the fact that each of its nodes, cells that store information, has no more than two descendants, connected nodes that are hierarchically lower. A binary tree is a recursive structure, since each of its sub-trees is a binary tree and, therefore, each of its nodes is in turn the root of another tree. Each node of a binary tree can have zero, one, or two subtree nodes.

A binary search tree is a type of binary tree that is constructed according to the following rule: all nodes of the tree lying in the left subtree contain keys whose values are less than the key values of the vertex node, and all nodes lying in the right subtree contain keys whose values are greater than or equal to the key value of the vertex node. This rule is the key difference between binary search trees and ordinary binary trees. Binary search trees are useful for maintaining data records without a lot of additional space, so they are used in database development.

This data structure is studied by students of many higher educational institutions of technical areas. For various reasons, not all universities can provide students with software for working with binary search trees, which helps to better understand and consolidate this educational material. To solve this problem, such software was developed.

When choosing a programming language, the choice fell on C++. The development was carried out using Object Oriented Programming (OOP) methods. Therefore, two main classes were

created that form the basis of the program structure: "TreeNode", which is responsible for representing the tree node, and "BTreeOfSearch", which implements the connection between the nodes and is responsible for interacting with them. The structures of these classes are shown in the diagram in Figure 1.

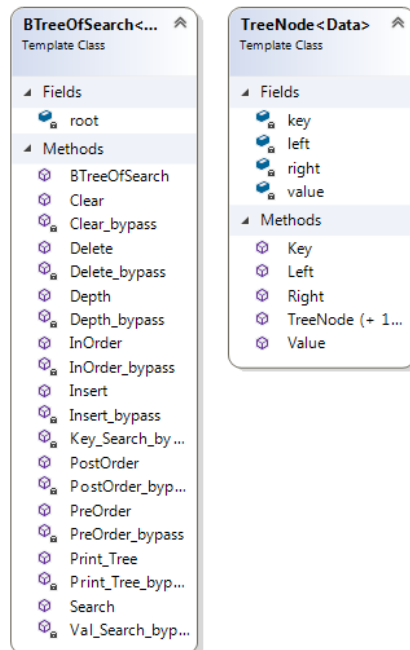


Figure 1 – Class diagram

The tree is managed using a special menu that uses the main functions of the "BTreeOfSearch" class. The tasks of these functions include displaying the tree in the console, adding new nodes, deleting old ones, searching through all nodes, pre-order, in-order and post-order traversals of the tree, as well as displaying the depth of the tree and clearing it.

Each function uses its corresponding utility functions, and you can see in the diagram that their name includes "bypass" in itself. Such auxiliary functions are necessary in order to traverse trees recursively. This method is the basis for working with binary trees.

The program interface is shown in the diagram shown in Figure 2. The program starts with calling the tree creation function, then the user gets to the main menu, from which the user can call any function from the general list that is necessary to fulfill his goals and objectives.

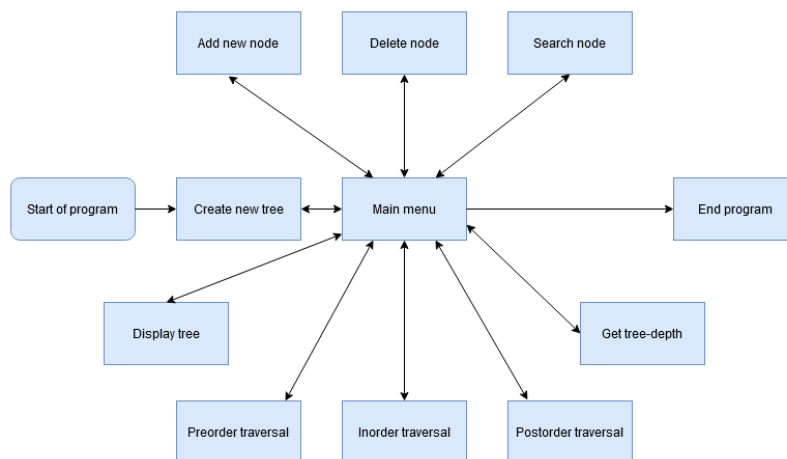


Figure 2 – Program interface diagram

Thus, education software for working with binary search trees was developed. This program will be extremely useful for students of technical universities to gain practical experience working with binary search trees.

The program has a development path based on the refinement of its functionality, for example, adding a mode for working with multiple trees to show their interaction with each other. The graphical interface can also be improved in this program.

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RESEARCH ON THE ARCHITECTURE OF A CONVOLUTIONAL NEURAL NETWORK FOR IMAGE RECOGNITION

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This article discusses the problem of choosing an efficient convolutional neural network architecture for image recognition. The accuracy of object recognition is analyzed using the CIFAR-10 dataset and the Keras library

Keywords: neural network, object recognition in images, CIFAR-10, convolutional neural network.

ИССЛЕДОВАНИЕ АРХИТЕКТУРЫ СВЕРТОЧНОЙ НЕЙРОННОЙ СЕТИ ДЛЯ РАСПОЗНАВАНИЯ ИЗОБРАЖЕНИЙ

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В данной статье рассматривается проблема выбора эффективной архитектуры сверточной нейронной сети при распознавании изображений. Анализ точности распознавания объектов проводится с использованием набора данных CIFAR-10 и библиотеки Keras.

Ключевые слова: нейронная сеть, распознавание объектов на изображениях, CIFAR-10, сверточная нейронная сеть.

The relevance of the article lies in the fact that the task of image recognizing objects is one of the most important in data processing. Despite there are various neural network architectures, the convolutional model is preferred. Programs designed to solve this problem simplify our lives, because, thanks to convolutional neural networks, we can search, sort, and process the resulting images. In addition, the recognition problem is found in many areas, starting with the solution of this problem for entertainment purposes, ending with the organization of the security system [1].

The purpose of the article is designing a program which is based on a convolutional neural network that allows recognition of objects in the resulting images.

The tasks of our work are as follows:

- analysis of existing methods of representation of convolutional neural networks;
- software implementation of the convolutional architecture;
- testing of the developed software tool;
- research and analysis of the accuracy of object recognition in the image in direct relation to the increase in training epochs.

The convolutional neural network architecture chosen for the study is a very broad class of architectures, the main idea of which is to repeatedly use the same parts of the neural network to work with different small, local sections of inputs [2]. In this case, to recognize objects in the input images, multiple processing of the image section must occur, regardless of the specific location of this section. If we are faced with the task of recognizing a certain object in the input image, it does not matter how many pixels a part of this object is located from a certain edge of the photo. You can also recognize this object in a heavily cropped photo, where only this object is present [2]. It is important to understand that the relative position of parts of objects plays a key role, but first you need to recognize them. This process occurs locally and independently of the specific position of the area with the object inside the large image.

The primary place in the convolutional architecture is occupied by the concept of convolution. Convolution is a linear transformation of a special type of input data. This mathematical model allows to transform a certain amount of input data into a more compact, collapsed form, while highlighting the significant features of the input data, obtaining a more averaged model [3].

In addition to the concept described above, in the convolutional architecture of a neural network, there is a nonlinear mathematical model, the so-called activation function, which calculates the output signal of the output neuron [3].

However, the model of the neural network, which we are researching, does not end with this function. In the classical design of convolutional architecture, there is a concept of "sub-sampling" (pooling or "subsampling" operation) [2]. This operation is based on the fact that convolutional architectures are usually based on assumptions, so the presence or absence of any feature is much more important than the exact location. In our task of recognizing objects in the input images by a convolutional network, it is much more important to understand whether the necessary object is present in the photo at all, rather than its exact location parameters. Therefore, there is a generalization of the selected features, while the loss of part of the information about their location is insignificant, compared with the acquisition of an advantage in reducing the dimension.

Our model of convolutional neural architecture has a convolutional layer consisting of three components:

- a convolution in the form of a linear map that highlights local features;
- a nonlinear function applied component-by-component to the results of the convolution;
- subsampling, which usually reduces the geometric size of the resulting tensors.

To implement this convolutional architecture, the Python programming language was chosen as the main design tool. The choice of this language is based on the availability of libraries and modules, in our case Keras and TensorFlow, which allow you to design a neural network of almost any architecture [4-5].

When creating a neural network, the following modules were used, and their description is also presented:

- numpy (for working with matrices and arrays);
- cifar10 (a data set for training our convolutional network, as well as checking the accuracy of recognition);
- Dense (for creating tightly connected or fully connected neural layers);
- Flatten (to convert a 2D image to 1D);
- Activation (to use the activation function);
- Sequential (for building the model sequentially);
- Dropout (a module for solving problems related to retraining);
- Conv2D (for using convolutional filters);
- MaxPooling2D (for determining the maximum subsampling);
- np_utils (for translating labels into categories);
- SGD (for gradient descent).

In the research, the CIFAR-10 dataset was used to train a neural network. It contains 60,000 images with a size of 32x32, which contain objects belonging to the classes: plane, car, bird, frog,

cat, deer, dog, frog, horse, ship, truck. It is important to note that each image contains only one object belonging to a particular class. In addition, CIFAR-10 is divided into two sets according to the following ratio: 50,000 images are sent for training, and 10,000 for testing.

At the beginning of our research, we will create the basic structure of a convolutional neural network (Fig. 1). This model contains two verification levels, followed by maximum pooling and alignment of the network for fully connected levels.

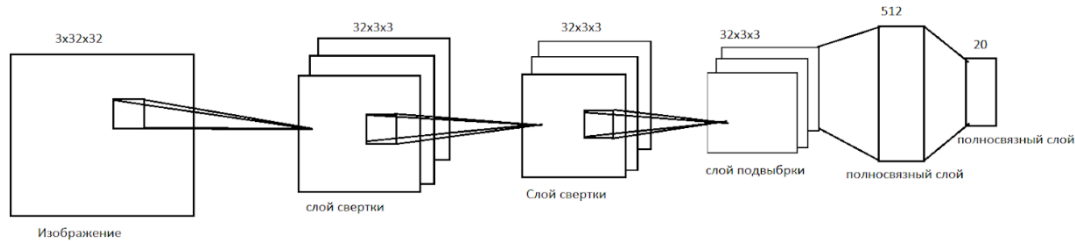


Figure 1. Basic structure of a convolutional neural network

In the behavior of the exploration of the correctness of object recognition in the image, the "accuracy values" were analyzed. When using the CIFAR-10 set as input, we get a direct dependence of the increase in recognition accuracy for each subsequent epoch. At the 25th training epoch, the convolutional neural network produces a recognition accuracy of 69 %.

This percentage of accuracy is not the limit for convolutional neural networks. To increase the efficiency of solving the problem, we will change the structure of this neural network. We will expand and complicate the neural network model by adding two more convolutional layers, thereby obtaining a deeper version of this software product. In this case, the convolutional neural network structure contains 4 convolution layers, 2 subsampling layers, and 2 fully connected layers.

In the process of analyzing the correctness of the program, the accuracy of object recognition in images increased to 76 % after 25 years of training.

To achieve a higher percentage of the accuracy of the convolutional neural network, we will create a larger and even more complex program structure, thereby adding 2 more convolutional layers.

We will combine the data obtained in Table 1, and also consider the effect of changing the probability in the regulatory layer.

Table 1

Comparative characteristics of convolutional neural network architectures

Numberofconvolutionlayers	Dropout parameter (probability of disabling a neuron)	The accuracy of the neural network on the test sample	Trainingtime (seconds)
2	20 %	68 %	118
2	25 %	69 %	118
4	20 %	76 %	137
4	25 %	76,5 %	138
6	20 %	78,22 %	158
6	25 %	79 %	160

Based on the data presented in the table, it can be concluded that the accuracy of image recognition on the CIFAR – 10 test dataset depends on the structure of the convolutional neural network. The percentage of accuracy increases in direct proportion with the increase in the number of convolutional layers, so a deeper convolutional neural network better copes with the task of recognizing objects in images. The optimal parameter of the Dropout regulatory layer is 0.25. It is at this value that the probability of retraining the convolutional neural network is small. It is also

important to understand that as the depth and complexity of the convolutional neural network increases, so does the learning time.

In conclusion, we would like to say that our work has studied and analyzed several structures of a convolutional neural network with subsequent software implementation in the Python programming language, using Keras libraries and methods. This neural architecture is able to recognize objects on color images with a size of 32 x 32 pixels.

The program demonstrates the capabilities of a convolutional neural network to recognize objects in the images of the CIFAR-10 dataset with an accuracy of 79 %. The neural network is able to recognize objects of ten names: car, plane, bird, cat, deer, dog, frog, horse, ship, truck.

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ON WAYS OF IMPROVING AUTHENTICATION MECHANISMS ON REMOTE SERVICES

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The paper focuses on the positive and negative aspects of using alternative authentication methods. It describes the advantages of attribute-based authentication over password-based authentication. The main methods of authentication without using passwords are also given. In general, the possible prospects for the development of this area are considered

Keywords: attribute authentication, information security, password flaws, biometrics, two-factor authentication.

О СПОСОБАХ СОВЕРШЕНСТВОВАНИЯ МЕХАНИЗМОВ АУТЕНТИФИКАЦИИ НА УДАЛЕННЫХ СЕРВИСАХ

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В работе рассматриваются положительные и отрицательные аспекты использования альтернативных способов аутентификации. В ней изложены преимущества атрибутивного вида аутентификации перед аутентификацией, предполагающей использование пароля. Также приведены основные способы аутентификации без использования паролей. В общем виде рассмотрены возможные перспективы развития данной области

Ключевые слова: атрибутивная аутентификация, защита информации, недостатки пароля, биометрия, двухфакторная аутентификация.

One of the trends in the development of the information security industry in 2021 is the use and systematization of attribute authentication. This trend is set by the Microsoft campaign, as it has long claimed that passwords are not a secure means of identification. Microsoft claims that about 80 % of cyber attacks are related to password theft, every 250th account is hacked every month [1]. Also, password leaks can be confirmed by the incident with the release of 3.2 billion email and password combinations into the network that occurred in February 2021[2]. Other surveys confirm the insecurity of using a password, because a large number of users have the same password on different resources, which is categorically unacceptable for the protection of information, especially personal data, because their leakage will cause damage on several resources simultaneously. Password authentication becomes insecure due to the human factor, as many users write down passwords on paper, and the password can be transferred to third parties, which is unacceptable, because it creates a financial, legal, and economic threat to the company [3]. Another significant disadvantage of this method of authentication is the risk of password theft by an attacker [4].

Every user in the modern world has a huge number of passwords and it is becoming a problem. But at the moment, thanks to a combination of sensors and encryption, the authentication process takes on a new image, which does not necessarily contain passwords. The goal of modern work in this field is to create a convenient, secure, error-free authentication system.

A promising area in this direction is attribute authentication. Its main types include: Security tokens, biometrics, multi-factor authentication (using a phone). In addition, they use such methods as Out-of-Band Authenticators, Attestation.

Tokens provide a decent level of protection, as they do not connect to the network, generate one-time passwords, which is based on the "seed record" synchronized with the central server. Modern tokens use Near field communication technology, so that the user does not even have to enter the password manually. Biometrics is already a very popular method of authentication, which is due to the appearance of Touch ID and Face ID in Apple products, and other companies that produce equipment. This authentication method is very convenient, since it does not require the user to know or have anything other than their biometric data. The disadvantage is the possibility of a criminal to steal the key, which in the case of data exchange in a closed channel will lead to identity theft. The channel should be closed and decentralized in order to exclude the possibility of collecting a biometric database that can be stolen by criminals. Also a disadvantage is the fact that biometric data is not a secret, they can be obtained, for example, by shooting. There are different types of two-factor authentication. For example, these are applications with push notifications. The principle of operation is that the user receives a notification as soon as he makes a request. The notification can be used to confirm the identity or login information. Mobile tokens should also be noted. The principle of operation is similar to hardware tokens, but no additional device is required to calculate the password, which makes the method more convenient. On the other hand, the password becomes more vulnerable to theft by cybercriminals, since it is located on a device connected to the network. Another and very common method is SMS authentication. It involves sending the user a one-time password in a short message. This principle of operation allows making the user free from the need to install special additional applications, but SMS delivery is not very reliable and is not recommended for use[5]. The use of a PSTN (Public Telephone Network) for out-of-band verification is limited. If out-of-band verification is to be performed using a PSTN, the verifier must verify that the pre-registered phone number used is associated with a specific physical device. Changing a pre-registered phone number is considered mandatory for the new authenticator. Verifiers should consider risk indicators, such as device replacement, SIM card change, number transfer, or other abnormal behavior, before using the PSTN to transmit the out-of-band authentication secret [6].

Next, let's pay attention to the out-of-band authenticator. It must establish a separate channel with a verifier to receive an out-of-band secret or an authentication request. This channel is considered out-of-band with respect to the main communication channel (even if it ends on the same device), provided that the device does not pass information from one channel to another without the applicant's permission. The out-of-band device must be uniquely addressable, and communication over the secondary channel must be encrypted, unless it is transmitted over a public switched telephone network (PSTN). There are additional requirements for the authenticator that are specific to the PSTN. Methods that do not prove ownership of a particular device such as VOIP (Voice over Internet Protocol) or email should not be used for out-of-band authentication [6].

A certificate is information passed to the verifier regarding the directly connected authenticator or endpoint involved in the authentication operation. The information transmitted as a result of verification may include, but is not limited to: origin (for example, manufacturer or supplier certification), health and integrity of the authenticator and endpoint, security features of the authenticator, security and performance characteristics of biometric sensors, sensor modality[6]. If this certificate is signed, it will be signed using a digital signature that provides at least the minimum security strength specified in the latest revision of SP 800-131A [7].

To develop technologies and improve authentication methods, Microsoft is creating new APIs (Application programming interface) and a user interface for managing security keys based on the FIDO2 standard.

FIDO2 is a project that consists of two parts: TheWebAuthn-JS API (JavaScript API) for managing accounts on public keys. This is a W3C (World Wide Web Consortium) standard, so it will be mandatory for all browsers. CTAP2-Client-to-Authenticator 2 is a standard that describes the CBOR protocol for communicating with an authenticator over USB, NFC, and BLE[4].

The attribute authentication system has many advantages. First, security. FIDO2 cryptographic credentials are unique on each web page, and passwords, biometric data, do not leave the device or are stored on the server. In this way, the possibility of phishing and other forms of password theft is eliminated. The second advantage is convenience. The user does not need to enter a complex password; he will be able to connect by reading the data of the fingerprint scanner, camera as well as using FIDO security keys or a mobile device. The use of FIDO keys ensures the user's privacy, as these keys are unique for each website.

According to Microsoft, in May 2020 the number of people using attribute authentication has reached 150 million. Also, in just six months, the number of people increased by 50 million. In the company itself, 90 % of employees switched to attribute authentication [8].

Thus, we can observe the growing popularity of attribute authentication. We can even say that in the near future the need for passwords will disappear. Large companies are actively conducting research in order to find a replacement for this already quite old method of authentication. Microsoft, in its turn, is engaged in standardizing and systematizing this approach, which should lead to the creation of the most convenient system for confirming identity. At the moment, it is impossible to say exactly what method will come to replace passwords, perhaps it will be a completely new method, which is not yet known to us.

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VARIATION PRINCIPLES AND MATHEMATICAL MODELS

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This article describes the main principles of making mathematical models.

Keywords: Mathematical model, Hamilton's principle, mechanical system, method.

ВАРИАЦИОННЫЕ ПРИНЦИПЫ И МАТЕМАТИЧЕСКИЕ МОДЕЛИ

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В данной статье рассматриваются основные принципы при создании математических моделей.

Ключевые слова: математическая модель, принцип Гамильтона, механическая система.

Let there be a mechanical system in which every interaction between it's elements is defined by the laws of mechanics. Position of this mechanical system will be defined by establishing the value $Q(t)$ – generalized coordinates. dQ/dt is the generalized velocity of an object at time t .

In order to describe the mechanical system Lagrangian function is introduced.

$$L\left(Q, \frac{dQ}{dt}\right) = E_K - E_P, \text{ where } E_K - \text{kinetic energy, } E_P - \text{potential energy}$$

Let's introduce value $S[Q]$ – action

$$S[Q] = \int_{t_1}^{t_2} L\left(Q, \frac{dQ}{dt}\right) dt$$

Hamilton's principle states: if a system moves in accordance to mechanical laws then $Q(t)$ is a stationary stochastic function for $S[Q]$:

$$\frac{d}{d\varepsilon} S[Q + \varepsilon\varphi]_{\varepsilon=0} = 0$$

Function $\varphi(t)$ is a certain tentative function which takes the value of 0 when t_1, t_2 , at the same time condition must be met that $Q(t) + \varepsilon\varphi(t)$ is the possible coordinate for this particular system.

Another method for making a model of the “spring-ball” system.

Let's use Hamilton's principle for making a model of the ball's movement which is connected to the spring. Let's pick ball's coordinate $r(t)$ as the generalized coordinate. Then the generalized

velocity $\frac{dr}{dt} = v(t)$ is the conventional velocity of the ball.

Lagrangian function $L = E_K - E_{\Pi}$ being applied using kinetic $E_K = \frac{m}{2} \left(\frac{dr}{dt} \right)^2$ and potential $E_{\Pi} = \frac{k}{2} r^2$ energy values of the system:

$$L = \frac{m}{2} \left(\frac{dr}{dt} \right)^2 - \frac{k}{2} r^2$$

Action value is calculated:

$$S[r] = \int_{t_1}^{t_2} \left(\frac{m}{2} \left(\frac{dr}{dt} \right)^2 - \frac{k}{2} r^2 \right) dt$$

Now let's calculate action on variables $\varepsilon \varphi(t)$ of coordinate $r(t)$ in accordance with the scheme:

$$\begin{aligned} S[r + \varepsilon \varphi] &= \int_{t_1}^{t_2} \left(\frac{m}{2} \left(\frac{d(r + \varepsilon \varphi)}{dt} \right)^2 - \frac{k}{2} (r + \varepsilon \varphi)^2 \right) dt = \\ &= \int_{t_1}^{t_2} \left(\frac{m}{2} \left(\frac{dr}{dt} \right)^2 + 2 \frac{m\varepsilon}{2} \left(\frac{dr}{dt} \right) \frac{d\varphi}{dt} + \frac{m}{2} \left(\varepsilon \frac{d\varphi}{dt} \right)^2 - \frac{k}{2} (r^2 + 2r\varepsilon\varphi + \varepsilon^2\varphi^2) \right) dt = \\ &= \int_{t_1}^{t_2} \left(\frac{m}{2} \left(\frac{dr}{dt} \right)^2 + m\varepsilon \frac{dr}{dt} \frac{d\varphi}{dt} + \frac{m}{2} \varepsilon^2 \left(\frac{d\varphi}{dt} \right)^2 - \frac{k}{2} r^2 - kr\varepsilon\varphi + \frac{k\varepsilon^2\varphi^2}{2} \right) dt. \end{aligned}$$

Then let's estimate $\frac{dS}{d\varepsilon}$

$$\frac{dS[r + \varepsilon \varphi]}{d\varepsilon} = \int_{t_1}^{t_2} \left[m \frac{dr}{dt} \frac{d\varphi}{dt} + \frac{m}{2} 2\varepsilon \left(\frac{d\varphi}{dt} \right)^2 - k^2 r \varphi - \frac{2k\varepsilon\varphi^2}{2} \right] dt$$

Supposing $\varepsilon = 0$

$$\left. \frac{dS[r + \varepsilon \varphi]}{d\varepsilon} \right|_{\varepsilon=0} = \int_{t_1}^{t_2} \left[m \frac{dr}{dt} \frac{d\varphi}{dt} - kr\varphi \right] dt$$

$$\int_{t_1}^{t_2} \frac{dr}{dt} \frac{d\varphi}{dt} dt = \frac{dr}{dt} \varphi \Big|_{t_1}^{t_2} - \int_{t_1}^{t_2} \varphi \frac{d^2 r}{dt^2} dt = \frac{dr}{dt} \varphi \Big|_{t=t_2} - \frac{dr}{dt} \varphi \Big|_{t=t_1} - \int_{t_1}^{t_2} \varphi \frac{d^2 r}{dt^2} dt$$

Then, assuming that $\varphi(t_1) = \varphi(t_2) = 0$

$$\left. \frac{dS[r + \varepsilon \varphi]}{d\varepsilon} \right|_{\varepsilon=0} = \int_{t_1}^{t_2} \left(-m\varphi \frac{d^2 r}{dt^2} - kr\varphi \right) dt$$

$$\int_{t_1}^{t_2} \left(m\varphi \frac{d^2 r}{dt^2} + kr\varphi \right) dt = 0$$

Since the tentative function $\varphi(t)$ is random, then the integral equals 0 at any $t_1 < t < t_2$

$$m \frac{d^2 r}{dt^2} + kr = 0$$

Application of Hamilton's principle in making models of mechanical systems.

This principle is the only real method of making models for systems consisting of a large number of various elements that are connected with each other in different ways.

Let's assume that there is another additional force affecting the ball $F_1 = const$ in the "ball-spring" system .

Applying Hamilton's principle:

$$S[r + \varepsilon\varphi] = \int_{t_1}^{t_2} \left\{ \frac{m}{2} \left(\frac{dr}{dt} + \varepsilon \frac{d\varphi}{dt} \right)^2 - \frac{k}{2} (r + \varepsilon\varphi)^2 + F_1 (r + \varepsilon\varphi) \right\} dt =$$

$$= \int_{t_1}^{t_2} \left\{ \frac{m}{2} \left(\frac{dr}{dt} \right)^2 + \frac{m}{2} \left(\varepsilon \frac{d\varphi}{dt} \right)^2 + m\varepsilon \frac{dr}{dt} \frac{d\varphi}{dt} - \frac{kr^2}{2} - \frac{k}{2} (\varepsilon\varphi)^2 - k\varepsilon r\varphi + F_1 r + F_1 \varepsilon\varphi \right\} dt$$

$$\frac{dS}{d\varepsilon} = \int_{t_1}^{t_2} \left\{ m\varepsilon \left(\frac{d\varphi}{dt} \right)^2 + m \frac{dr}{dt} \frac{d\varphi}{dt} - k\varepsilon\varphi^2 - k r\varphi + F_1 \varphi \right\} dt$$

$$\left. \frac{dS}{d\varepsilon} \right|_{\varepsilon=0} = \int_{t_1}^{t_2} \left[m \frac{dr}{dt} \frac{d\varphi}{dt} - k r\varphi + F_1 \varphi \right] dt = 0$$

- Hamilton's principle.

$$\int_{t_1}^{t_2} \frac{dr}{dt} \frac{d\varphi}{dt} dt = \int_{t_1}^{t_2} \left(-\varphi \frac{d^2 r}{dt^2} \right) dt$$

Then

$$\left. \frac{dS}{d\varepsilon} \right|_{\varepsilon=0} = \int_{t_1}^{t_2} \left\{ -m\varphi \frac{d^2 r}{dt^2} - k r\varphi + F_1 \varphi \right\} dt = 0$$

$$-m\varphi \frac{d^2 r}{dt^2} - k r\varphi + F_1 \varphi = 0 \quad \text{or} \quad m \frac{d^2 r}{dt^2} + k r = F_1.$$

Conclusion

Examples of applying Hamilton's principle in making models of mechanical systems serve as a clear instruction. Strictly following the steps of the sequence is the main rule of variation principles. Mathematical models can be made in simpler ways however variation principles are practically the only way for making such models for complex objects.

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CREATING CRM FOR INDIVIDUAL ENTREPRENEUR ENGAGED IN IT

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This article deals with the problem of the most effective personnel management for individual entrepreneurs engaged in the field of Internet technologies. In order to create the most objective requirements for the system and evaluate the required modules, competitors are analysed. This allows you to see both the pros and cons of these systems. As a solution to the problem, it is proposed to create a system, including a stack of technologies for its development.

Keywords: IT, CRM, CustomerRelationshipManagement, HTML, CSS, programming language, JavaScript,PHP, framework,Vue,Laravel, data base, MySQL.

СОЗДАНИЕ CRM ДЛЯ ИП, ЗАНЯТЫХ В СФЕРЕ ИТ

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В данной статье затрагивается проблема о наиболее эффективном управлении персоналом для индивидуальных предпринимателей, занятых в сфере интернет-технологий. Для создания наиболее объективных требований к системе и оценке требуемых модулей производится анализ конкурентов. Это позволяет увидеть как плюсы, так и минусы данных систем. В качестве решения проблемы предлагается создание системы, включая стек технологий ее разработки.

Ключевые слова: IT, CRM, система управления взаимоотношениями с клиентами, HTML, CSS, язык программирования, JavaScript,PHP, фреймворк, Vue, Laravel, база данных,MySQL.

Today, many services from companies registered as individual entrepreneurs can be obtained anywhere in the world. This is possible thanks to the very rapid growth of Internet technologies. Many people make any purchases online. For example, in stores Aliexpress, Ozon, DNS and others. Everyone can visit the site, choose the product they are interested in, compare it with analogues and purchase it.

In order for this system to work clearly and smoothly, it is necessary to organize the workflow. After all, without this, products will not appear on store shelves in a timely manner, user requests from the site will not be processed, and the head of the company will not know what his subordinates are doing. To solve this problem, there are a number of applications designed to organize team interaction, and provide reporting for heads of companies. One of the types of such applications is CRM (Customer Relationship Management).

CRM is a system that helps you control all channels of communication with customers and automate sales. If at the beginning of the company's development it is quite convenient to use just table Excel to record customer information, then with a large base of customers and employees, the convenience of Excel disappears. Such systems have a number of advantages:

1) All information about customers served by the company is stored in a single database. This means that the head of the company can at any time get all the information about the service that was provided to him and offer any other service.

2) Control over the work of employees. Such systems usually provide the ability to create and distribute tasks among employees. This allows the head of the company to see what kind of load each employee has, the amount of his work over a period of time.

3) Analytics of the company's work. This analysis allows you to identify vulnerabilities in the company's work, for example, how well the service was provided. Or, if it failed, the head of the company will be able to see at what stage and because of what the order was canceled. This feature allows companies to work more efficiently and improve.

4) Forecasting. Based on the information described in the previous paragraph, the head of the company is able to predict the performance of the company and take the necessary actions in emergency situations.

Today, there are already many popular CRM systems on the market that are designed to solve the problems described above. All of them have both advantages and disadvantages. Consider a few of them.

Bitrix 24. This CRM is among the most well-known systems in the CIS countries. This system is an integral part of a larger system, which gives a lot of opportunities and this is an undoubted plus. Among these features are:

- ability to manage employee relationships with the company's customers;
- monitoring the work of employees. Tasks are set for employees, and the head of the department always has up-to-date information about the state of affairs of the department;
- combining CRM with accounting;
- security implemented by separating user roles. This function allows you to keep the necessary information of some departments secret from others.

However, despite the described advantages, this system also has disadvantages:

- overloaded interface. Bitrix24 has a very loaded interface, in which an inexperienced user can easily get confused;
- not stable features. Using this system for a long time, users may notice that some functions are periodically unavailable. In some situations, such interruptions can have very unpleasant consequences.
- there is no possibility to change the interface to suit your needs. This possibility would be very relevant for companies that do not use all the functions of the system, but are forced to search among the interface sections of interest to them. This reduces the speed of work.

Deloteka. Although this system is not as popular as Bitrix24, it has enough functionality to compete with it. This system includes:

- ability to manage employee relationships with the company's customers;
- control of work by setting tasks;
- nice and user-friendly design and interface.

Like the previous system, Deloteka provides reporting on the company's performance. However, this system is not without its drawbacks, for example:

- the inability to change the interface for the needs of the company;
- there is no possibility of integration with mail.

PlanFix is one of the most common CRM systems. Among the features of this system are:

- ability to manage employee relationships with the company's customers;
- integration with mail;
- creation of Gantt charts;
- ability to export / import company data.

However, this system has some disadvantages, such as:

- overloaded interface;
- the inability to configure the interface for the needs of the company;
- unstable operation of the service;
- bulkiness. This disadvantage is manifested in situations where you need to quickly process the client's request. To do this, you need to perform quite a lot of actions compared to other systems.

The purpose of this work is to create a system that takes into account the described pros and cons of other projects. The concept of the system of this work involves the creation of a web resource. This approach assumes the presence of a client and a server. The client is the user's browser, which requests or sends data to the server. A server is essentially any single computer on the Internet that allows other machines to use itself as an "intermediary" in data transmission. All the necessary information is stored here. Also, a server is a program that processes client requests [1].

To implement this task, the following technologies are expected to be used:

1) Programming languages. At this point, we should highlight such components as the user interface and the server part. The user interface is planned to be created using the markup language HTML 5, CSS 3 and the programming language JavaScript. To increase the speed and convenience of work, it is assumed to use the framework Vue. This framework is used to create a user interface that has several features:

- Vue is easy to combine with other user interface creation tools;
- it is suitable for creating both simple and complex applications [2].

The server side will use the PHP 7 programming language. Of course, there could be other programming languages, such as Python, C++, or Java.

However, the choice is made in favor of PHP, because this language was developed specifically for creating websites. PHP is a translation interpreter that allows you to execute program code at a fairly high speed. Also, PHP can run on any server, since it does not contain server-specific code [3].

To ensure extensibility and security, the Laravel 8 framework is planned to be used with PHP.

2) Database. To store user information, we need to use some kind of database. Для этого была выбрана база данных MySQL. The MySQL database was selected for this purpose. This database provides the ability to establish relationships between tables, as well as choose between database usage modes (InnoDB, MyISAM, etc.).

3) Structure. At the first stage, the structure of this system will include the following sections:

- applications. This section is responsible for creating, storing and processing requests for services received by the company;
- deals. This section is intended for a detailed description of the terms of transactions of the company and the customer. An employee of the company will be able to specify information about the service, its cost, deadline, employees responsible for this transaction and other necessary information;
- tasks. This section is the next step after creating a deal. To perform the service, employees need to perform a number of tasks. This section is used to create, store, and process information about tasks;
- staff. The necessary information about employees will be stored here;
- customer information. It stores information about customers who have used the company's services;
- analytics. This section is intended to provide the head of the company with information about the work of employees, completed projects and transactions. This will allow the boss to distribute tasks more competently among employees and determine their success.

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MAINMETHODS OF SPACECRAFT COOLING

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This paper discusses the problems of organization of cooling of spacecraft. The purpose of cooling is considered. The main cooling methods are analyzed. The effect of cooling on the performance of spacecraft is estimated.

Keywords: spacecraft, cooling systems, operating temperatures, thermal conductivity.

ОСНОВНЫЕ СПОСОБЫ ОХЛАЖДЕНИЯ КОСМИЧЕСКИХ АППАРАТОВ

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Данная работа рассматривает вопросы организации охлаждения космических аппаратов, представляет цели их охлаждения. Анализируются основные способы охлаждения. В работе оценивается влияние охлаждения на работоспособность космических аппаратов.

Ключевые слова: космический аппарат, система охлаждения, рабочие температуры, теплопроводность.

Spacecraft is a specific technology that has no analogues. Due to the peculiarities of spacecraft operation, various design problems arise. This ultimately leads to the emergence of new, unusual solutions [1]. One of such tasks is the need to ensure a given temperature level for various elements of space-rocket vehicles. The safety of spacecraft depends on the success of its solution.

It is important to develop spacecraft cooling systems because there are spacecraft operating temperature ranges, going beyond which can influence the efficiency of devices. For most devices, this range is 0 – 40 °C. Meanwhile, situations when the devices overheat during intensive work often arise. In this case, various cooling systems are used.

When creating such cooling systems, it is necessary to take into account various external and internal heat sources, as well as the arrangement of devices inside the spacecraft. For some elements of the spacecraft not to heat up those that are close to them, and those that are far from them not to freeze, a special system is developed. It is called thermal control system. The main purpose of thermal control system is to ensure the maintenance of operating temperatures on board the spacecraft. Thermal control system can include radiators, heat pipes, fans, heaters, heat-shielding coatings, and even special computers.

To consider the issue of thermal protection of the elements of spacecraft body let us assume that there is some device installed on the outside of the case. This device has its own temperature, which is determined by the thermal balance based on data on external and internal heat flows.

Thermal balance of the device can be warm or cold. In the first case, the device receives excessive external solar thermal radiation, as a result there will be overheating. In the second case, an excessive heat outflow from the device itself is observed, which leads to overcooling of the device.

To prevent the device from overcooling or overheating, it is covered with insulation that allows the least heat to pass through. It should be taken into account that its own heat from a working device will be observed. This heat has to be dumped into space so that the temperature of the device does not exceed the limits. Excess heat is usually removed into space using a thermal radiation mechanism.

The standard operating temperature ranges for spacecraft instruments are different. Sometimes certain devices must operate at low temperatures. For example, the space orbital observatories Millimetron and JWST, which are planned to be launched in the near future, will observe the thermal radiation of the Universe, for this their receiving equipment must be cooled to temperatures as close as possible to the temperatures of open space. At JWST, the radiation receiver is planned to be cooled down to -173°C , and at Millimetron the temperature will even be lower, -269°C [2]. To exclude solar illumination, the receivers of these observatories are covered with the so-called radiation screen, a blanket. Blanket is screen-vacuum thermal insulation, it is a polymer film coated with a special alloy, which retains thermal radiation.

It is better to install the fuel elements on the radiation surface, but this is not always possible. If such an element is located far from the radiation surface, the heat flux transmitted by thermal conductivity from the element to the surface must overcome some thermal resistance. An increase in thermal resistance with an increase in the linear heat transmission path leads to increase of the temperature of the fuel element at the same temperature of the radiation surface. As a result, a fuel element can overheat significantly.

Transmission of heat from devices to radiation panels by thermal conductivity is impractical due to the large linear distances of the heat transmission path. Also, an increase in distance leads to an increase in the temperature difference on various surfaces of device body: those parts that are illuminated by the sun can heat up more than those that are in the shade. Therefore, a different cooling system is used for a large spacecraft. A fan is installed in the sealed compartment, which, blowing air over the devices in the compartment, cools them, and also equalizes the temperatures along their surface. The heat removed in this way can be transmission further to the radiation surface on the body of the device.

Example of Thermal Control Subsystem use is Amazonia-1. Amazonia-1 is a Brazilian remote sensing satellite providing mainly images, in order to observe and monitor deforestation, especially in the Amazon region. The Amazonia-1 Thermal Control Subsystem (TCS) has active and passive thermal control elements which keep the spacecraft's elements within a controlled range of temperature during the whole mission of the spacecraft, from the Beginning of Life (BOL) to the End of Life (EOL). The payload equipment, the propulsion subsystem components and batteries, along with their operational requirements, are the main drive to develop Amazonia-1 thermal control design and analysis.

TCS will ensure a proper thermal environment which supports safe work of all elements during all mission phases, minimizing the thermal control mass and heater power budgets. The basic functions of the Amazonia-1 thermal control are to supply temperature distribution to have all onboard equipment operate within their designed operational temperature range and to allow the dissipation of the excess energy generated with no detrimental effect.

The Amazonia-1 thermal design is based on the following criteria:

Insulate the satellite of external environment. Radiators are used to reject internal heat dissipation;

Minimize thermal gradients in the satellite by using high emittance coatings on the internal surface and enhance the conductive coupling between equipment and mounting panels;

Insulate the equipment placed in direct view to space from the space environment. It is important in order to prevent large temperature fluctuation;

Insulate MMP from payload module, considering the premise that the MMP is a multi-mission platform and its thermal design shall be qualified for any payload [4].

Thus, the problem of cooling is one of the most essential ones when designing a spacecraft. Cooling can be implemented in various ways: thermal insulation, radiation panels, fans, heat pipes. The development of rocket and space technology continues and new cooling systems can appear. There are a lot of new and complex problems ahead. These problems solution will inevitably lead to the emergence of original technology.

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ON CREATING A PROTECTED "SMART SOCKET"

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A new protocol for secure remote control of devices is proposed. It can be used to protect the spacecraft control channel. A mockup of a "smart socket" remote power control device has been created that implements the proposed protocol

Keywords: protection protocols, telecontrol, Arduino.

О СОЗДАНИИ ЗАЩИЩЁННОЙ «УМНОЙ РОЗЕТКИ»

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Предлагается новый протокол безопасного удалённого управления устройствами. Он может быть использован для защиты канала управления космическим аппаратом. Создан макет устройства удалённого управления питанием «умная розетка», реализующий предлагаемый протокол.

Ключевые слова: сетевые протоколы защиты, телеуправление, Arduino.

Introduction. In the modern world, there are a lot of expensive devices that are connected to the electrical network, but such devices can burn out, for example, from a voltage surge during constant operation or from a lightning strike in relative proximity to it. Therefore, there is a need for means of secure remote power control. There is a large number of so-called "Smart Sockets" on the market that have been researched. It turned out that none of them is suitable, since protection mechanisms are either absent, or they are closed, or the protection algorithms do not have recommendations of regulators in the field of information security in Russia, such as the Federal Service for Technical and Export Control and the Federal Security Service [1-3]. Other parameters are also important, such as price. In addition, the relevance of the topic is due to a significant increase in the size of the "Internet of Things" [4]. Already in the period from 2008 to 2009, the number of IoT devices exceeded the world's population.

Therefore, the aim of the work is to create a secure home automation device "Smart socket", taking into account the requirements for information security in the Russian Federation. To achieve this goal, the following tasks are formulated: to investigate the problems of information security in general in the field of "Internet of Things" and in particular in the field of home automation; to propose a mechanism for protecting the remote control of devices used in home automation; to create a home automation device "Smart socket", protected by the proposed protection mechanism and to practically show its performance. To solve the problems, research has been carried out in

open sources on the security of home automation tools; tools and elements from which a secure home automation tool can be built have been researched.

Defense mechanism. A new device control protocol was developed for which the following requirements are imposed: identification and authentication of the control side, protection against reprocessing of a command previously sent by a legal user and intercepted by an attacker, mandatory simplicity of the control protocol, hidden operation of the control side in local mode, identification and authentication of the controlled side when command is requested in the global mode, the simplicity of the used protection algorithms, the recommendation of protection algorithms by the Federal Security Service of the Russian Federation.

This protocol is better than others because it is small enough to check its feasibility and security level.

Remote power control device "Smart socket". The developed device is an example of the protocol implementation. The device will work as follows: a person, using a smartphone or a computer, transmits a command to the "Smart socket" via the Internet, in which the attacker is supposed to be located, and the socket regulates the state of the device connected to it. Moreover, the transmission channel must necessarily be protected, since the connected device can be very expensive, and it can burn out during a power surge due to constant work, or the connected device can be responsible for a person's life.

The whole complex is: a "smart socket" for four controlled sockets and two uncontrolled ones; a console program that acts as a control subject for a "smart plug"; the background program for the message delivery service from the control program to the smart plug. The "smart socket" consists of the following units: Arduino UNO microcontroller on the board – a computational module that implements the control protocol; Arduino Ethernet shield W5100 expansion board for communication with the network; Arduino Relay 4 control relay block for four 220-volt relays; a power supply that converts 220 volts to 12 volts; five-volt voltage stabilizer "KREN" for power supply of the control relay; a case from a broken "IPPON" uninterruptible power supply.

The "smart socket" operates in two modes: local, the so-called "white" mode, when the socket and the control subject are directly connected by a wire, and the global, so-called "gray" mode, when the control subject sends a packet with a command to the command delivery service, the object management submits a request to the service to receive a command and receives it in response. All settings such as password, IP address and others are stored in the permanent memory of the device. The microcontroller manufacturer Arduino guarantees to write parameters 100,000 times. Therefore the average service life is at least 5 years of work.

Conclusion. As a result of the work done, the need for the development of home automation tools in a secure design in the manner of recommendations of the Federal Security Service of Russia has been proved. A new universal protocol for secure control of smart home devices has been proposed. Its distinctive feature is its fundamental simplicity. This makes it possible to implement it in many microcontrollers, even in those where RAM and computing resources are significantly limited, for example, in the on-board computer of a spacecraft. The second distinctive feature of the proposed protocol is the provability of the security of its implementation due to its simplicity. Such provability can be carried out by information security specialists in an information security laboratory. The third feature is complete openness. This allows many Internet users to check its safety. A prototype of a smart socket home automation tool has been created. Its characteristics are shown in table 1.

Table 1

Characteristics of the prototype of the "smart socket" remote power management device

Parameter	Value
Number of uncontrolled outlets	2
Number of controlled outlets	4
Availability of light indication	Yes
Disconnecting both power lines	Yes
Overload protection for power lines	Yes (thermal relay)

Local control capability	Yes
Global management capability	Yes
Supports static IP address setting	Yes
Supports dynamic IP address setting	Yes
Possibility of MAC address modification	Yes
Crash recovery	Yes
Guaranteed work period	5,7 years
Basic security algorithm	"Stribog" according to GOST R 34.11-2012
Remote Control Protocol	Network security command control protocol (proposed in the work)
Configurable via USB-B from a computer	Yes
Ethernet connectivity (RJ45)	Yes

The developed prototype of the "smart socket" has been successfully implemented and is being used as a means of remote power supply control in the laboratory of the Institute of Engineering Physics and Radioelectronics of the Siberian Federal University. This laboratory is intended for the development and research of elements of a network of non-demand measuring stations GLONASS.

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APPLICATION OF CONVENTIONAL NEURAL NETWORK IN COMPUTER VISION TASKS

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This article describes a convolutional neural network, namely, the features of its architecture and training, as well as the advantages of using this model of neural networks for solving urgent problems in the field of computer vision.

Keywords: computer vision, object recognition, artificial intelligence, convolutional neural network

ПРИМЕНЕНИЕ СВЕРТОЧНОЙ НЕЙРОННОЙ СЕТИ В ЗАДАЧАХ КОМПЬЮТЕРНОГО ЗРЕНИЯ

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В данной статье приведено описание сверточной нейронной сети, а именно особенности ее архитектуры и обучения, а также преимущества применения данной модели нейронных сетей для решения актуальных задач в сфере компьютерного зрения.

Ключевые слова: компьютерное зрение, распознавание предметов, искусственный интеллект, сверточная нейронная сеть

Artificial intelligence can be defined as the science that deals with the modeling of human behavior. Modern artificial intelligence technologies are actively developing in several directions, one of which is computer vision [1] – the theory and technology of creating machines that can detect, track and classify objects [2].

Computer vision is designed to solve problems related to the collection and analysis of visual information in various areas of production, while partially or completely replacing a person, and its purpose is to form useful conclusions about objects and scenes in the real world based on the analysis of images, received with the help of sensors [3].

The identification of features of objects in digital images is one of the main tasks of computer vision and the theory of pattern recognition. One of the options for implementing this technology is the use of convolutional neural networks.

In an ordinary perceptron, which is a fully connected neural network, each neuron is connected to all the neurons of the previous layer, and each connection has its own personal weight coefficient. In a convolutional neural network, the convolution operation uses only a limited matrix of small weights, which is "moved" throughout the processed layer, forming after each shift an activation signal for the neuron of the next layer with a similar position. The peculiarity of such an

architecture is the content of 3 main paradigms [4]: 1) Local perception; 2) Shared weights; 3) Subsampling.

Local perception implies that the input of a single neuron is not the entire image, but only a certain area of it. This approach allowed us to preserve the topology of the image from layer to layer.

The concept of shared weights assumes that a very small set of weights is used for a large number of links. So, if the input has an image with the size of 32x32 pixels, then each of the neurons of the next layer will accept only a small section of this image with the size, for example, 5x5, and each of the fragments will be processed by the same set. There can be many sets of weights, but each of them will be applied to the entire image. Such sets are often called kernels.

The essence of subsampling and S-layers is to reduce the spatial dimension of the image. So the input image is reduced by a given number of times, most often by 2, although there may be a non-uniform change, for example, 2 vertically and 3 horizontally. Subsampling is necessary to ensure scale invariance. Alternating layers allows us to create feature maps from feature maps, which in practice means the ability to recognize complex feature hierarchies.

Figure 1 shows a typical convolutional neural network architecture.

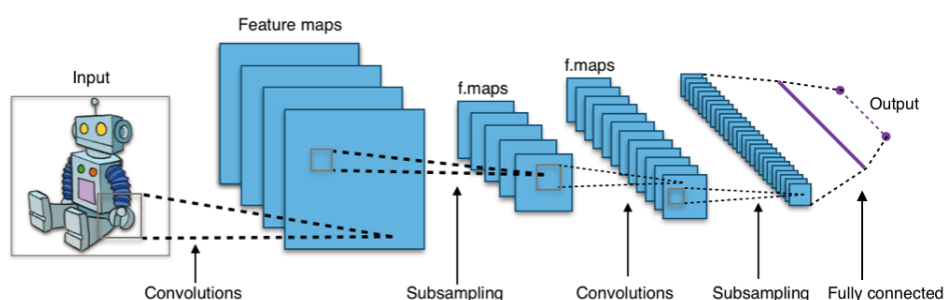


Figure 1-Typical architecture of a convolutional neural network [5]

After several passes of image convolution and compaction, the system rebuilds from a specific grid of high-resolution pixels to more abstract feature maps, as a rule, the number of channels increases on each subsequent layer and the image dimension in each channel decreases. In the end, all that remains is a large set of channels. The channels store a small number of data (even a single parameter), which are interpreted as the most abstract concepts identified from the original image.

The simplest and most popular method of studying is the method of studying with a teacher, also called the method of error back propagation. To improve the network performance, increase its stability and prevent retraining, we can also use the method of training a subnet with the throwing of random single neurons.

Convolutional neural networks are resistant to offsets, rotations, angle changes, and other input data distortions. The main advantages of this model include its versatility in recognition tasks. This subspecies of neural networks can be successfully used for face recognition and computer vision systems design.

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COMPARATIVE ANALYSIS OF BIOMETRIC AUTHENTICATION METHODS

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Methods of authentication based on human biometrics are considered. In all organizations, according to the law of the Russian Federation, it is required to ensure information security. The analysis of various methods of biometric authentication is carried out in order to make the most competent choice of equipment to ensure the protection of information.

Keywords: identification, authentication, biometrics, falsification, hardware components, information security, analysis, infrared radiation.

СРАВНИТЕЛЬНЫЙ АНАЛИЗ МЕТОДОВ БИОМЕТРИЧЕСКОЙ АУТЕНТИФИКАЦИИ

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Рассмотрены методы аутентификации по биометрии человека. Во всех организациях по закону РФ требуется обеспечить информационную безопасность. С целью наиболее грамотного выбора оборудования для обеспечения защиты информации проведён анализ различных методов биометрической аутентификации.

Ключевые слова: идентификация, аутентификация, биометрия, фальсификация, аппаратные компоненты, информационная безопасность, анализ, инфракрасное излучение.

In every organization, there is a need for high-quality implementation of information security.

It is not difficult to list a wide range of industries that require fast, reliable and convenient user authentication: access to a personal computer or smartphone, access to e-mail, bank transactions, opening doors and starting the car engine, controlling access to premises, crossing state borders, and in general, as a rule, any interaction with state authorities requires identification.

Password and attribute methods of identification and authentication, traditionally used in access control and information security systems, have a number of significant drawbacks. The main one is the ambiguity of user identification and the possibility of cheating the security system, for example, by stealing or imitating an attribute, or cracking the user's password [1].

Authentication methods based on biometric parameters of the individual, due to the inherent biometric characteristics of a particular person, are able to provide increased, in comparison with other methods of verification of compliance, have a very high accuracy.

The purpose of this work is to analyze modern biometric systems and select the most fault-tolerant equipment on the market. Table 1, shows the basic principles of biometric authentication by the main characteristics that are most important for the work.

Comparison of biometric identification methods

Biometric identification method	FAR	FRR	Falsification	Authentication speed, sec	Contactless authentication	Availability in the Russian market
Fingerprint	0,001 %	0,6 %	Possible	2	Not possible	High
2D Face Recognition	0,1 %	2,5 %	Possible	3	30-40cm.	Average
3D Face Recognition	0,0005 %	0,1 %	Problematic	10	20-30 cm.	Average
The iris of the eye	0,00001 %	0,016 %	Problematic	2	20 cm.	Low
Retina of the eye	0,0001 %	0,4 %	Not possible	10	Not possible	Low
Vein pattern	0,00008 %	0,01 %	Not possible	2	10 cm.	High

FAR-False Pass rate

FRR-False Failure Rate

Compared to a fingerprint or finger vein pattern, the palm vein pattern is more complex and has more unique features that allow to fairly accurately build a digital model and make identification from databases. The inner side of the palm is less susceptible to skin discoloration than the back side, so it is mainly used for identification. It is also worth noting that this method is absolutely harmless to the skin and blood vessels.

The principle of operation of the vein pattern readers is based on the ability of the blood hemoglobin to absorb infrared radiation.

Of course, the choice of the biometric authentication method for the access control system primarily depends on the requirements imposed on it. However, a comparison of biometric methods by a combination of factors clearly demonstrates their advantages in general [2].

The scanning equipment can work "on the lumen", when the object of scanning (most often a palm or finger) is placed between the radiation source and the reading surface. But, much more often, the technology of reading reflected IR light ("Reflection") is used. It allows to get a more compact design of the reader, by placing all the hardware components in one place. And, in addition, to avoid unnecessary psychological barriers for the user, who does not have to put his biometric ID (for example, a hand) inside the scanning device.

As a result of the IR scan, an image of the object is obtained, where the veins are represented by a darker, actually black, color. The image undergoes additional software processing, after which the resulting vein layout is verified [3].

If the growth of systems based, for example, on the recognition of the iris, is limited by the high cost and low availability for the Russian consumer, then the potential of the method of biometric authentication based on the pattern of the veins is obvious.

After conducting a comparative characteristic, the most accurate and practical method of biometric authentication is identified – the drawing of the veins of the palm.

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ASYMMETRIC ENCRYPTION WITH THE RSA ALGORITHM

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The article describes the encryption by the RSA method, application of the method, information about encryption and decryption, the actuality of the topic.

Keywords: the RSA algorithm, encryption, decryption, cryptography.

АСИММЕТРИЧНОЕ ШИФРОВАНИЕ С ПОМОЩЬЮ АЛГОРИТМА RSA

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В статье приведено описание шифрования методом RSA, применение метода, информация о шифровании и дешифровании, актуальность темы.

Ключевые слова: алгоритм RSA, шифрование, дешифрование, криптография.

In the context of the emergence of global networks, the rapid growth of digital communications and electronic data exchange, many users, communicating in cyberspace, do not think at all about the security of information.

Every day, we exchange a lot of our personal data, thereby leaving our digital footprint. To be strict, the information that we freely share with each other, we inadvertently leave open and unprotected for cybercriminals. Currently there is a need to find ways to implement the confidentiality of information, there is a need for modern cryptography.

Cryptography is a branch of knowledge that studies the principles, means and methods of data transformation in order to hide the information content and prevent unauthorized use. Cryptography allows users to use public and private media, such as the Internet, to make purchases and avoid intercepting passwords and any other personal data.

Today, cryptography can be broadly divided into two categories:

1. Symmetric key cryptography.
2. Asymmetric cryptography.

The main difference between the two categories is that symmetric encryption algorithms use a single key, while asymmetric encryption algorithms use two different but related keys.

In my opinion, asymmetric encryption has a huge advantage over symmetric encryption, which is the ability of the parties to communicate and exchange data with each other without using secret communication channels. That is why in this article, I would like to pay special attention to the most common algorithm for asymmetric encryption – RSA.

The essence of the RSA algorithm is as follows.

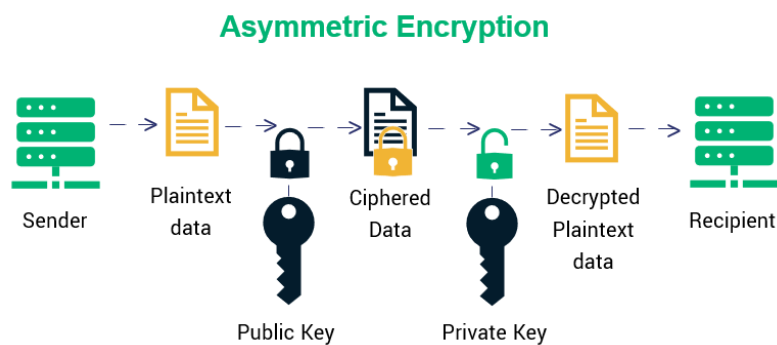
There are two linked keys, which are usually 1024 or 2048 bits long. One is the public key and the other is the private key. If the public key is used for encryption, then the message can only be decrypted using the private key and vice versa.

The idea of RSA is based on the fact that it is difficult to decompose a large integer.

The public key consists of two numbers, where one number is the multiplication of two large primes. The private key is also derived from the same two primes.

If someone can decompose the original large number, the private key will be cracked.

Therefore, the reliability of encryption depends entirely on the size of the key, and if we double or triple the size of the key, the strength of encryption will increase according to the law of geometric progression.



Structure of asymmetric cryptography algorithms

Advantages of the RSA algorithm as an algorithm for asymmetric cryptography:

- 1) solves the key distribution problem;
- 2) it is computationally intensive due to the use of mathematical functions.

Disadvantages of the RSA algorithm:

- 1) requires sufficiently long keys;
- 2) time-consuming;
- 3) inefficient for small wireless devices;
- 4) requires high computing power and bandwidth.

Thus, if we need to protect a small amount of information, and we are not restricted by time and computing resources, then we can safely use the RSA algorithm.

Effective encryption and decryption of data is the key to security in cyberspace. We convert the information into an unreadable format and provide access to it only to the users we need.

Cryptography allows users to communicate on the Internet, to transmit important information, while leaving it confidential. But even the fact that cryptography is used to convert information into an unreadable format does not make us absolutely sure that confidential data will not be available to cybercriminals, because we can say with great confidence that while we are improving the ways to protect information, they are improving in the methods of cyber hacking and data capture. Therefore, we have no choice but to outsmart them by using or creating powerful information security algorithms.

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УДК 14

ON FRACTAL MECHANISMS OF THE SYNERGETIC APPROACH TO THE SYSTEM FUNCTIONING

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The paper deals with the relevance of the synthesis of synergetics and fractal geometry methods when describing the behavior of dynamic systems. The similarity of approaches in synergetics and fractal geometry in the framework of post-non-classical science is highlighted and justified. New methods to the description of existing synergetic concepts are proposed.

Keywords: synergetics, fractal geometry, dynamic system, dissipative systems, turbulence.

ФРАКТАЛЬНЫЕ МЕХАНИЗМЫ СИНЕРГЕТИЧЕСКОГО ПОДХОДА К ВОПРОСАМ ФУНКЦИОНИРОВАНИЯ СИСТЕМ

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В данной работе проводится исследование актуальности синтеза методов синергетики и фрактальной геометрии в описании поведения динамических систем. Выделяется и обосновывается общность взглядов синергетики и фрактальной геометрии в рамках пост-неклассической науки. Предлагаются новые методы описания существующих в синергетике вопросов.

Ключевые слова: синергетика, фрактальная геометрия, динамическая система, диссипативная структура, турбулентность.

Until the twentieth century, over the whole period of scientific development and formation of humanity's understanding of the world structure, such concepts as non-smoothness, evolutionism, and dynamism were mostly excluded.

Then the model of scientific development and the approach to the phenomena of animate and inanimate nature faced the crisis and simultaneous, relevant reformation. The Newtonian model showed its inconsistency in describing many processes: as classical science had a tendency to approximation and unambiguity, such issues as turbulence, gravitational and photometric paradoxes were left unresolved.

All these processes predetermined the creation of a new scientific and philosophical trend. In the 1970s, synergetics was finally formed – the scientific field that defines structures as states that appear as a result of the multivariate and ambiguous behavior of their multi-element structures or multifactorial environments developing due to their openness and in flow of energy from outside. It is noteworthy that at the same time, the French-American mathematician B. Mandelbrot, after rigorous research, formed a new branch of mathematics-fractal geometry and introduced the term "fractal" into science[1,2,3].

It is not surprising that as a result of the crisis of classical approach new scientific fields started to emerge simultaneously during this period that considered many issues in the same way.

Due to the obvious similarity in consideration of processes and the interdisciplinary universality of the principles of synergetics and fractal geometry, there were increasingly attempts to apply both disciplines to the issues of biology, economics, physics and social sciences.

Both theories – synergetics and fractal geometry – are distinguished by the universality of applying their basic principles to a wide range of sciences, while defining general laws and ways of systems and their groups functioning.

The results of analyzing the main concepts of the theories of dissipative systems, self-organization of systems and fractal geometry reveal their consistency within the framework of post-non-classical scientific knowledge [4].

The paper deals with the common nature of the problems of synergetics and fractal geometry: both disciplines aim to solve such issues as turbulence, the functioning and interaction of populations, the dynamics of price growth and fall in the economy, the distribution of mass, objects and their transformations in space.

The complementarity of the basic synergetic concept – self-organization and openness of systems that determine their behavior and regulation – with the principals expressed by B. Mandelbrot in his works on fractal geometry is obvious. The hierarchical architecture of systems with their order at the micro level and the variety of forms and chaos at the macro level is nothing more than a mechanism described in fractal theory as natural fractals. Manifesting themselves in a variety of forms, complex multi-level systems are a set of generating small processes that are open to external influences. They form the entire variety and nonlinearity of the final phase trajectories of dynamic systems by accumulating in combinations, determined by the perturbations and changes in external conditions applied to the system.

The consideration of turbulent processes as dissipative structures with micro-ordered behavior is consistent with Mandelbrot's assumption about the fractal dimension of fluid flows in turbulence with a variable number of such dimensions: characteristic areas are identified where flows form both separate sets of points and areas tending to surfaces $D \rightarrow 2$ and sections of space $D \rightarrow 3$, while leaving mechanisms at the micro level (molecular friction and energy loss by liquid jets) functioning according to the same laws [5,6].

The paper proposes a method for considering the synergetic problem of distributing cities, towns and roads on the Earth's surface in terms of fractal geometry. The process of reaching by the system the critical point at which a smaller settlement appears is taken as the main parameter (generator). Within the limit, such a system forms a grid of cities that has a fractal dimension, while the process is still regulated by the mechanisms described in the basic papers on synergetics [7].

The growing interdisciplinarity of scientific works within the framework of post-non-classical rationality is clearly reflected in synergetics: when trying to describe the functioning of systems, the generality of such a description is emphasized for systems of different nature and, in some cases (in the process of open interaction), the possibility of influence of systems with different nature on each other. In turn, fractal geometry introduces a radically new factor for science – fractional dimension – and asserts the primacy of this factor in the modeling of most natural and social processes. Clear parallelism of such discoveries allows concluding about the common nature of the fundamental laws and possible prospects in the field of modeling the behavior of a wide range of processes of different nature with probable identification of some non-system mechanisms of functioning that are common at their initial level for processes of any nature.

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MODERN TECHNOLOGIES IN MECHANICAL ENGINEERING

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This paper is devoted to the research of modern technologies and their impact in the field of mechanical engineering.

Keywords: modern mechanical engineering, technologies, heavy-duty material, overcoming friction, lasers, nanotechnology.

СОВРЕМЕННЫЕ ТЕХНОЛОГИИ В МАШИНОСТРОЕНИИ

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Данная статья посвящена исследованию современных технологий и их влиянию на область машиностроения.

Ключевые слова: современное машиностроение, технологии, детали, сверхпрочный материал, преодоление трения, лазеры, нанотехнологии.

The purpose of our research is to find out to what extent and what modern technologies are relevant in mechanical engineering. Our research is theoretical. In this research, the following questions were raised and investigated:

- 1) what modern technologies are used in mechanical engineering;
- 2) how they affect overall productivity;

Mechanical engineering is a huge industry with many ramifications, which includes such areas as: robotics, manufacturing of industrial machine tools, household appliances, radio engineering, electrical industry, etc.

Modern mechanical engineering has changed a lot lately. Almost all processes have become automated. Machine tools and technological lines have become more compact, mobile, less energy-consuming, which affected the accuracy and manufacturability of products. But now, more highly qualified specialists are needed to maintain modern machine tools.

Science-intensive technologies and innovations are considered to be the basis of modern mechanical engineering. Such sciences as energy, physics, chemistry and IT-sphere every year give us new discoveries that are used in production. Here are some of them:

Heavy-duty material. A group of researchers from North Carolina and Canada have synthesized a new alloy, the density of which does not exceed that of aluminum, and the strength of this alloy is superior to titanium. It has not yet received an official name, so in scientific papers it is called by its chemical formula – $Al_{20}Li_{20}Mg_{10}Sc_{20}Ti_{30}$. The composition is a mixture of 5

known metals: magnesium, aluminum, lithium, titanium and scandium. The characteristic features that this material demonstrates are superior to all existing design counterparts at the moment.

Overcoming friction. Argonne National Laboratory has unveiled a new technology developed for mechanical engineering that reduces friction between two different materials to almost zero at the macroscopic level. The researchers coated one surface with graphene and applied a diamond-carbon composition to the other. After that, both surfaces were moved over each other, as a result of which the coefficient of friction turned out to be practically zero. This innovation has been enthusiastically embraced by machine builders in space exploration and development, where they intend to implement this approach in the next 15 years.

Lasers for the manufacture of parts. Laser systems are used more and more in mechanical engineering. This method has a number of advantages: complete automation of the process, high speed of work execution, absence of errors and imperfections. This approach will reduce to zero possible deformations and breakages that arise when using old methods.

Nanotechnology. The introduction of nanotechnology in modern mechanical engineering will allow manipulate the properties of nanomaterials at the atomic level, creating complex structures, which will increase the strength of the material, improve flexibility, heat resistance, thermal and electrical conductivity, etc. Such technologies are already used in the following areas: aerospace engineering, production of structural materials, tool production and instrument making.

IT technologies. IT technologies provide process automation in mechanical engineering. They provide the following advantages: the ability to make decisions in real time, perform several processes at the same time, quickly introduce new technologies into an already formed system, etc.

Innovative principles and materials for mechanical engineering continue to be developed around the world.

So, industries must implement new technologies in their work processes. Every year, with the use of modern technologies, the manufactured products become more accurate, less energy consuming and more affordable.

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IMPROVEMENT OF METROLOGICAL SUPPORT IN THE SPACE INDUSTRY

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The analysis of metrological support in the space industry was carried out. A method for improving metrological support in the space industry was proposed.

Keywords: metrological support, space industry.

СОВЕРШЕНСТВОВАНИЕ МЕТРОЛОГИЧЕСКОГО ОБЕСПЕЧЕНИЯ В КОСМИЧЕСКОЙ ПРОМЫШЛЕННОСТИ

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Проведен анализ метрологического обеспечения в сфере космической промышленности. Был предложен способ совершенствования метрологического обеспечения в космической промышленности.

Ключевые слова: метрологическое обеспечение, космическая промышленность.

Currently, the Russian space industry needs the development of domestic electronics. The political situation makes it especially necessary. The transition from western to domestic electronics lead to decline of the quality of all production of the space industry. Nowadays, in the conditions of the most severe competition, it is necessary to develop measures that will be aimed at stabilizing the activities of metrology in the space industry, first of all, in the management of efficiency of the use of electronics [1].

One of the main directions of improving the quality of production is metrological support, improving the organization of production.

Metrological support is the establishment and application of scientific and organizational foundations, technical means, rules and norms necessary to achieve unity and the required accuracy of measurements [2].

The main tasks of the Metrological Service in the space industry are [3]:

- organization and coordination of work on metrological support of rocket and space technology (hereinafter – RST) and ensuring the uniformity of measurements in the rocket and space industry (hereinafter – RSI);
- development and implementation of a unified scientific and technical policy in the field of metrological support of RST and ensuring the uniformity of measurements in RSI;
- determination of the main directions for the development of metrological support for RST and ensuring the uniformity of measurements in RSI;

- organizational, informational and scientific-methodological support of works on metrological support of RST and ensuring the uniformity of measurements in RSI;
- determination of the main directions of activity and performance of work on metrological support of the rocketry and ensuring the uniformity of measurements in the rocketry;
- development of a system for metrological support of RST and ensuring the uniformity of measurements in RSI;
- planning of work on metrological support of rocket and spacecraft and ensuring the uniformity of measurements in rocket and spacecraft;
- organization and coordination of the development and implementation of modern techniques (methods) and measuring instruments, measurement standards of units of quantities;
- organization of control over the condition and use of measuring instruments, measurement techniques (methods), compliance with metrological rules and norms;
- development and maintenance of the sectoral regulatory framework in the field of metrological support of RST and ensuring the uniformity of measurements in RSI.

Based on the above, it should be noted that metrological support in the space industry is based on theoretical and applied metrology. To improve the quality of production, one should rely on modern developments in applied metrology both in Russia and abroad.

In order to solve this problem, it is proposed to organize a structure of qualified field specialists for the development of modern applied metrology, aimed at improving the quality of elements of the base of electronic devices and components.

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RESEARCH ON THE EFFECTIVENESS OF THE STACKING PROCEDURE IN SOLVING THE CLASSIFICATION PROBLEM

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The effectiveness of the stacking procedure in solving classification problems is investigated. The statistical evaluation of the results of the stacking and its participants is carried out separately. The results obtained are analyzed.

Keywords: ensemble methods, stacking, weak students

ИССЛЕДОВАНИЕ ЭФФЕКТИВНОСТИ ПРОЦЕДУРЫ СТЕКИНГА ПРИ РЕШЕНИИ ЗАДАЧ КЛАССИФИКАЦИИ

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Исследуется эффективность процедуры стекинга при решении задач классификации. Проводится статистическая оценка результатов работы стекинга и его участников отдельно. Анализируются полученные результаты.

Ключевые слова: ансамблевые методы, стекинг, слабые ученики

When solving complex problems of classification, regression, and forecasting, it often turns out that none of the algorithms provides the desired quality of dependency recovery. Various methods of ensembling learning algorithms are used in problems of teaching with a teacher, in which the quality of the solution prevails over the limitation of its computational complexity. In such cases, it makes sense to build compositions of algorithms in which the errors of individual algorithms are mutually compensated.

What are ensemble methods? Ensemble methods are a machine learning paradigm where multiple models (often referred to as "weak learners") are trained to solve the same problem and combined to produce better results. The main hypothesis is that with the right combination of weak models, we can get more accurate and / or reliable models [1].

In ensemble learning theory, there is the concept of weak learners (or basic models), which can be used as components to design more complex models by combining several of them. In most cases, these basic models don't work as well on their own. The idea of ensemble methods is to try, by combining several weak students together, to create a strong student (or ensemble model) that achieves the best results.

To implement the ensemble method, we first need to select our weak students for aggregation. One important point is that our selection of weak learners must be consistent with how we

aggregate these models. This brings us to the question of how to combine these models [2]. We can mention three main types of meta-algorithms that aim to combine weak learners:

Bagging. In this case, it is often considered homogeneous weak students, train them in parallel and independently of each other, and then combine them, following some deterministic averaging process.

Boosting. In this case, we often consider homogeneous weak students, train them consistently in an adaptive way (the weak student depends on the previous ones), and combine them following a deterministic strategy.

Stacking. In this case, one often takes into account heterogeneous weak students, studies them in parallel, and combines them, training a metamodel to output a prediction based on the predictions of various weak models [3].

Stacking has two main differences from bagging and boosting. First, stacking often takes into account heterogeneous weak students (different learning algorithms are combined), whereas bagging and boosting take into account mostly homogeneous weak students. Second, stacking teaches how to combine basic models using a meta-model, whereas bagging and boosting combine weak students using deterministic algorithms [4].

As mentioned earlier, the idea of stacking is to learn several different weak learners and combine them by training a metamodel to output predictions based on the multiple predictions returned by these weak models. So, you need to define two things to build a stack model: the L students that need to be trained, and the metamodel that combines them.

For example, for a classification problem, you can choose a KNN classifier, a decision tree, a Bayesian classifier, and an SVM as a weak learner and decide to train a neural network as a metamodel. The neural network will then take as input the results of our four weak students and learn to make final predictions based on them. A statistical evaluation of the results was carried out and some conclusions were formulated. It is worth noting that the algorithm worked on the following tasks: "Breast cancer", "Wine" and "Digits".

The conclusions are as follows:

1. On the "Breast cancer" database, stacking worked as well as its parts, even better than some of them.
2. On the "Wine" database, stacking was second only to the Bayesian classifier.
3. On the "Digits" database, the stacking yielded to the KNN classifier and the support vector machine.

It was assumed that stacking would work better than its participants. Perhaps such results are obtained due to the simplicity of the databases used. In the future, more complex problems will be considered, ideally real data.

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COMPARATIVE ANALYSIS OF PROGRAMMING LANGUAGES

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Five popular programming languages are considered in order to form recommendations for novice specialists on the choice of the language most suitable for creating a software project in a given subject area. The significance coefficients of each programming language evaluation criterion are calculated.

Keywords: programming language, analysis, IT (information technology), C++, C#, Java, Python, Assembler.

СРАВНИТЕЛЬНЫЙ АНАЛИЗ ЯЗЫКОВ ПРОГРАММИРОВАНИЯ

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Рассмотрены пять популярных языков программирования с целью формирования рекомендаций начинающим специалистам по выбору языка, наиболее подходящего для создания программного проекта в заданной предметной области. Рассчитаны коэффициенты значимости каждого критерия оценки языка программирования.

Ключевые слова: язык программирования, анализ, IT (information technology), C++, C#, Java, Python, Assembler.

There are many programming languages in the IT universe. Every year their number is growing, and both the languages themselves and the programming technologies they implement are changing. Beginners do not always manage to choose the right programming language that is suitable for solving specific tasks.

The choice of a programming language that is effective in creating a software project is determined by a number of factors, including the features of the language and the subject area of automation, as well as the preferences of the customer and the developer [1].

A programming language is a formal language designed for writing computer programs. A programming language defines a set of lexical, syntactic, and semantic rules, which in turn determine the appearance of the program and the actions that the performer (usually a computer) will perform under its control.

Areas of application of programming languages in the modern world abound: scientific applications, business applications, artificial intelligence, system programming, web applications, and so on. Therefore, the first task when choosing a language is to list the main requirements of the project, followed by secondary requirements.

In this article, programming languages are considered according to general criteria. For the comparative analysis, the following criteria were selected:

- readability (how difficult will it be to read the code);
- simplicity (how easy it will be to work and use libraries);
- orthogonality (control operators and data structures of the language can be expressed using a relatively small number of elementary constructions);
- GUI (Graphical user interface): how easy will it be to work with a GUI application;
- cross-platform (easy to run the program on different platforms).

The most competitive programming languages were taken into consideration:

- C++;
- C#;
- JavaScript;
- Python;
- Assembler;

At this stage, it is necessary to determine the weight coefficients of each criterion in order to understand which one is more important.

The weight coefficients in this paper are determined by the expert method and are based on the use of generalized experience and intuition of expert specialists. In the expert method, the assessment of the level of importance of a particular property is determined in dimensionless units.

Ranking procedure:

1. The objects of expertise are arranged in the order of their preference (ranking). The place occupied in this arrangement in the ranked row is called the rank.

2. The most important criterion, according to the expert, is assigned the highest score, all the others in order of decreasing their relative importance – points up to 1.

3. The obtained measurement results are normalized, i.e. divided by the total amount of points. The weight coefficients obtained in this way take values from 0 to 1, and their sum becomes equal to 1.

The values of the weight coefficients are calculated using the formula [2]:

$$G_i = \sum_{j=1}^n G_{ji}, \quad g_i = \frac{G_i}{\sum_{j=1}^m G_i}.$$

Where G_{ij} – the score (rank) of the j -th criterion, put down by the i -th expert;

n – the number of experts;

m – the number of "weighted" indicators.

When processing the results obtained by ranking, the following operations must be performed:

1. Determination the sum of the points assigned by all experts to the j -th criterion.
2. Determination the sum of the points of all the criteria set by all the experts.
3. Determination the weight coefficient of the j -th criterion.

The expert commission included three specialists in the field of programming.

Criteria:

- Readability – Q1;
- Simplicity – Q2;
- Orthogonality – Q3;
- GUI (Graphical User Interface) – Q4;
- Cross-platform – Q5;

The expert opinions on the five programming languages listed above are expressed as follows:

- 1 expert: Q2 , Q3 , Q5 , Q1 , Q 4
- 2 expert: Q2 , Q4 , Q5 , Q1 , Q 3
- 3 expert: Q4 , Q2 , Q1 , Q3 , Q 5

According to the sum of the ranks of each object of expertise, a ranked series is constructed, which is the result of multiple measurements. The weight of the series is determined.

Sum of ranks:

$$Q_1 = 4 + 4 + 3 = 11$$

$$Q_2 = 1 + 1 + 2 = 4$$

$$Q_3 = 2 + 5 + 4 = 11$$

$$Q_4 = 5 + 2 + 1 = 8$$

$$Q_5 = 3 + 3 + 5 = 11$$

$$G_{ij} = 11+4+11+8+11= 45$$

Weight coefficients:

$$g_1 = 11/45 = 0,24$$

$$g_2 = 4/45 = 0,08$$

$$g_3 = 11/45 = 0,24$$

$$g_4 = 8/45 = 0,18$$

$$g_5 = 11/45 = 0,24$$

Table 1 shows the results of the evaluation of programming languages [3].

Table 1

Results of the evaluation of programming languages

Title	Readability	Simplicity	Speed	GUI	Cross-platform
C++	6	3	8	4	7
C#	7	5	7	6	2
JavaScript	7	6	6	7	10
Python	5	10	2	8	10
Assembler	2	2	10	0	0

Based on a comparative analysis of five programming languages, we can conclude that JavaScript is the most practical language for writing various types of programs.

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ANALYTICAL METHODS FOR PROCESSING UNRELIABLE OBSERVATIONS

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Research some analytical methods for processing and analyzing experimental data, namely, blunders. The effectiveness and features of each of the methods are analyzed.

Keywords: data processing, unreliable observations, analytical methods.

АНАЛИТИЧЕСКИЕ МЕТОДЫ ОБРАБОТКИ НЕДОСТОВЕРНЫХ НАБЛЮДЕНИЙ

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Исследуются некоторые аналитические методы по обработке и анализе экспериментальных данных, а именно грубые промахи. Анализируется эффективность и особенности каждого из методов.

Ключевые слова: обработка данных, недостоверные наблюдения, аналитические методы.

In the modern world, automated systems are becoming increasingly important in industry. For high-quality process control, a preliminary construction of a mathematical model or identification and in-depth study of the process is necessary. Models allow you to perform qualitative and quantitative analysis of an object, as well as predict its future behavior. The initial data has a huge impact on the adequacy of the future model, so the pre-processing of the data is of particular importance. The main task of this stage is to process anomalous measurements, outliers (misses), in the original sample. The reasons for the appearance of abnormal observations in practice are very diverse: – failure of measuring equipment – – distortion of data during their registration, transmission and storage. The presence of multiple outliers can negatively affect the calculation of estimates of distribution parameters and various statistical characteristics.

The problem of processing data containing sharply distinguished values has long been known. Even one such unnoticed value can significantly reduce the accuracy of data analysis, and sometimes even completely devalue it. The idea of what values are considered to stand out sharply is in most cases subjective, since it is based on the personal experience of the researcher. The exclusion of "bad" data is essentially a "cleaning" of the primary data before processing, and in some cases is quite acceptable. However, such a thorough data review procedure is only possible for small samples. If the amount of data is large, then viewing it will take so much time and effort

that it is unlikely to be real. In this paper, we will talk about the analysis and processing of sharply distinguished observations.

It is usually assumed that the observations of the unsaturated part have a one-dimensional or multidimensional normal distribution with unknown parameters. When analyzing the deviations of observations from the mathematical model, it is sometimes additionally assumed that the mean of the distribution of deviations is zero, i.e. that the model does not introduce any bias on average. There is no consensus on the models for clogging. Sometimes it is assumed that the outliers have the same variance as the bulk of the sample, but a markedly shifted mean. Sometimes, the mean is not much different from the mean of the main part, but the variance is much larger. For the convenience of further references, we will write down these assumptions in a more formal form. Let x_1, x_2, \dots, x_n – be the results of the observation. $i_1, \dots, i_{n_1}, j_1, \dots, j_{n_2}, (n_1 + n_2 = n)$ – наборы индексов из множества $1, 2, \dots, n$, corresponding to the uncluttered and clogged parts of the sample. Assumption about the unsaturated part of the sample:

$$x_i \in N(\mu, \sigma^2) \quad (1)$$

where μ, σ – are unknown parameters.

Assumptions about the clogged part the case of the mean shift:

$$x_j \in N(\mu + d, \sigma^2)$$

and the case of large variance:

$$x_j \in N(\mu, \gamma\sigma^2), \gamma \geq 1$$

In the case when, from a priori considerations, it can be assumed that the average of the main part of the sample is zero, (1) passes into

$$x_i \in N(0, \sigma^2), \quad (2)$$

and the assumptions about the clogged part are in

$$x_j \in N(d, \sigma^2); \quad (3)$$

$$x_j \in N(0, \gamma\sigma^2), \gamma \geq 1. \quad (4)$$

Next, we will present methods for excluding "blunders" from the sample. When working with these elements, it is very important to be careful in excluding them, as the assumption of uniformity may be erroneous and the intended observations may actually be an important part of the sample, which may form a group of elements indicating how the data was collected. The following methods will be considered: an analytical method for excluding one extreme observation and several extreme observations.

An analytical method for excluding one extreme observation. Without violating generality, we will assume that we are talking about maximum observation. Let $x_{(1)} \leq \dots \leq x_{(n)}$ be

the variation series of the sample. The decisive rule for excluding the extreme term of the variation series is based on the statistic $T_n = (x_{(n)} - \bar{x})/s$, where \bar{x} and s – are defined in the usual way. If

T_n is greater than the corresponding critical value, then the hypothesis of the presence of an outlier

is accepted, but if T_n less than the critical value, then from a statistical point of view there is no

reason to say that there is an outlier. If several extreme values are suspected in the sample, the criterion is first applied to the maximum of them. If it is recognized as an outlier, then it is removed from the sample, and the criterion is applied to the next largest, and so on, until it is recognized that there are no more outliers. One of the difficulties of this iterative approach is that suspicious observations are often grouped close together, forming a group away from the bulk of observations,

making an iterative procedure based on the use of \bar{x} and s , insensitive to them. Here we can recommend replacing \bar{x} and s on the corresponding points.

An analytical criterion for the simultaneous exclusion of several extreme observations.

The null hypothesis is that the sample is extracted from a normal population. The decisive rule for excluding the k largest terms of the variation series is based on statistics

$$L_k = \frac{\sum_{i=1}^{n-k} (x_{(i)} - \bar{x}_k)^2}{\sum_{i=1}^n (x_{(i)} - \bar{x})^2},$$

Where \bar{x}_k – is the average of the first $n-k$ terms of the variation series, and \bar{x} is the average of the entire population. If there are outliers, the L_k statistic must be less than the critical limit calculated for the normal distribution. If both left and right outliers are possible in the sample, then the above rule should be modified to assess their significance. The modification is as follows. First by selection x_1, \dots, x_n s calculated by \bar{x} , then absolute deviations $|x_i - \bar{x}|$. Let us construct a variation series from the absolute deviations and denote its elements $z_{(i)}$. Let $\bar{z}_{(k)}$ – be the arithmetic mean of the $n-k$ first terms of the variation series, then the modified criterion has the form:

$$E_k = \frac{\sum_{i=1}^{n-k} (z_{(i)} - \bar{z}_{(k)})^2}{\sum_{i=1}^n (z_{(i)} - \bar{z})^2}.$$

The disadvantage of the above criterion is that it relies on statistics that strongly depend on the assumptions of normality, and also that in practical work k is never known in advance, but is estimated from the same data, to which the statistics \bar{x} and s are then applied.

Conclusions. Statistical procedures for distinguishing sharply distinguished observations are based on the assumption of data uniformity. In this case, the outliers are considered as observations that are atypically far removed from the center of the distribution. To date, many analytical procedures have been proposed to identify outliers and assess the significance of their deviation. The main difficulty in using these methods is that the real proportion of "clogging" is not known, but is estimated from the same data that checks the significance of the deviation. Graphical procedures are the most resistant to deviations from the assumption of normality of the main part of the sample. When using statistical methods for allocating outliers, it should be borne in mind that outliers may be the most significant part of the sample that sheds light on how the data were collected.

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COMPARISON OF 3D PRINTING TECHNOLOGIES

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This article considers the main technologies of 3D printing and analyzes their respective advantages and disadvantages.

Keywords: SLA, FDM, printing process, working surface.

СРАВНЕНИЕ ТЕХНОЛОГИЙ 3D ПЕЧАТИ

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Рассмотрены основные технологии 3D печати. Анализируются преимущества и недостатки каждой технологии.

Ключевые слова: SLA, FDM, процесс печати, рабочая поверхность.

The purpose of the study is to analyze the main technologies of 3D printing. Currently, there are three main 3D printing technologies:

The first technology is extrusion printing. The principle of this technology is based on putting a number of thinnest (0.1-0.2 mm) layers on top of each other. Plastic in the form of a round rod with a thickness of 1.75 mm or 3 mm is fed into the print head-extruder. In the extruder, the plastic is heated to the melting point and squeezed out by a stepper motor through the nozzle onto the work surface. The extruder itself moves along the specified coordinates with the help of the stepper motors, "pulling" a layer of plastic on the working surface.

The most common defect in the printing process of such technology is deformation. With certain types of plastic shrinkage occurs during cooling after extrusion. Since different sections are cooled at different rates, their sizes can also change at different rates. Differential cooling causes an accumulation of internal stresses that pull the layer, the one from the bottom to the top, deforming it. From a technical point of view, deformation can be prevented by more careful control of the temperature of the platform and the chamber as a whole. By increasing the adhesion between the part and the platform. Also, using this technology, it is necessary to provide "support". The support structure is essential for creating geometries with protrusions. Since plastic cannot be applied to air, some geometries require a support structure.

FDM printing is the most economical way to produce non-standard thermoplastic parts and prototypes. But it has the lowest dimensional accuracy and resolution compared to other 3D printing technologies, so it is not suitable for models with complex geometry and small details. It is suitable for the production of small models, according to which it is planned to produce the product in the future.

The next printing technology is powder sintering of materials. The material is supplied in powder form. The 3D printer applies this powder in a very thin layer on the work surface. After that, the laser sinters the powder into a single layer at the specified coordinates. Then the surface is lowered to the height of the specified layer and a new layer of powder is applied. This method is convenient because when printing, you don't need to print "support", since unused material fulfills this role. This technology allows you to make products from materials such as nylon, glass, ceramics, metals and their alloys.

The disadvantages of this method include: "dirt" in production: the powder is volatile and, if handled carelessly, rises into the air, clogging the surrounding space, and getting into the human lungs. The complexity and bulkiness of the equipment used mainly in industrial production. In this regard, powder printing can be used in the production of complex elements and elements that require increased strength.

The latest technology is photopolymer adhesion. Stereolithographic is an additive manufacturing process, the result of which is achieved by means of resin polymerization. In SLA printing, an object is created by selectively curing a polymer resin, layer by layer, using an ultraviolet laser beam. The materials used in SLA printing are light-sensitive thermosetting polymers that are available in liquid form.

SLA printing process consists of the following:

1. In a tank with a liquid photopolymer, a platform is placed, at the same height level from the resin surface.

2. Then, according to a pre-established algorithm, the ultraviolet light selectively cures the necessary areas of the photopolymer resin. The laser beam is focused on a given path using a set of mirrors. Then the entire cross-sectional area of the model is illuminated. Therefore, the resulting part is completely solid.

3. When one layer is finished, the platform moves to a safe distance, and the agitator foot inside the bath mixes the resin.

This process is repeated until the part is printed. After printing, the part is not completely finished and requires further post-processing under an ultraviolet lamp. At the end of the ultraviolet lighting treatment, the part acquires very high mechanical and thermal properties.

The photopolymer adhesion process is irreversible, and there is no way to transfer the resulting parts back to the liquid state. When heated, they will burn, not melt. This is because the materials that are produced by SLA technology are made of thermosetting polymers, as opposed to thermoplastics that FDM uses. This technology guarantees high accuracy of the resulting product and a smooth surface. You can get products of any complexity, thin-walled or small items. There are also no technological problems with printing, such as: overheating, delamination, collapse under weight, poor adhesion, peeling of corners. Using this technology, we get an object with low tensile strength, as we are limited in the choice of manufacturing material. It is possible to use only special types of photopolymers. The most important disadvantage is the high cost of equipment based on this technology.

Thus, analyzing the main 3D printing technologies, you can choose a method that will allow you to get an object with the necessary requirements. Whether it is strength, high accuracy, or relatively inexpensive cost.

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THE BIRTH OF THE EARTH AND ITS EARLY LIFE HISTORY

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The article tells about the appearance of the Earth, its early history. Its geochronological scale is shown. It tells about the shape and structure of the Earth.

Keywords: Earth, early history, form, structure, geology.

РОЖДЕНИЕ ЗЕМЛИ И ЕЁ РАННЯЯ ИСТОРИЯ ЖИЗНИ

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В статье рассказывается о появлении Земли, её ранней истории. Показывается её геохронологическая шкала. Рассказывается о форме и строении Земли.

Ключевые слова: Земля, ранняя история, форма, строение, геология.

The Earth is the only planet of the solar system known to man at the moment, inhabited by living organisms. Scientific evidence indicates that the Earth formed from a solar nebula about 4.54 billions years ago and soon after it acquired its only natural satellite the Moon.

Presumably, life appeared on Earth about 4.25 billion years ago. Since then, the Earth's biosphere has significantly changed the atmosphere and other abiotic factors, causing the quantitative growth of aerobic organisms, as well as the formation of the ozone layer. Which, together with the Earth's magnetic field, weakens solar radiation harmful to life, thereby preserving the conditions for the existence of life on Earth. Radiation caused by the earth's crust itself has significantly decreased since its formation due to the gradual decay of radionuclides in it. The Earth's crust is divided into several segments, or tectonic plates, which move across the surface at speeds of the order of several centimeters per year. About 3.5 billion years ago, the Earth's magnetic field was formed, which prevented the devastation of the atmosphere by the solar wind. The science of geology deals with the study of the composition, structure and laws of the development of the Earth.

Approximately 70.8 % of the planet's surface is occupied by the World Ocean, the rest of the surface is occupied by continents and islands. The Earth revolves around the Sun and makes a complete revolution around it in about 365.26 solar days – a sidereal year. The Earth's axis of rotation is tilted 23.44 ° relative to the perpendicular to its orbital plane, which causes seasonal changes on the planet's surface with a period of one tropical year – 365.24 solar days.

The history of the Earth is divided into different time periods. Their borders are based on the most important events that took place then.

The boundary between the Phanerozoic eras is drawn according to the largest evolutionary events – global extinctions. The Paleozoic era is separated from the Mesozoic by the largest mass Permian extinction in the history of the Earth. The Mesozoic era is separated from the Cenozoic by Cretaceous-Paleogene extinction .

There are a number of theories of the origin of life on Earth. About 3.5-3.9 billion years ago, the " last universal common ancestor " appeared, from which all other living organisms subsequently descended.

In 1960, the Snowball Earth hypothesis was put forward, stating that between 750 and 580 million years ago, the Earth was completely covered with ice. This hypothesis explains the Cambrian explosion – a sharp increase in the diversity of multicellular life forms about 542 million years ago.

The Earth belongs to the terrestrial planets, and unlike gas giants like Jupiter, it has a solid surface. It is the largest of the four terrestrial planets in the solar system, both in size and mass. In addition, the Earth has the highest density, surface gravity and magnetic field among these four planets. It is the only known planet with active plate tectonics.

The shape of the Earth (geoid) is close to an oblate ellipsoid. The divergence of the geoid from the ellipsoid approximating it reaches 100 meters. The average diameter of the planet is approximately 12,742 km, and the circumference is 40,000 km, since a meter in the past was defined as 1/10,000,000 of the distance from the equator to the north pole through Paris (due to incorrect accounting for the polar compression of the Earth, the standard meter in 1795 turned out to be shorter by about 0.2 mm, hence the inaccuracy).

The result of the action of a kind of fusion of energies was the formation of a relief on the planet's surface. This is how mountains, valleys, plains and oceanic trenches appeared on Earth. Scientists believe that the depressions were formed after the course of terrestrial processes. And external processes, phenomena of a cosmic nature led to the fact that very soon such depressions were filled with products of destruction.

So the living world is created. It took over 3 billion years, and it was the most difficult. A huge number of variants of the development of the initial carbon compounds cannot be enumerated. However, the most important result was the emergence of life on Earth.

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Bachelors and Specialists' Research (Economists & Humanitarian students)

УДК 339.1

PROMOTION OF SOCIAL MEDIA MARKETING IN RUSSIA

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In this article the most effective social networks for advertising, promotion of your product, as well as the current level of development of SMM in Russia are considered.

Keywords: advertising, promotion, smm-specialists, social networks, media advertising, contextual advertising.

ПРОДВИЖЕНИЕ СОЦИАЛЬНОГО МЕДИАМАРКЕТИНГА В РОССИИ

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В данной статье рассмотрены наиболее эффективные социальные сети для настройки рекламы, продвижения своего продукта, а также текущий уровень развития направления SMM в России.

Ключевые слова: реклама, продвижения, smm-специалисты, социальные сети, медийная реклама, контекстная реклама.

Social networks are unique media platforms for product promotion on the Internet. Nowadays, almost all spheres of business use social networks to promote their goods and services, because SMM has become an integral part of modern Internet marketing, and it attracts a target audience for businesses of any scale, regardless of geography. However, in Krasnoyarsk and in Russia as a whole there are special features of promotion of organizations in social networks. Among Russian companies, the activity indicators in 2021 compared to 2017 on the expanses of social media has increased by several times, but not all companies at this time used SMM tools to

promote their business on the market. Companies should realize that the technologies of their products promotion have changed [1].

The relevance of this work is proved by the fact that due to the epidemiological situation, consumer interest in online shopping has increased by 93 % compared to 2019. It's worth noting that interest in online shopping is not a temporary effect. Even after the lockdown online shopping continues to increase and has more than doubled by half compared to the second half of 2019. This situation is a good reason to rearrange your business goals and focus on product promotion online.

Let's look at specific examples, such as SMM.

SMM promotion is an effective way to attract an audience to a website through social networks, blogs, forums, communities. SMM advertising belongs to non-standard methods of promotion. Social Media Marketing is the most promising method of promotion. SMM-specialists provide marketing services to businesses in social networks.

An SMM specialist deals with: profile packaging, targeting advertising and working with bloggers. Profile packaging includes: design and introduction of the account, copywriting (writing texts for posts) and content creation. Targeted advertising includes setting up and maintaining an advertising account, creating advertising creatives, shooting promotional materials. Working with bloggers includes searching for bloggers and creating pitches (idea and creativity).

There is a number of social networks where businesses can promote themselves in Russia, such as Instagram, Facebook, VKontakte. Which social network is more effective?

Let's look at some social networks:

1. "VKontakte". It remains one of the most popular platforms for all types of businesses.

There were more than 510 million registered users on VKontakte in 2020. Even if you consider that about 30 % of them are not active (bots, fakes, blocked and deleted pages), it is still a huge number of users.

Site Features: you can create full-fledged stores with payment through your own payment system VK Pay; receive feedback from the audience, work out objections and negative feedback in comments and personal messages; publish short posts and long posts with photos, audio, video, and gif images; connect widgets and notifications; set up newsletters, surveys and questionnaires; implement sales autofunnels.

VKontakte is constantly improving its functionality and offers new features to businesses.

Who is it suitable for?

You can promote virtually any small or medium-sized business with a help of "VKontakte": e-commerce; medical centers and dentists; companies involved in tourism and entertainment; insurance companies and banks; fitness centers and beauty salons, etc.

Exceptions: B2B and specific businesses that operate primarily offline and do not require the creation of diverse content: gas stations, tow truck services.

2. "Instagram". Rumors that Instagram is a social network primarily for schoolchildren and students are exaggerated. According to data of 2020, almost 67 % of users of the service in Russia are people between the ages of 18 and 34, which means that they are solvent and actively buy. The second stereotype is that Instagram has a mainly female audience. There are more girls, 60 % on average compared to 40 %. And as the age increases, the share of men also grows.

Site features: it's easy to collect statistics (track which posts get the most views and likes, etc); it's easy to run ads (through the Instagram app or the Facebook ad cabinet); you can create directories with hashtags (introduce several tags for your business: by product category, service, or one of the blog's topics); you can engage your target audience for free (use popular hashtags); you can tag the places where the photo was taken; you have opportunities to create video content (post stories and do live streaming to engage your audience more).

Promotion in Instagram is especially effective for businesses where the appearance of goods and visualization of services play an important role in sales: beauty salons and fitness centers; art and photo studios, tattoo parlors; clothing and jewelry brands, etc.

3. "Facebook". Features of "Facebook": single Facebook, Instagram and Whats App account; "Smart" advertising algorithms (if you know the clear characteristics of your target

audience, "Facebook" will accurately identify users who are interested in your product); business-oriented ("Facebook" users tend to dive deeper into the product and buy more expensive products/services than users of other social networks); high competition.

Who is it suitable for?

"Facebook" is universal and suitable for a large number of businesses: banks and insurance; B2B and "complex" businesses; medical centers and pharmaceuticals; IT and electronics.

The differences between these social networks:

"VKontakte" has a wide audience reach, and it is suitable for almost all businesses, except B2B and expensive goods. "Facebook" is similar to "VKontakte" in its characteristics, but differs from it in its business focus. It is suitable for B2B, complex business topics, expensive products. "Instagram" gives opportunity to create content at the intersection of photo, text, video and audio.

After sorting out the actual online platforms for 2020, the question how to promote advertising arises.

Let's deal with the main directions of advertising. The first direction is media advertising (massliking, maslukiing – reciprocity likes, reposts, massive views; giveaways – drawings, investor promotions and contests). The second direction is contextual advertising (direct mailing: customer database associated with the social network, work with a target audience; targeted advertising: ads of different types in social networks, aimed at finding a target audience; retargeting: online ads are directed to users who have already interacted with the site).

Let's consider food delivery ads as an example. They analyzed all the objections of their customers and came up with a variety of ways to attract, such as: weekend promotions, free delivery of a big order, 10 % discount on your birthday, etc.

In conclusion, it should be noted that in modern world the most effective way to promote a product or a service is using social networks. Companies need to immediately start advertising in social networks in order to spread information about the company, its goods or services. SMM-promotion will allow companies to stand out among a large number of competitors, to attract the attention of potential customers, as well as reduce advertising expenses. A range of tools and methods is quite wide and will allow a company to choose the most appropriate, based on individual characteristics. However, we should not forget that it is quite a complex profession, which requires constant analysis of the needs of the target audience and the development of various strategies.

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ASSESSMENT OF THE EFFECTIVENESS OF THE RUSSIAN CUSTOMS AUTHORITIES IN 2019

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The customs authorities of the Russian Federation, as the Executive power, have a number of powers and tasks that must be performed within a certain allotted time. Statistics show that every year the results of the work of customs authorities differ. We reviewed statistics on the work of customs authorities in 2019, as well as analyzed the results of their work.

Keywords: statistics, customs authorities, performance indicators.

ОЦЕНКА ЭФФЕКТИВНОСТИ ДЕЯТЕЛЬНОСТИ РОССИЙСКИХ ТАМОЖЕННЫХ ОРГАНОВ В 2019 ГОДУ

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Таможенные органы Российской Федерации, как исполнительная власть, имеют ряд полномочий и задач, которые необходимо выполнять за определенное отведенное время. Как показывает статистика, каждый год результаты работы таможенных органов отличаются. Нами была рассмотрена статистика работы таможенных органов за 2019, а также проанализированы результаты их работы.

Ключевые слова: статистика, таможенные органы, показатели эффективности.

Thanks to Article 266 on the assessment of the work of customs authorities of the Federal Law of 03.08.2018 N 289-ФЗ "On customs regulation in the Russian Federation and on amendments to certain legislative acts of the Russian Federation", the customs authorities are obliged to openly show the results of their work, which will stimulate them to be active in order to achieve certain established parameters in a particular area. Thus, the results of the activities of customs authorities depend on a specific list of indicators, the order and system of their monitoring.

The main criteria for evaluating the work of customs authorities are:

1) the speed of customs operations when importing goods into the Russian Federation and exporting goods from the Russian Federation, as well as reducing the costs of interested parties when performing customs operations;

2) the timeliness and completeness of the receipt of customs payments;

3) the effectiveness of combating crimes and administrative offenses.

The Federal Customs Service (FCS) defines a list of indicators for assessing the effectiveness of customs authorities, the procedure and methodology for monitoring them, the procedure for participation in such monitoring by persons engaged in foreign economic activity, authorized

economic operators, persons carrying out activities in the field of customs, their associations and associations [1].

In addition, information on the results of monitoring indicators for assessing the effectiveness of customs authorities is brought to the general information by posting on the official website of the federal executive body exercising control and supervision functions in the field of customs, on the Internet, which we just used for analysis.

So, let's look at the dynamics of changes in the main values of indicators of the work of the customs authorities of the Russian Federation (see Table) [2].

**Report on the implementation of the main indicators of the work of the customs authorities
of the Russian Federation for 2019**

№	Indicator name	Indicator value for:			
		I quarter	II quarter	III quarter	IV quarter
Criterion 1. The speed of customs operations when importing and exporting goods to (from) the Russian Federation, reducing the costs of interested parties when performing customs operations					
1.1.	Time for customs authorities of the Russian Federation to carry out operations at automobile checkpoints (min)	28.32	27.65	28.83	28.59
1.2.	Share of declarations for goods issued in email form, in the total number of completed declarations for goods that do not require additional verification of paper documents (%)	99.92	99.95	99.97	99.95
Criterion 2. Timeliness and completeness of customs payments (%)					
2.1.	The level of fulfillment of the forecasted task for the revenues administered by the customs authorities to the federal budget	21.99	45.84	71.65	101.59
2.2.	The share of customs payments returned to payers in connection with the satisfaction of complaints of foreign economic activity participants	0.0001	0.0005	0.0003	0.0002
2.3.	The share of customs payments returned to payers or offset against future payments by court decisions overturning illegal decisions of customs officials	0.01	0.05	0.05	0.05
Criterion 3. Effectiveness of combating crimes and administrative offenses (%)					
3.1.	The share of consignments of imported (exported) goods in respect of which customs inspection was carried out	3.5	3.8	3.6	3.4
3.2.	The share of consignments subjected to customs inspection, as a result of which violations of customs legislation were revealed, or as a result of which the release of goods was refused	52.7	53.5	54.2	54.7
3.3.	Proportion of successful customs inspections after goods release	95.37	95.05	96.01	92.0

Thus, based on V. I. Bulavin's speech on the results of 2019, we can say that the positive dynamics of growth in efficiency indicators is due to the growth of the US dollar, an increase in the VAT rate by 2 percent and an increase in the efficiency of customs administration. Customs payments account for almost a third of Federal budget revenues. The implementation of fiscal functions by the Federal customs service of Russia takes on special significance in the context of the implementation of The President's address and national projects [3].

Also, an important direction for raising additional revenue is to increase the effectiveness of control functions performed by customs authorities. In 2019, according to the results of their implementation, the customs authorities collected more than 45 billion rubles. Control measures under the risk management system cover 32 % of product shipments. Almost every second verification event is effective.

Customs control after the release of goods has become more targeted. The number of inspections decreased by 17 percent and their average efficiency increased by 2 times. A total of 17 billion rubles were added to the total amount. The work is carried out in close cooperation with The tax service.

In addition, according to the results of 2019, we can note an increase in the efficiency of 35 mobile groups that solve the problem of preventing the illegal movement of goods. 80 thousand vehicles were checked. 105 thousand tons of prohibited goods were detected, including 4,000 tons of sanctioned goods.

Therefore, the indicators from quarter to quarter encourage customs officials to move towards the planned milestones, in an effort to bring the level of achieved indicators to the planned plan.

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THE USE OF GENDER STEREOTYPES IN ADVERTISING AND THEIR IMPACT ON HUMAN CONSCIOUSNESS

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The article deals with gender stereotypes that are used in advertising for the successful promotion of goods and services. The goal of the article is to do formulate the main provisions for the exploitation of gender stereotypes in advertising. The article presents the most effective ways of introducing gender stereotypes, which attract the most attention of consumers. Thus, such advertising affects public opinion, our actions and purchases.

Keywords: advertising, gender stereotypes, influence of advertising, promotion of goods.

ИСПОЛЬЗОВАНИЕ ГЕНДЕРНЫХ СТЕРЕОТИПОВ В РЕКЛАМЕ И ИХ ВЛИЯНИЕ НА СОЗНАНИЕ ЧЕЛОВЕКА

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В статье рассматриваются гендерные стереотипы, применяемые в рекламе для успешного продвижения определенных товаров или услуг. Цель статьи – сформулировать основные положения эксплуатации гендерных стереотипов в рекламе. В статье представлены наиболее эффективные способы внедрения гендерных стереотипов, которые привлекают наибольшее внимание потребителей. Таким образом, такая реклама оказывает влияние на общественное мнение, на наши действия и покупки.

Ключевые слова: реклама, гендерные стереотипы, влияние рекламы, продвижение товаров.

The media advertising in modern society impacts increasingly all the aspects of our life. They often become the main sources of personal socialization. Advertising penetrates into human consciousness and contributes to the formation of stereotypes and attitudes. Because of this, society begins to build its attitude to the reality that is happening. Also today, advertising is becoming an area of mass culture. The media plays a huge role in shaping gender stereotypes. Advertising began to clearly form the necessary male and female images, social attitudes, as well as political attitudes.

In today's society there is a need for research on various aspects of advertising communications. The study of gender stereotypes in advertising is of great theoretical and practical importance for both producer and buyer.

The importance of advertising in the formation of gender stereotypes is enormous. The main task of any advertising is not only to inform society about products and services, but also to create

relevant male and female images. Advertising clearly demonstrates different types of interpersonal relationships. Subsequently, it is from them that people's self-esteem, perception of reality, views on life and what is happening depends.

Let us analyze the definition of stereotypes. Stereotypes are a mass phenomenon, which is why any departure from its boundaries does not go unnoticed. The advertising image talks to us by non-verbal means, through gestures and a person's position in society. The media produce vivid gender stereotypes, thereby provoking the consumer to be active and willing to purchase the advertised product or service.

It should be noticed, that advertising is considered effective only if it takes into account the gender characteristics of the target audience for which it is intended. Thus, gender stereotypes in advertising are practical [1].

It is known that the main task of the media is the most effective impact on the buyer. But the impact will be effective only when the competent analytical work is done: starting with the choice of the target audience and ending with the form of the advertising message.

Gender stereotypes are more clearly represented in commercial advertising. Women's publications usually publish pictures of young, successful and cheerful women with children, because these images are the most desirable for the readership. Women's advertising texts are written in a simpler and clearer language. For men's ads, photos are used that show successful men from the business sector. Such advertisements use a coarser vocabulary. In "male" advertising it is usual to see expensive cars, new equipment. Purchases of the stronger sex are most often limited to necessary goods. Men buy only what was originally intended, perceive short and simple wording better, react more openly and calmly to jokes and mild provocations [2].

Typical roles of male characters in advertising include the loving husband and father, the loyal friend who is always ready to help, the athlete with a muscular physique, and the competent businessman in an expensive car and always in a good classic suit [3]. Typical features and roles of female characters in advertisements include the housewife, the beautiful and well-groomed lady who is able to listen to her spouse or girlfriend, and the businesswoman who is determined and able to get her way in any situation.

The task of the advertising specialist is to identify all possible stereotypes of potential buyers, to convince them of the advantages and uniqueness of the advertised product and the need to buy it.

Marketers, when creating advertisements, show the characters of advertisements, focusing on their target audience, taking into account their expectations, preferences, social and gender roles. Advertising shapes cultural and visual stereotypes, assuming that these are the ones that exist in the minds of its target audience.

Thus, the success of advertising, the main goal of which is to sell not just goods, but a holistic way of life, depends entirely on the appeal to gender stereotypes, established in society, the unconscious framework of perception of the relationship between the two sexes.

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THE PSYCHOLOGY OF COLOR: HOW TO INCREASE SALES WITH PAINTS

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In development of online sales, it is necessary to update the directions of marketing. Color becomes the leading tool of interaction. This article defines the interpretation of color solutions based on the psychological aspects of the individual.

Keywords: marketing, consumer, color, sales, design.

ПСИХОЛОГИЯ ЦВЕТА: КАК УВЕЛИЧИТЬ ПРОДАЖИ С ПОМОЩЬЮ КРАСОК

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В режиме развития интернет-продаж необходимо актуализировать направления развития маркетинга. Ведущим каналом взаимодействия становится цвет. В данной статье определяется интерпретация цветовых решений на основании психологических аспектов личности.

Ключевые слова: маркетинг, потребитель, цвет, продажи, дизайн.

The pandemic has actualized and accelerated the transition process of sales to the information environment. It causes the loss of impact tools such as tactile, aromatic or taste sensations. As a consequence, the importance of color in design has increased. The manufacturers are forced to find another way for promotion. The leading tool for product promotion is advertising. Advertising methods can have a simple structure and a primitive effect on a person as well as a complex one, affecting the deeper levels of the psychological and emotional perception of the consumer. Color design evokes subconscious associations, appeals to the prototypes of consciousness, so the choice of color is a task of competent marketing, than a personal preference. Knowledge and introduction of color psychology is one of the main conditions for creating a high-quality advertising.

A number of independent studies shows us the power of color communication. About 85 % of consumers make purchases due to a certain color design. Texture, taste and smell are not available in online sales. And this is a large part of purchases, which are made by modern people. Therefore, the lack of color design leads to decline of demand.

Color has a direct impact on a person: it can change the taste perception, affect the time perception, speed up or slow down the heartbeat and also affect your opinion about the reliability of a particular person or brand [1]. Certainly, it is possible to influence the purchasing habits, if the manufacturer is informed. Color design skills allow not to follow the single strategy and gives you

the opportunity to choose color solutions consciously depending on the specific requests of the manufacturer.

The manufacturer should identify the target audience and its demand correctly, because the color perception often depends on the behavioral pattern, fashion trends, traditions and gender.

For example, the red color which is used by 28 % of the world's leading brands is ideal for attracting impulsive buyers. And they will be encouraged to buy something for the sale or in an online store. Color produces this effect because it evokes associations with action, desire, and energy. A similar effect cannot be expected from all bright colors. Although the orange is not less bright and saturated, cannot push you to buy something. However, it is a great non-annoying way to focus on something, because it does not cause negative emotions. Moreover, the orange is associated with childhood and happiness and contrasts well with other colors [2].

The dark noble colors will motivate budgetary buyers to act. These are mainly shades of the blue, which is associated with calm, reliability and stability. Using of this color is widespread, that is the leader among the world's top brands (about 32 % brands use blue). Though, this color can attract other groups of buyers with a competent approach. This observation is also true for the gold, the silver and the purple. They are associated with wealth and status. The black and the purple are also included in this group. Although they are among the most controversial. Manufacturers avoid the black because it has a dark background. But psychologists say that the black can increase sales, especially when it used with contrasting text. The violet is one of the most gender-controversial. Male representatives find this color unpleasant, while women consider that the violet is one of the most favorite colour shade [3]. That is why the purple color is widely used for the design of "women's" stores and goods.

Traditional buyers are motivated to buy goods of the pink and the blue colors. The pink color evokes associations with romance, femininity, and the blue-with brutality, masculinity [4]. These colors are widely used in the design of online clothing stores.

These conclusions can be used for residents of Europe, Russia, Commonwealth of Independent States, the United States and other countries that do not have different cultural backgrounds. For a person from East Asia and Africa, it is worth considering not only the typical perception of colors, but also the symbolism of colors, cultural associations. For example, in Japanese culture death is represented with the black and in Chinese culture – with the white color.

Therefore, the importance of color communications in development online sales increases dramatically, replacing tactile, taste and aroma forms of interaction between the product and the consumer. Marketing analysts are able to raise the status of the brand, attract consumers and increase consumer demand with professionally using and combining color technologies.

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THE ROLE OF DIGITAL TECHNOLOGIES IN MUSEUM ACTIVITIES

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This article discusses possible options for digitalization in the museum field and the use of information technologies. Museums also need to adapt to changing trends and understand what is best to do to attract a new audience.

Keywords: museum, digital technologies, content, social network.

РОЛЬ ЦИФРОВЫХ ТЕХНОЛОГИЙ В МУЗЕЙНОЙ ДЕЯТЕЛЬНОСТИ

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В данной статье рассматриваются возможные варианты цифровизации в музейной сфере и применение информационных технологий. Музеям также необходимо адаптироваться к меняющимся тенденциям и понимать, что лучше сделать для привлечения новой аудитории.

Ключевые слова: музей, цифровые технологии, контент, социальные сети.

Contemporary museums are institutions that virtually become centers of education, communication, and cultural heritage.

Modern museums are designed one of the main goal of designing those institutions is to tackle, keeper and promoter of cultural heritage.

The appearance and development of new types and forms of museum activity is determined by the specifics of the modern museum world: Today, it is not enough to consider only the historical and cultural importance of museums. It is important to consider the activities of the museum as a vital resource.

In the contemporary world, in the conditions of fierce competition, the museum community is constrained to recognize the need to use new technologies to hold and attract a new audience, especially in Russia.

Digital technologies are an excellent tool for all cultural institutions to democratize access to culture, art, and new experiences. They open up a space for dialogue with visitors and facilitate the exchange of ideas and knowledge. Digital technologies can help cultural institutions offer visitors an exceptional and understandable cultural experience [1].

Some museums are expanding their developments in the areas of artificial intelligence and virtual reality. The State Hermitage Museum in St. Petersburg has successfully mastered the project of a cinema showing the film «The Hermitage. Virtual immersion in time and space». The main

feature of this project was a unique possibility for everyone to get to the closed locations: the roof of the Hermitage or even to the art funds [2]. Museums can also create their own mobile apps with additional reality. Such an innovation is likely to attract new visitors.

Experimenting with technology will help museum managers make more knowledgeable decisions about which works of art to open to the public, how and where to place them, as well as which digital devices are most interesting for a particular spectator. Information and technology should be used to update permanent collections and present them in a new light, making them attractive to a wider, and in some cases previously uninterested, audience.

It should be noted that social networks are now an essential part of the museum's interaction with visitors. Opportunities to interact with clients before and after visits are increasingly expanding, and many museums offer educational content to an audience that follows remotely [3]. For the same purpose, many museums are remaking their sites, taking them to a whole new level. Some publish their entire collection online. To expand their reach museums usually use different social networks, it is important to know that each social network works for different purposes. To reach your target audience as much as possible, you will have to maintain accounts at all sites at once. But it should be remembered that many are registered in several social networks and the audience can intersect.

So, for example, Facebook users have an active lifestyle, are interested in business, politics, various spheres of culture, are always ready to share their opinions on current issues, and are aimed at finding business contacts. Therefore, it is best to publish news about museum life here. Vkontakte will be more convenient to conduct online video broadcasts and sell tickets, as with the help of Vkontakte you can even pay for the purchase. Instagram is, first of all, a story about a photo, it is a story about a beautiful picture. New exhibits and old collections should be published there. Social networks and information technologies enable museums to develop information strategies to promote their activities.

In conclusion, the emergence of digital technologies in museum activities is of great importance. They help to expand the opportunities for interaction between the museum and visitors. This attracts a new audience and an opportunity to learn about culture and art.

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CHANGES IN BRAND ADVERTISING DUE TO THE COVID-19 PANDEMIC

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In this article, the author analyzes the world and Russian advertising in the context of the pandemic. Compares the advertising texts of major brands before and during the pandemic. It also highlights the methodology of advertising impact on the audience of large brands and those that recently appeared during the epidemic to identify the effectiveness and impact of the situation on the advertising sphere.

Keywords: brand, advertising, pandemic.

ИЗМЕНЕНИЯ В РЕКЛАМЕ БРЕНДОВ ВСЛЕДСТВИЕ ПАНДЕМИИ COVID-19

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В данной статье автор анализирует мировую и российскую рекламу в условиях пандемии. Сравнивает рекламные тексты крупных брендов до пандемии и во время ее появления. А также, выделяет методику рекламного воздействия на аудиторию крупных брендов и недавно появившихся во время эпидемии для выявления эффективности и влияние ситуации на сферу рекламы.

Ключевые слова: бренд, реклама, пандемия.

In 2019, first in China, and then, filling the whole world, an epidemic of a new virus called "Covid-19" hit. It has left an indelible mark on the history of mankind, affecting many areas of human life: politics, medicine, education and advertising. Advertising, as a reflection of the world's perception of man at the present time, has also undergone changes. Not only new brands and companies had to look for new advertising approaches and bend to the current realities, but also large franchises that have long established themselves on the global and Russian market. From the point of view of P. A. Kuznetsov, public relations should be interpreted as a specific form of managerial activity, which is associated with the creation and alteration of the information field around the PR subject in the right direction. Thus, the goal of PR is to change the information background in a favorable way by using PR tools. And it is in a crisis situation for the country that it is possible to determine how well advertising and PR will help brands in maintaining business [1]. Previously, major brands donated money to charity, invested in cultural heritage, sports, and world-famous athletes. So, for example, "Lays" is the official sponsor of UEFA, the Russian brand "Vyazanka" is the official sponsor of the show "Voice. Children" and the Audi brand is the official sponsor of the American Film Institute festival [2].

Now, companies are making donations to fight the virus and help medicine, and are switching to the production of medical equipment or materials. They also tell in their advertising campaigns how they help clients cope with financial difficulties. A striking example is the brand Ralph Lauren, which has allocated \$10 million to fight the coronavirus, as reported in the official Instagram account [3].

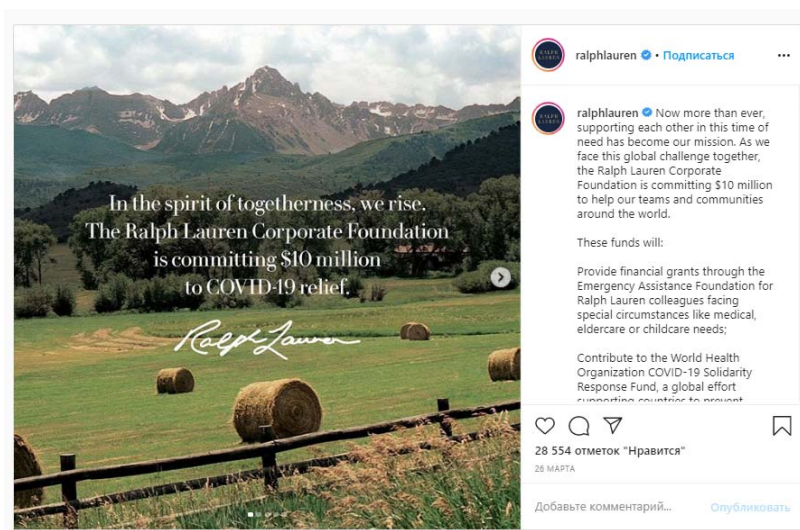


Fig. 1. Post about the Ralph Lauren brand donation

Food services and catering companies have launched contactless delivery. Fitness centers conduct training online, and concerts are switching to this format. Now innovations do not occur in the context of "Who first launched the best". This is a necessary minimum, without which the work of any company can't do.

In the context of the pandemic, everything has become different. There is a trend to unite competitors in the fight against the pandemic on the basis of common values. Next, we will consider the methodology of advertising influence on the audience, and what new key messages appeared in advertising companies of world brands in the conditions of self-isolation. The big picture can be divided into three types: "we're doing something" ads, "we thought you should know this" ads, and "we're here for you" ads. By resorting to the first type, brands often demonstrate that they donate money, produce medical equipment, help customers cope with financial difficulties, and so on. They try to talk about it in a way that doesn't make the ad look like a brag. Budweiser released an ad in which it was able to creatively praise advanced health care workers, report on canceled sports events, and announce that the company would direct the sports budget to fight the coronavirus.

In the second type, companies specify what they can or can't order. Domino's Pizza and Little Caesar's have made it clear that they are open and deliver food. Little Caesar's video is only 16 seconds long, but it turned out to be one of the best in this category.

And, finally, the third type includes advertising designed to morally support customers, similar to social videos in an informal style. Nike and Guinness encourage social distancing with simple but expressive slogans and images. Jack Daniel's took video calls between friends and relatives as a basis and showed other ways to communicate during isolation.

Of all three categories of crisis-oriented advertising, it is the third that allows companies to hide behind pleasant emotions. However, the longer the COVID-19 outbreak continues, the more difficult it will be for major brands to rely only on this type of commercials and not take other actions.

The acquired business reputation is recorded on the balance sheet and amortized over 20 years, but not more than the term of the organization's activity. If the acquired business reputation of the company is negative, it is equally attributed to the financial results of the company as operating

income [4]. It is not easy to acquire a good reputation of the company, and only those who followed the above rules could not lose their image and business as a whole.

Thus, it can be noted that the pandemic has had a huge impact on advertising texts and advertising in general. It is impossible to say definitely in which direction the changes have taken place, they just happened and they need to be accepted. Some global brands have paused in their long-standing feud and united thanks to one flash mob. Others have become closer to their consumers. Anyway, covid-19 has made its contribution to the advertising industry and left an indelible mark both in it and in all spheres of human life.

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SOCIAL AND PSYCHOLOGICAL ADAPTATION OF STUDENTS IN A FOREIGN LANGUAGE ENVIRONMENT

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The problems of adaptation and their impact on students in a foreign language environment are considered. The article presents the sociocultural problems that students who come to a foreign-speaking country should be prepared for. Ways to solve the problems that have arisen are discussed.

Keywords: Adaptation problems, international students, foreign language environment.

СОЦИАЛЬНО-ПСИХОЛОГИЧЕСКАЯ АДАПТАЦИЯ СТУДЕНТОВ В ИНОЯЗЫЧНОЙ СРЕДЕ

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Рассмотрены проблемы адаптации и их влияние на студентов в иноязычной среде. Приведены социально-культурные проблемы к которым должны быть готовы студенты, приехавшие в иноязычную страну. Пути решения возникших проблем.

Ключевые слова: проблемы адаптации, иностранные студенты, иноязычная среда.

At the moment, international relations are very developed in the world, and this includes educational ties. Cooperation in the field of education is an important task for many countries. The education of the younger generation is assigned a significant role in the process of spiritual rapprochement of peoples and integration of the world community. In the modern world, educational ties between countries are actively developing, and the number of young people who want to get an education in another country is increasing. Currently, the share of foreign students among the total number of students in Russian educational institutions is about 7.3 %. At the same time, about 1.5 % of Russian students are studying abroad, and this percentage is increasing every year. Therefore, the topic of sociocultural adaptation of students in a foreign-language country is very important. In addition, successful adaptation helps the student to engage quickly in the educational process. Many students when moving to another country do not think about the problems that may arise, which later affects their morale and physical condition. The objective of the article is to familiarise with the problems that students may face. After all, the adaptation of students in a foreign language environment is a complex and rather individual process [1, 2].

The features of international students' adaptation are manifested in the fact that they are in a different psychological and sociocultural situation, which can be characterized by the following

points: a different language environment; a different cultural (mentality) and political environment. It is these factors that first occur to us when we talk about the adaptation of students, but in fact, there are many more of them [3].

To prove the above, we conducted a survey consisting of 11 questions among Russian students who moved to another country and international students at Russian universities. The questions posed are aimed at psychological aspects. Based on the responses to the questionnaire, it is possible to compile percentages associated with adaptation problems. More than 80 % of respondents had studied the language of the country they came to for several years before moving, but despite the preparation, they had a language barrier, which is directly related to fear and self-doubt in situations when it is required to speak a foreign language. Against this background, at first, there were difficulties in communication and understanding with fellow students and teachers. Students could only talk about simple topics that were accessible to their language level. There is a noticeable change in the education system, which can affect the student's progress. The difference was felt in the possibility and impossibility of choosing subjects and in the attitude of teachers to students. Difficulties in the assimilation of knowledge arise mainly because educational programmes and courses are often not adapted for foreign students. The problems of teaching international students are studied all over the world, but the approaches of foreign and Russian researchers are noticeably different. If abroad they consider education outside their native country as a problem of the interaction of cultures, and above all in the aspect of learning foreign languages, then for Russian researchers the psychological and pedagogical approach is more typical. After a certain period of time, the student begins to adapt quickly to the speech behaviour of the country to which he moved, forms thoughts faster and expresses them more competently. This linguistic growth is associated with daily contact with native speakers. 90 % of students realised the role of a foreign language for self-development and personal growth. In addition, students gradually began to acquire the habits and behaviour of the country's inhabitants. 70 % of the surveyed students concluded that their worldview has changed dramatically. Some have become more closed as a result of the behaviour of the surrounding people, while others began to display joy when they wanted to, and not when it is accepted in society. Less than 30 % showed a level of homesickness that made them want to return to their homeland. More than 70 % of students had an idea of the purpose of their stay in another country, in connection with which they studied on an equal basis with everyone and actively participated in events [4].

Based on our results, we want to highlight the following problems faced by students who have left to study in another country. The first is the language barrier. This is the inability of a person who has absolutely no command or only has command of certain lexical and grammatical material to perceive and reproduce spontaneous speech in any foreign language environment due to lack of confidence in their knowledge. It includes a lack of vocabulary, a lack of knowledge of grammar, and difficulty in understanding a spoken foreign language due to poor listening skills. The language barrier appears due to fear and self-doubt in those situations when it is required to speak a foreign language. The reason for this is lack of practice and a lack of communication. To overcome the language barrier quickly, you should communicate with native speakers. At first, conversations will be on simple topics. There may also be some misunderstandings with fellow students and teachers due to a lack of knowledge, which may be stressful, but over time you will move on to more serious ones for conversation and a common understanding with other students and teachers [5, 6].

The second most important problem in the process of students' adaptation concerns the educational and cognitive problems associated with the change in the education system. The educational system in Russia differs significantly from other countries of the world. The first difference is the choice of subjects for study, which is possible in countries other than Russia. The second is the attitude of teachers towards students, and the third difference is that the teaching of basic theoretical linguistic disciplines is carried out in a foreign language. Misunderstandings of the material given during lessons can arise, as well as difficulties in completing assignments. The inability to communicate with people puts foreign students in an extremely difficult position. International students cannot understand what their teachers and fellow students are talking about

during lessons. Therefore, the teacher plays an important role in language adaptation in the framework of the educational process, specifically in terms of his speech rate and his origin. The greatest difficulty is getting used to the rate of speech [7].

The third point concerns sociocultural problems, meaning sociocultural competence. This is the student's readiness and ability to develop their intercultural communication based on knowledge of the culture of the country of the target language, its traditions, mentality, norms of etiquette, social conditions and the speech behaviour of native speakers. This problem implies a rejection of the previous way of life because change pervades all aspects of life. Among the external factors of student adaptation, unusual climatic conditions can be identified, as well as the peculiarities of national cuisine, living conditions and many other factors of the external environment. Adaptation of students to educational activities is a multilevel process, which is implemented by a single functional system, and ensures the optimal result of the activity and maintains the state of balance in the 'person-environment' system [8].

The final point involves psychophysiological problems that are directly related to the reorganisation of the personality in the conditions of initial adaptation and adaptation to the conditions of a foreign environment. That is, in any case, you will get used to the communication conditions of the country to which you have moved, but perhaps it will take a certain time. Most likely, the world outlook will change partially or radically, based on the percentage of the students surveyed. In general, language shapes thinking, and when a person thinks in another language, then everything around assumes a different meaning. You should have a clear idea of your purpose of staying in another country, which can compensate for the homesickness. The clearer you understand your mission in a particular country, the easier it is to adapt to a foreign language environment [4, 7].

Thus, the above problems of adaptation, which are faced by students who come to study abroad, are associated with the language barrier, and educational, cognitive, sociocultural and psychophysiological difficulties. These problems of adaptation of students are caused by the inclusion of the individual in a new sociocultural and educational-cognitive environment, where the formation of the structure of stable personal relationships to all components of the educational process and culture of another country takes place. To avoid encountering the language barrier and further understand the speech of the teacher and fellow students, you should prepare in advance. That is, all the strength and motivation can be directed to learning the language, you can watch television shows, films and even communicate with native speakers because now there are many ways to improve your speaking and understanding skills. You should also study the culture, and familiarise yourself with the traditions and speech behaviour of the country to which you plan to go. Most importantly, set yourself a goal and follow it. The more you understand why you are in a particular country, the easier adaptation will be.

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THE IMPACT OF CORONAVIRUS PANDEMIC ON SMALL BUSINESSES IN RUSSIA

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This article examines the problems that small businesses are experiencing in connection with the COVID-19 coronavirus pandemic. The relevance of the topic is determined by the fact that entrepreneurship is the basis of a market economy; this is proved by the experience of those countries that are now living well. During this year, the world and the country as a whole have changed. The coronavirus infection has already gone down in history as an international emergency. The current situation in Russia and the support measures taken by the government raise questions about their relevance and effectiveness.

Keywords: coronavirus pandemic, entrepreneurship, small business, Russia.

ВЛИЯНИЕ КОРОНАВИРУСНОЙ ПАНДЕМИИ НА МАЛЫЙ БИЗНЕС В РОССИИ

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В данной статье рассматриваются проблемы, которые переносит малый бизнес в связи с пандемией коронавируса COVID-19. Актуальность темы определена тем, что, предпринимательство является основой рыночной экономики, это доказано опытом тех стран, которые сейчас живут благополучно. За этот год мир и страна в целом очень изменились. Коронавирусная инфекция уже вошла в историю как чрезвычайная ситуация международного значения. Сложившаяся ситуация в России и принятые правительством меры поддержки, вызывают вопросы об их актуальности и действенности.

Ключевые слова: коронавирусная пандемия, предпринимательская деятельность, малый бизнес, Россия.

Small business plays a very significant role in the country's economy. The economic and social role of small business is the right of citizens to freely use their abilities and property to carry out entrepreneurial activities. In all economically prosperous countries, the share of small businesses in GDP production is at least 50 %, but in the Russian Federation, the contribution of small businesses to GDP is about 20 %. Entrepreneurial activity is almost always a risk, because there are no guarantees of an appropriate level of sales of goods or services.

Russian entrepreneurs face many problems: gaps in tax legislation, a lack of economic resources, the anger of large companies, the illiteracy of entrepreneurs themselves, and high credit rates. Solving these problems is the most important task of the State.

In fact, the economy has not created a high-quality foundation for the development of entrepreneurship for historical reasons, and business development requires a sufficiently long period of economic stability, in which there would be stable business rules. In Russia, there has not yet been a single decade in which there has not been some kind of crisis or significant changes in legislation.

The main problems of small and medium-sized businesses at present are:

- falling demand for goods and services – 39,43 %;
- inability to conduct business due to the restrictions imposed – 36,77 %;
- the need to pay salary and rent obligations – 19,92 %;
- additional costs associated with the growth of the currency exchange rate – 3,67 % [1].

Due to the coronavirus outbreaks, companies around the world, regardless of size, have begun to experience a reduction in production. Small businesses have been hit the hardest by the pandemic and, in particular, from the quarantine. Most small businesses have stopped operating, some have lost their daily income, and some are on the verge of bankruptcy.

Recent evidence suggests that the business that could afford to work remotely remained in a winning position. People engaged in such small and medium-sized businesses quickly adapted to the new modern requirements: they switched to an online format, launched home delivery and other services. Such organizations will overcome the crisis[2].

If we now turn to the basics, such a crisis has become global in nature, as a result of which each country has developed and implemented its own anti-crisis programs in support of small businesses. In such a situation, state support was necessary for small and medium-sized businesses.

Today, there are several areas of state support for small and medium-sized businesses. All of them are available only to enterprises from the affected industries and subject to all restrictions on the number of employees and revenue. These are such types of support as:

– exemption from taxes (except for VAT and personal income tax, for which enterprises only transfer taxes to the budget) and fees for the second quarter of 2020. At first, they only talked about deferrals and instalments, but then the situation got worse and taxes were cancelled altogether. However, individual entrepreneurs will still have to pay fixed fees for themselves;

– subsidies for the payment of salaries – 12,130 roubles per employee for 2 months, issued through the Federal Tax Service. It is not necessary to return, but it is also impossible to collect debts – those who have debts will not be given subsidies. The main thing is to keep 90 % of the staff;

– a discount of 12,130 roubles for individual entrepreneurs on the payment of insurance premiums;

– salary credits. There are 2 programs: the first one is designed for a six-month interest-free period, and the second one started on June 1, 2020, and you will need to pay 2 % per annum on it. And if the company retains 90 % of the number of employees for a whole year, then the loan will not have to be returned at all;

– various kinds of deferrals and discounts when renting state or municipal property, the ability to go on "rental holidays" or even terminate the lease agreement ahead of schedule without penalties;

– a moratorium on the initiation of cases in bankruptcy;

– for the self-employed-refund of the tax paid for 2019 and "tax capital" of 12,130 roubles for the current year [3].

The current study found that before the Russian regions began to go to the regime of total self-isolation, the main blow fell on such types of areas as beauty salons, hairdressers and other representatives of the service sector.

The country's exports also suffered due to border closures and reduced demand. The closure of entire cities in China, followed by the closure of borders and the ban on air/rail traffic, seaports, led to supply chain disruptions. Sales of oil abroad decreased by approximately 2.5 %, wood – by almost 10 %, some metals-by 12 % or more.

This factor has a distributed value over time – someone has created stocks, someone has alternative suppliers, but the fallout from the supply chain of the world's largest supplier cannot but

affect business: small businesses, companies that did not provide for stocks, and even large technology companies can suffer greatly in the near future.

Another important finding was that those who created the reserves can't expect to improve the situation in the near future – the closure of borders with China has been replaced by the total closure of borders by all European countries and many in the world. Even if China, as the leadership of the Communist Party of China (CPC) claims, defeats the coronavirus and soon returns to normal functioning of the economy, the problem will continue due to quarantine measures of other countries. At present, the issue of opening borders is being gradually resolved, and many countries have already done so.

This paper reviews the evidence that communications play a big role in business, and now the coronavirus has complicated them as much as possible. The cancellation of major events in the world will lead to the rupture of the traditional channel of communication, cooperation, exchange of opinions and technologies. It will become impossible to enrich ideas and formulate problems, conclude major deals, advertise and promote brands and new products, which will become a serious fact of technological and economic stagnation [4].

Currently, it is not even possible to predict how many small businesses will cease to exist. Now the situation in the country is on the decline, restaurants and cafes were allowed to work in compliance with all security measures, and vaccination against COVID-19 is also being imported throughout the country. The vaccine is used for groups of people with a high risk of disease: doctors, teachers, social workers and those who come into contact with a large number of people. According to the Recommendations of the Ministry of Health of the Russian Federation for vaccination in the conditions of COVID-19, a preliminary appointment is required. This is done so that there are no queues, so a large accumulation of people in a closed room. World Health Organization (WHO) is considering the possibility of carrying out preventive vaccinations at home, Russian legislation allows this. The Union of Pediatricians of Russia emphasizes that vaccination is also important for those who are not at home, for example, in nursing homes, in boarding schools for special children [5].

This study has shown that, despite all, we can assume that if there is a new wave of coronavirus infection, then first of all, the areas of public catering and tourism, trade and services will again suffer. The entertainment and transport markets will also suffer significant losses.

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УДК 316.776

A COMPARATIVE ANALYSIS OF THE NON-VERBAL COMMUNICATION OF RUSSIAN AND BRITISH UNIVERSITY TEACHING STAFF

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The article is devoted to the study of non-verbal communication of teaching staff during lessons and comprises a comparative analysis of their gestures and postures at universities in the United Kingdom and Russia. The teacher must possess not only speaking skills, but also a range of non-verbal behaviour in order to conduct lessons effectively.

Keywords: non-verbal communication, teaching staff, posture, gestures.

СРАВНИТЕЛЬНЫЙ АНАЛИЗ НЕВЕРБАЛЬНОГО ОБЩЕНИЯ ПРЕПОДАВАТЕЛЕЙ РОССИЙСКИХ И БРИТАНСКИХ УНИВЕРСИТЕТОВ В ОБРАЗОВАТЕЛЬНОМ ПРОЦЕССЕ

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Статья посвящена исследованию невербального общения преподавателей на занятиях и сравнительной характеристике жестов и поз преподавателей в университетах Великобритании и России. Учитель должен обладать не только речевыми навыками, но и культурой невербального поведения, чтобы эффективно провести занятие.

Ключевые слова: невербальное общение, преподаватель, позы, жесты.

Nowadays, the most important and valued characteristic in people is the ability to communicate competently. However, there are professions where the ability to communicate is vital. One such profession is teaching.

The ability to convey their experience, knowledge, opinions and skills as well as the rational and emotional state of their students all depend on the communicative nature of the teacher. In the process of teacher-student interaction [1], non-verbal communication plays an important role since body language contains much more information than words. A. S. Makarenko, a Soviet teacher, noted that '[t]o be a true master, you need to be able to recognise through gestures and facial expressions some signs of mental movements. I became a real master only when I learned to say "come here" in 15-20 different tones, when I learnt to give 20 different nuances to the expression of the face, body and voice [2].' In addition, his research showed that when the lecturer's face is motionless, up to 15 % of information is lost [3]. In this regard, the significance of non-verbal communication in the activities of the teacher deserves special attention since most teachers do not consider this component important in their work [4].

The study of literature on non-verbal communication helped to choose the appropriate type of communication for conducting research. The system of gestures occupies a special place in the system of non-verbal communication. The gestures of the teacher create a certain mood and discipline in the group, and they also play a big role in ensuring the attention of students, which is the most important condition for effective learning [5].

The originality of the work lies in the discovery, description and explanation of non-verbal means of communication based on the example of non-verbal communication between teachers and students at universities in Russia and the United Kingdom. The object of research is communication between teachers and students during lessons.

The practical significance of my work can be considered from the point of view of the benefits for teachers and students. The teacher, having studied the features of non-verbal communication, gestures, facial expressions and their meaning, will be able to better and more effectively convey information to students. Students who are familiar with my work will be able to learn how to recognise gestures and their meaning in communicating with friends, as well as use the necessary gestures in various situations. The study was organized among the teaching staff who provide lessons at the Reshetnev Siberian State University of Science and Technology. Table 1 shows the most common gestures in order of frequency of use [6].

Table 1

Most common gestures of teaching staff

	Name of gesture/posture	Meaning
1	pointing gesture	a gesture that reinforces the information
2	open posture, open palms	gestures that indicate positivity and openness to interaction in communication
3	rubbing pointers or rings, scratching the head	gestures indicating uncertainty or increased anxiety
4	leaning on a table or chair with one's hands	gestures that express a certain degree of dissatisfaction with the situation, supports for giving self-confidence
5	knocking on the table	expression of discontent, anger or rage
6	interlocked fingers	gesture of tension
7	covering the mouth, rubbing ears and eyes	gesture of self-doubt
8	hands on one's sides, the "women's fighting pose"	gesture of pressure on children, dominance and aggression

The most popular gesture at the Reshetnev Siberian State University of Science of Technology is the pointing gesture. It helps to focus on what is required. In second place is a gesture of uncertainty and anxiety, which indicates the anxiety of teachers during lessons. Most often, this is associated with the bad behaviour of a group of students. In third place are the 'hands on hips' and 'knocking on the table' gestures, which deserve special attention. For example, while watching a teacher at work, you can often hear the word 'Conversation!' This category of gestures has an average level of use, which indicates the humanistic position of teachers in relation to the students of the university.

To conduct a survey among British students, I registered on the Tandem website and conversed with peers. They revealed a lot of interesting information about their teachers. It transpired that their postures and gestures are slightly different from those of Russian teachers. Frequently used gestures and postures in the United Kingdom include: closing the eyes, an expression of dissatisfaction or reaction to the wrong answer of the student; if the teacher stands up, it means he is going to say important information; a straight posture gives students a sense of reliability and importance; open hand gestures that help you better digest information; tapping on the forehead; pointing gestures; the palm grasps the chin, which means a decision is being considered.

In the United Kingdom, teachers are more emotional. They smile more often, which creates a warm and trusting relationship with students, and it is more pleasant and easier for them to digest new information. In Russia, they often like to wear a mask to create an image of a strict and influential teacher.

Thus, we can conclude that the most popular gesture in the United Kingdom and in Russia is pointing. In the United Kingdom, some postures are almost not used at all, unlike in Russia, for example, placing the hands on one's sides. The majority of teachers feel confident in the classroom, and uncertainty is mainly manifested only in young teachers. In the gestures of some teachers, there are signs of authoritarianism. Most importantly, the gestures used by the vast majority of teachers indicate a good-natured attitude towards students and a desire to work with them. This research will help students to determine more accurately the emotional atmosphere and well-being of teachers, thereby improving their performance and responses during lessons. Additionally, the students, having studied the features of non-verbal communication, will correctly use gestures and give the teacher "feedback"[7].

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USING GUERRILLA MARKETING TO PROMOTE AN INSTAGRAM ACCOUNT

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In the modern world, various ways of promoting a business company on social networks are used for its development. This article will consider guerrilla marketing as a type of account promotion on the Instagram social network.

Keywords: marketing, guerrilla marketing, promotion of an Instagram account, promotion methods.

ПАРТИЗАНСКИЙ МАРКЕТИНГ КАК ПРОДВИЖЕНИЕ АККАУНТА В ИНСТАГРАМ

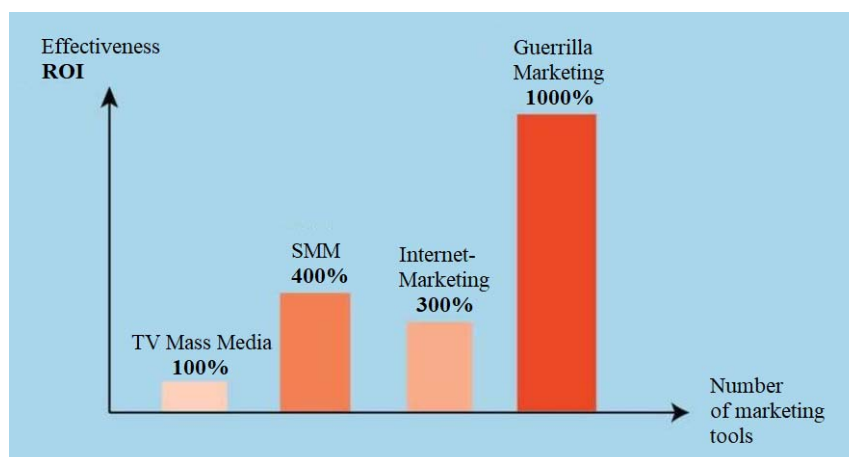
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В современном мире для развития бизнес-компании используются различные способы ее продвижения в социальных сетях. В данной статье будет рассмотрен партизанский маркетинг как вид продвижения аккаунта в социальной сети Инстаграм.

Ключевые слова: маркетинг, партизанский маркетинг, продвижение аккаунта Инстаграм, методы продвижения

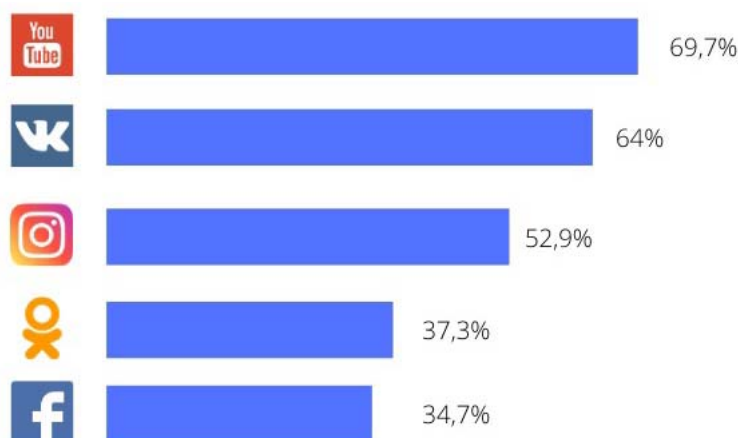
The term “Guerrilla Marketing” refers to the effective promotion of goods and services as well as attracting new clients without any financial investment or at minimal cost.



Picture 1. Comparative table of main types of Marketing

This term was coined in the book “Guerrilla Marketing” written by marketing and sales expert John Levinson in 1984 [1]. In this book he noted the difference between two kinds of marketing – traditional and the one he wrote about. The main difference was in effective use of a creative approach and innovative thinking for drawing clients’ attention [2].

Levinson believed that business cards and fliers posting in different media could be good for potential clients. Nowadays, with a quick growth of Internet such means of advertising have become not so effective. According to statistics, the Internet in January 2021 numbered 124 million including 56 million of Instagram users. Instagram is one of the most popular networks not only in Russia but also in the whole world.



Picture 2. Coverage of social networks in Russia in 2020

Instagram is a social network that was created for people’s everyday communication and for promoting services and regular exchange of views between its users whose number is growing constantly. Instagram network gives the opportunity for many businessmen to promote and develop their business successfully. The biggest social networks have now served not only as entertainment content, but also as a perfect Start-up for new brand building. As it was mentioned above, guerrilla marketing is a low-budget promotion of goods and services that is based on recommendations and opinions of experienced experts which is a natural way of promotion in Instagram. It is one of the normal means for Instagram promoting. For this purpose, various strategies, different practices and SMM-service industry are set up in Instagram.

Content – Marketing. Content can be briefly described as “information presented in photos, videos, posts, musical tracks”, etc. It is the basis for Instagram promotion. Any successful business profile should include interesting, useful and quality content to attract clients’ attention. Instagram is a visual platform where quality photos and videos play an important role. That is why using the brand color palette in the account will be associated with your products by potential clients.

Go-Pro brand, famous for its action cameras, is considered to be a good example of posting quality content. The company puts the content generated by its users in its feed.

Choice of videos. Instagram users like videos so much that Stories are now more popular than Instagram posts in the feed. It is known that videos are the major marketing tool for gaining profit because of the active involvement, brand presentation and communication with Instagram followers. If you are an expert who advertises your own brand or if you have a small or medium-sized business, then to make an advertising video clip you will not have to use expensive equipment. Your smartphone will be good enough for it.

Online clothing store Yoox, for example, which was opened in 2008, is now a popular account for people wearing only the most stylish clothes. Yoox is one of the first online stores that started using Stories in Instagram. The company has created the stylish campaign based on photo symmetry, bright colors and unusual video editing transitions. Due to this, ad recall (a campaign

metric that measures how memorable an advertisement is to an audience) has grown by 11 points and brand recognition by 6 points.

Collaboration with bloggers and companies. Collaboration is one of the most popular and almost free ways of promoting for business account [3]. Mutual PR between bloggers and companies that use one another's advertisements is considered to be one of the main up-to-date mean of promoting. This way is very effective for developing accounts as well as for exchanging attracted subscribers.

It is also important to consider two things:

- Engagement rate (the higher the engagement rate of your partner's account, the better the response is).
- Target audience (collaboration with those partners, whose target audience will become your potential clients).

Hashtags are also used for promotion on Instagram. Hashtags are the words or word expressions that filter and organise content by topic [4]. Hashtag is one of the account promotion tools, which is also free. Correctly chosen tags can help attract target audience to accounts and get more LIKES from the Instagram followers. Creating your own brand hashtag is the best way for new users to find and choose your company.

To sum up, it can be said that guerrilla marketing is a highly effective marketing strategy that increases brand awareness and sales on a low-budget. Bringing together guerrilla marketing and Instagram one can achieve high marketing efficiency using quality and creative content which includes viral videos and commercials; collaboration with other companies and bloggers and adding hashtags under each post in a user's feed. However, the list of marketing means is not limited to the above-mentioned ones. It is important to remember that the art of marketing is in finding new means and ideas which have not been used by anyone.

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BUSINESS NETWORKS IN ACHIEVING COMPETITIVENESS IN INTERNATIONAL BUSINESS

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The article reveals theme of competitive advantages in modern international business. Based on the analysis of the modern alliances of organizations and their solution to competitive we establish that strategic alliance are main competitive advantages.

Keywords: business networks, strategic alliance, international business, competitiveness.

КООПЕРАЦИОННЫЕ СВЯЗИ В ОБЕСПЕЧЕНИИ КОНКУРЕНТОСПОСОБНОСТИ КОМПАНИИ В МЕЖДУНАРОДНОМ БИЗНЕСЕ

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В статье раскрывается тема конкурентных преимуществ в современном международном бизнесе. На основании анализа современных альянсов организаций и их способах конкурентной борьбы устанавливается, что стратегические альянсы являются главным конкурентным преимуществом.

Ключевые слова: стратегические альянсы, международный бизнес, конкурентоспособность.

Globalization of the world economy contributes to changing of established economic systems, that is why process of technology innovation and movement of capital is accelerating, labour mobility is increasing and companies' collaboration is changing. Organizations had competed with each other in for resources, provides and markets.

Collaboration of organizations is one of the ways to manage the difficulties and to solve problems in a modern business. More and more companies form strategic alliances cooperating with each other.

Strategic alliances are trust-based long-term symbiotic relationships between firms that make every partner achieve strategic goals more effectively, coordinate common resources and optimize transaction costs. Alliances may have different goals. They might be marketing, technological and hybrid.

Cooperation in international strategic alliances provides a wide range of opportunities for partner companies such as access to the resources and to new markets, reduce uncertainty, gaining of knowledge and experience. International markets are becoming essential for company's growth through strategic alliances.

Some researchers believe nowadays companies feel the pressure of two competing factors and have to accommodate and function in a changing environment. According to G. Hamel and I. Doza,

all companies participate in global race for international markets and in technical race for new equipment and information technologies [1]. During technical race organization make resources and build capacity, which may be used to manage new industries and future markets.

Strategic alliances and symbiotic relationships are advantages in crisis of the economy. Organizations can reallocate resources and share costs. Moreover, it is better to be prepared for the future growth.

According to Michael Porter, sustainable competitive advantage is a combination of activities that would be hard to copy. He has developed a model of market forces that include suppliers, consumers, competitors and organizations that produce substitute products.

B. Gomes-Casseres identifies as a core of collectively competitive, as an opportunity of reinforce avoiding traditional antimonopoly policy. There are synergies between two organizations. Effectiveness is achieved to move companies rapidly to new market and technological frontiers.

Companies win when they are included at the alliance. They save on new product development and scale of production. Effectiveness of synergy between several organizations consists in improving the quality of the product and in reducing the cost of the product to the consumers.

B. Gomes-Casseres have analyzed dynamic growth of international partnership over the 1970-1993 period. Alliances in IT industries have the largest increase from the absence in 1970 to 250 in 1993. It is important to mention significant growth in biotechnology and in the chemical industry [1]. There was a slight reduction of international alliances in 1990 and 1991. Since then, there has been commensurate growth in all high-tech industries.

The automotive industry, trade and refining are under enormous pressure and joint ventures are very common in these industries. They are also common in innovation industries such as medicine, biology and IT industries [2].

General Motors and *Volkswagen* have several dozens of joint ventures. Largest international oil and gas companies are exporting almost 80 percent of their product due their joint ventures [2].

Cooperation and alliances imply the sharing of knowledge and the joint creation of new value for consumers. Cooperation provides opportunities for institutional development. Partnership demands the interaction of stake holders in innovative activity and achieving goals in emerging markets [3].

Nowadays managers understand that the core of competitive advantages is partnership and cooperation. Combined efforts and pooled resources will optimize processes and achieve better results. Strategic alliances provide new international markets and opportunities to improve technologies.

Companies become more competitive forming strategic alliances. The main advantage is logistics and costs minimization. Moreover, companies gain an access to a new market and consumers, which they didn't have an opportunity to work with before, and to resources, knowledge and new information.

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THE PROBLEM OF TOLERANCE IN RUSSIA

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This article reveals the meaning of the concept of "tolerance", examines the problem of tolerance in Russia in the 90s and in our time. What does the concept of "tolerance" actually mean in the Russian dictionary? The question of how tolerant Russian society is discussed.

Keywords: tolerance, Russia, USSR, modern generation, concept of tolerance, UNESCO

ПРОБЛЕМА ТОЛЕРАНТНОСТИ В РОССИИ

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В данной статье раскрывается смысл понятия "толерантность", рассматривается проблема толерантности в России в 90-ых и в наше время. Что же на самом деле означает понятие "толерантность" в русском словаре. Рассматривается вопрос о том, насколько же все-таки толерантно российское общество.

Ключевые слова: толерантность, Россия, СССР, современное поколение, концепт толерантности, ЮНЕСКО.

At present, the phenomenon of tolerance is being actively studied by specialists of various spheres: historians, lawyers, political scientists, psychologists, sociologists, and cultural scientists. The concept of "tolerance" is used both in the field of science and in everyday life. Tolerance is interpreted as tolerance for a different way of life, behaviour, customs, ideas, beliefs.

Today, more than ever, it has become important to understand that it is necessary to learn to live within the framework of a new culture, a culture of harmony and tolerance, which is the foundation of a democratic society and seems to be fundamental in the formation of the ethics of united humanity.

The problem of tolerance is relevant to modern Russia due to its multinational composition and multi-confessional nature. Currently, the problem of toleranceformation is especially acute. Its relevance is explained by several reasons: a sharp stratification of world civilization along economic, social, and other grounds and associated growth of intolerance and terrorism; the development of religious extremism; aggravation of interethnic relations caused by local wars, refugee problems, etc [1, 2].

The concept of "tolerance" in semantic richness is much broader than just "tolerant attitude". This is a kind of ethical doctrine of our time, claiming to be central to the "axis of coordinates" of the 21st century. People living in an era of cosmopolitanism, erasing economic and other boundaries, need a new philosophy, an open and understanding community.

Unfortunately, in our time for Russians, tolerance is a distant concept. There still exists hatred of newcomers, contempt for the disabled, the desire to get rid of foreigners and non-traditional religions in Russia.

According to the definition given in the Declaration of Principles of Tolerance (signed on November 16, 1995, in Paris by 185 member states of UNESCO, including Russia), tolerance means "respect, acceptance and correct understanding of the rich diversity of cultures of our world, our forms of self-expression and ways of manifesting human individuality ". This definition, the most ambitious, implies a tolerant attitude towards other nationalities, races, skin colour, gender, sexual orientation, age, disability, language, religion, political or other opinions, national or social origin, property, etc [3].

The Declaration was translated into Russian from English as "Декларация принципов терпимости". The concept of "tolerance" not only does not reflect the completeness of "tolerance", but it can also be directly opposite to it. The Russian verb "to endure" has a negative connotation: patience is always passive and means only external restraint of one's attitude, which does not in any way change the very position of intolerance. On the contrary, "tolerance" is interpreted in the Declaration as "an active attitude formed based on the recognition of universal human rights and fundamental freedoms" [4].

In the history of mankind, intolerance has always been present, giving rise to wars, religious persecution, and ideological confrontations. In everyday life, it was expressed and is expressed in fanaticism, stereotypes, insults, and on a national scale – in racial discrimination, persecution on a national, religious basis, in violation of the most important democratic freedoms.

The USSR was a good example of tolerance. The older generation's memories can be evidence of it. Peoples' friendship is not the result of Soviet propaganda. Basic values, which included friendship, cooperation and mutual assistance, as well as common goals and practices were of great importance. Soviet people fought in the Great Patriotic War, developed wild lands, conquered the space, constructed the Baikal-Amur Mainline.

The collapse of the USSR and the course towards the development of identity and national self-determination of each, even the smallest ethnic group, led to the complication of interethnic relations, to conflicts on religious, economic, and political grounds. Under these conditions, the recognition of the value of tolerance can be qualified as a way to ensure the safety of a multinational state [5].

At present, Russia has a lot to develop in this matter, there is a lot to learn from Europe. After all, how can you live in a state where your gender, religion, racial affiliation can be condemned?

Fortunately, the modern generation is more tolerant and open to something new, their views are completely different, with pure intentions. This is largely due to the proliferation of social networks and the ability to connect with people around the world.

At present, among young people, through the media, especially on various social platforms, more and more attention is paid to tolerance. In particular, on the territory of our state, there is a large number of foreign students who need a healthy socio-cultural environment for a quiet life. And it is a part of tolerance. Therefore, Russian students need to be more educated and enlightened in intercultural communication, everyone should understand that skin colour, gender, nationality, etc. do not define a person differently. We all are humans and deserve equal treatment and respect. In this regard, a lot of forums are held for students, where the phenomenon of tolerance is touched upon.

The youth elite is now our future. The future of interethnic relations, among other things, depends on how today's youth will be formed. Therefore, holding special events, that help to nurture respect and interest in other cultures in the younger generation, is now more important than ever.

Students demonstrate the development of personal potential, professionalism and capabilities in solving problems at any state level. Therefore, the most urgent is the work on the dissemination of ideas of tolerance among the students, as the most active social group, called upon to establish ties between different peoples and cultures in future [6].

Using the example of Siberian State University, it can be noted that activities are being carried out to familiarize Russian students with other cultures. Foreign students feel comfortable in Russian society. We can say that our students know what tolerance is, they are always ready to help and show round the university. We ourselves have witnessed these examples more than once.

The younger generation in Russia, in comparison with the older generation, is more tolerant and more tolerant of other nationalities. Foreign students from different countries come to study to Russian universities. For example, exchange students from China study at our university. Also, at our university, foreign language classes are conducted by native speakers from China, and there is also an English teacher from the UK. Teachers' nationality does not affect the attitude of students towards them. Students also show respect to them, fulfil their requirements.

Despite the tolerance of the younger generation, Russian society is still hardly tolerant. Many citizens of our country, especially adults and the elderly, despise representatives of other nations, other sexual orientations, and other views on life. To create a more tolerant society in the future, it is necessary to work with the younger generation.

It is essential to convey to young people that all people are different and that this is normal. A person being Chinese or Russian is a person with the same feelings and emotions.

In educational institutions, concept of tolerance should be explained and formed among all the students. Various special events, forums, festivals can be held.

Speaking of tolerance, one must remember that tolerance is an intolerant attitude towards injustice, not a rejection of one's own for the sake of other people's interests, not condescension or connivance, but an active attitude, recognition, and respect for the rights and freedoms of both individuals and entire states.

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DIGITAL ENVIRONMENT: INTERNET EFFECT ON THE ENGLISH LANGUAGE LEARNER'S COGNITIVE ABILITIES

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The article is devoted to the current problem of the negative and positive influence of the Internet on the study of a foreign language and the cognitive ability of a student. An increasing number of people are switching to distance learning, where Internet resources play an important role. The main purpose of the article is to identify factors that indicate which side of the Internet's influence is predominant, positive or negative. The examples and statistics of the use of information resources are studied and presented, the problems that negatively affect the study of the English language are indicated.

Keywords: digital environment, information sources, educational Internet platforms, free educational content, Zoom, plagiarism, critical thinking, cognitive abilities.

ЦИФРОВАЯ СРЕДА: ВЛИЯНИЕ ИНТЕРНЕТА НА ПОЗНАВАТЕЛЬНЫЕ СПОСОБНОСТИ СТУДЕНТА, ИЗУЧАЮЩЕГО АНГЛИЙСКИЙ ЯЗЫК

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Статья посвящается актуальной на сегодняшний день проблеме негативного и позитивного влияния интернета на изучение иностранного языка и когнитивную деятельность студента. Всё большее количество людей переходит на обучение в дистанционном формате, где интернет ресурсы играют немаловажную роль. Основной целью статьи является выявить факторы, которые указывают, какая из сторон влияния интернета является преобладающей, положительная или отрицательная. Изучены и приведены примеры и статистика использования информационных ресурсов и указаны проблемы, негативно воздействующие на изучение английского языка.

Ключевые слова: цифровая среда, источники информации, образовательные интернет платформы, Zoom, бесплатный образовательный контент, плагиат, критическое мышление, когнитивные способности.

The main objective of the article is to identify how the Internet contributes to productive learning of the language, or whether it only slows down the cognitive processes and reduces critical thinking abilities. We draw attention to the fact that the role of the Internet in human life is increasingly coming down to obtaining knowledge, information and the necessary data. Based on this, a change in the market for language learning in favor of the Internet has occurred.

If we talk about the positive impact on the study of a foreign language, undoubtedly English dominates the Internet in many areas: from science to entertainment; about half of the information on the Internet can be found exclusively in English, which indicates the importance of its learning. As an example the publicly available multilingual universal Internet encyclopedia can be suggested. More than 11 % of all Wikipedia articles are written in English [1]. Wikipedia is one of the helpful tools of a student, studying a foreign language.

The epidemiological situation in 2020-2021 forced schools and universities to go online. According to Interfax, 78 % of Russians began to use the Internet during the lockdown [2]. Consequently, educational Internet platforms have gained significant popularity: Skype, Zoom, Discord and other messengers. Zoom has become a convenient platform for organizing audio and video conferencing when learning a foreign language. Based on the experience of the first-year students of Reshetnev Siberian State University of Science and Technology, we will try to find out the problems that arose when learning English through Zoom. 24 students were involved in our research on the positive and negative sides of online learning a foreign language. According to our research only 15 % were in favor of online education, 10 % were against, the 75 % expressed mixed emotions and voted for a combined type.

Among the positive feedbacks were: the Internet allows you to avoid tension, which sometimes occurs in the classroom; saves time on travelling; availability of access to free educational content, or sending home assignments online. However, the following problems were mentioned: lack of face to face communication with teachers; since the classroom rules included mandatory video links on both sides, this caused a disadvantage for students as well. The reasons were such as embarrassment, unwillingness to be seen by others in their informal background; limited ability to use Internet resources or translators; most students began to be more distracted in classes. In addition, technical problems should be considered. Sometimes, with a slow Internet speed or a server overload, Zoom eliminates trainees from the conference – an error "Try later" appears in the application. Along with this, inconvenience associated with the time limit of a free conference (40 minutes), namely, the need to re-enter the conference. If we talk about interaction with the teacher, the students claimed that they were much calmer and more comfortable to ask their question in the offline mode.

As can be seen, among a large number of positive sides of Internet application in training, a wide range of negative influences should be mentioned, since information technologies allow users not only to exchange the necessary information, but also to perform some tasks instead of a person, and a number of tasks are reduced to finding a ready-made answer, which does not always have a positive impact on the quality and efficiency of training [3], as well as the development of critical thinking. According to Oxford Learner's dictionary "critical thinking" is the process of analyzing information in order to make a logical decision about the extent to which you believe something to be true or false; the process of thinking carefully about a subject or idea, without allowing feelings or opinions to affect you [4].

The problem is that students, entering a university, do not have the experience of writing texts, but have extensive experience in writing essays applying the so-called Copy-Paste method, which they possessed at school. In the process of copying someone else's text, a person does not need to come up with something new, think, or make discoveries. This greatly simplifies scientific activities and leads to a decrease in the level of science in the country as a whole and the quality of training outcomes. According to statistics, about 50-70 % of student papers have clear signs of plagiarism, which undoubtedly affects the quality of education [5]. According to Oxford Learner's dictionary "plagiarism" is copying another person's ideas, words or work, and pretending that they are your own. It is important to note that plagiarism is not necessarily manifestation of the moral or intellectual corruption of a student. Many of those who resort to plagiarism are capable and intellectually developed people. However, the permanent practice of writing and including the use of Google translator affects their cognitive abilities and reduces the desire to critical thinking. Cognitive abilities are those connected with mental processes of understanding that somebody/something is able to do something [6].

Most of the plagiarism in one way or another is processed. Many students still edit automatically translated text, some try to rephrase individual lines and insert their own thoughts, trying to give the written text more academic view. There is a widely spread type of translated plagiarism – the choice as sources for plagiarism texts written not in English, but in Russian and their subsequent translation into English [7].

Another negative factor in the use of electronic resources in education is the proliferation of all kinds of services that perform educational tasks for students. The most inventive students, who are lazy to do home assignments, tend to prefer unfair practices of finding answer keys or attracting a third party to this work since most of textbooks can be downloaded from the Internet. One more problem is vocabulary acquisition. Availability of numerous on-line dictionaries and translation services like Yandex or Google translate are far from being a priority choice since they do not give any examples or definitions, their translations are often limited or based on transliteration. However, they tend to be the most enjoyed ones by the English language learners.

Summing up, there are both positive and the negative impact of the Internet on English language learning. One of the biggest advantages of online learning is its availability and easy access. But it should also be noted that with the advent of the Internet and its great impact on life, students are increasingly trying to simplify their studying process, and reduce the amount of time and personal intellectual resources. Two mentioned factors – the lack of practices for critical thinking and availability of any information – quite successfully explain the fact that such a high percentage of students practice plagiarism, which slows the mental activity and reduces memory operation. The development of information technology helps and contributes to the acquisition of new knowledge and education, but it also has a number of disadvantages that can lower not only the level of education, but also the development of society as a whole. Therefore, it is necessary to take into account the negative aspects of using electronic resources and change the attitude to their excessive use.

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SOUTH KOREA CUSTOMS SERVICE

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This article gives an overview of the Korea Customs Service, the organization of it and how the KCS is promoting e-commerce and managing the risks around trade.

Keywords: Korea Customs Service, customs operations, customs control.

ТАМОЖЕННАЯ СЛУЖБА ЮЖНОЙ КОРЕИ

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Рассматривается система таможенных органов Южной Кореи, организация таможенной деятельности, осуществление таможенных операций, которые реализуются таможенными органами Южной Кореи.

Ключевые слова: таможенные органы Южной Кореи, таможенный контроль, таможенные операции.

The Korea Customs Service (KCS) is one of the tax organizations in South Korea and is run under the Ministry of Economy and Finance. Nowadays, cross-border e-commerce is increasing in Korea so it requires continuous development of the Customs. Despite the fact that Korea is known as a country that has the best quality of the Internet, which is enormously important in activities in the field of customs; and the country with one of the best economy results, KCS has to deal with problems of the different spectrum [1].

By processing customs clearance of all goods entering or leaving the country while strictly enforcing the law, the Korea Customs Service protects the national finance and economy, prevents the inflow of risks harming social safety and living standard, promotes legitimate international trade and travel. The mission of the organization is to make stronger economy and safer society.

The Customs of South Korea has some particular qualities, which are expressed in the need by the customs authorities to think creatively carrying out their work, listen to the voice of the customers carefully, work with an energetic mindset, act on the spot, and offer people a good service.

The concept of the KCS work consists of: interaction between business and the state (post-audit), creating favorable conditions for doing business (UNI-PASS), protecting the national interests of Korean business in foreign markets. The purpose of post-audit is to control the correctness in determining the declared customs value of goods and, thereby, in full payment of customs duties.

There is a selective type of post-audit of the customs value of goods involving an audit to select a specific case of importing goods into the customs territory. Scheduled post-clearance audit of the customs value of goods means that all participants are divided into three classes:

- 1) participants in foreign economic activity who systematically violate customs legislation;
- 2) foreign trade participants who periodically violate customs legislation;
- 3) conscientious participants in foreign economic activity.

Comprehensive post-customs audit of the customs value of goods is based on a combination of independent internal control and control by the customs authorities.

Another basis of the concept of the KCS is a UNI-PASS. It is a customs clearance system that helps efficiently perform administration business, provides an optimized economic border control, that contributes to a significant share of national tax revenue through accurate taxation on import or export cargo, establishes international trade order through crackdown on smuggling and foreign exchange control, and supports domestic industries with rapid customs clearance processes as well as FTA-related business management [2].

Protection of the national interests of Korean business in foreign markets is one of the priorities in activity of the customs authorities. Main directions of this type of activities are:

- 1) rendering maximum assistance to the implementation of agreements on free trade and mutual recognition of the status of an authorized economic operator with the main partner countries;
- 2) maintaining the system of customs control and clearance;
- 3) assistance to export companies with little capital.

There is a guide made by KCS specially for foreigners called “Guide to Customs declarations” to help duty payers who have been trying to make a correct customs declaration but had difficulties with little information on the customs. This book is important as it covers various fields of customs administration and provides basic and comprehensive information on customs that might be useful for duty payers [3].

Nowadays, Korea Customs Service is working hard to stop the spread of COVID-19 and reduce damage in economy caused by the coronavirus pandemic, through the following measures:

- 1) tax benefits for importers and exporters;
- 2) implementation of special clearance procedures on personal effects;
- 3) collaboration with other agencies;
- 4) UNI-PASS crisis response manual;
- 5) measures to prevent infection of customs officials[2].

Korea Customs Service deservedly can be called as one of the fastest and modern systems in this world right now. There are a lot of problems that KCS has to deal with but in general, it works well.

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MAIN DIFFICULTIES OF TECHNICAL TEXTS TRANSLATION

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This article presents the features and difficulties of translation of technical texts that affect the translation process and the choice of translation strategy. The main lexical feature of a scientific and technical text is the richness of the text with terms, the presence of lexical structures and abbreviations. Currently, there is a need to identify scientific and technical translation as a special type of translation activity.

Keywords: technical texts, main feature, term, difficulty.

ОСНОВНЫЕ ТРУДНОСТИ ПЕРЕВОДА ТЕХНИЧЕСКИХ ТЕКСТОВ

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В данной статье представлены особенности и трудности перевода технических текстов, которые оказывают влияние на процесс перевода и выбор переводческой стратегии. Основным лексическим признаком научно-технического текста является насыщенность текста терминами, присутствие лексических конструкций и сокращений. В настоящее время существует необходимость в выделении научно-технического перевода как особого вида переводческой деятельности.

Ключевые слова: технический текст, особенность, термин, трудность.

Scientific progress is a special feature of the modern world. Currently, there is a need to identify scientific and technical translation as a special type of translation activity and a special theory that analyzes this type of activity. Some researchers suggest that scientific and technical translation should become an independent applied discipline.

Translation of technical texts is the translation of materials with a scientific and technical focus, which contain scientific and technical terms. Examples of technical texts are: scientific articles on technical issues, technical documentation for machine-building equipment, manuals for the use of complex technical products, etc. [1].

Translation of scientific texts is closely connected with science, and translation of technical texts is closely connected with the usage of scientific knowledge in practice.

The main feature of technical texts translation is that this type of information translation orientates the translator to knowledge of specialized terminology. It does not matter what language is used for translation when translating technical texts, the translator may not have enough knowledge, not knowing special terminology.

Term as defined by O.S. Akhmanova is a word or phrase of a special (scientific, technical, etc.) language, created (adopted, borrowed, etc.) for the exact expression of special concepts and designation of special subjects [2].

A translator who works with technical and scientific texts should perfectly know the terminology of the field of science to which the translated text belongs. Correct translation of a term is not an easy task, but, despite this, terms have greater semantic certainty and independence than ordinary words. Translating terminology is a very time-consuming task. The translator has to exclude the use of foreign words when translating technical texts. Preference should be given to Terms of Russian origin should preferably be used when translating technical texts.

The special feature of the terms when translating is clarity of semantic boundaries. Terms have more independence in relation to the context than ordinary words in the text.

The terms refer to special vocabulary. Special words are words or phrases that name concepts or objects related to various spheres of human activity.

When translating terms, we can meet the following points:

a. Some terms that have an international character are transliterated and do not need translation. For example, generator – генератор.

b. Some terms have direct correspondences in Russian and are translated using proper equivalents. For example, voltage – напряжение.

c. Some terms are translated using loan translation, i.e., a word taken from English and translated in a literal or word for word way to be used in Russian. For example: program code – программный код.

d. When the dictionary does not directly correspond to an English term, a descriptive translation, that accurately conveys the meaning of the foreign language word in this context, is used. For example, video-gain – регулировка яркости отметок от отраженных сигналов[3].

Another difficulty concerning technical translation is constant development of technologies, emergence of new technologies, and, consequently, formation of a lot of new terms and abbreviations. Translator has to take this aspect into account and be able to choose an appropriate equivalent in the language.

There are also a lot of figures in technical texts, the translator should transmit them in accordance with the State System for Ensuring Uniform Measurement. Translators refer to national and international standards in the original language.

In terms of syntactic structure, English texts of technical content are distinguished by their constructive complexity. They are rich in participial, infinitive and gerundial phrases, as well as in some other complex constructions, which sometimes complicate the understanding of the text and set a difficult task for a translator.

To come to the conclusion, when translating technical texts, translator must know at least two foreign languages, be good at terms and concepts in two languages, use various sources of information. Translation of technical literature is considered a rather difficult and time-consuming task, which, in addition to a large amount of work, requires professional knowledge in a particular industry. The exact meaning of the text should not be distorted, and it is important to keep the style of the original.

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INFORMATION TECHNOLOGY IN ADVERTISING

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A method for solving marketing problems using artificial neural networks and Internet advertising has been investigated. Internet advertising as the most important component of the modern world. The efficiency of using ANN in Internet advertising is analyzed. The advantages and disadvantages of artificial neural networks are considered.

Keywords: information technology, advertising, advertising activities, Internet advertising, artificial neural network, marketing.

ИНФОРМАЦИОННЫЕ ТЕХНОЛОГИИ В РЕКЛАМЕ

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Исследован способ решения маркетинговых задач, с помощью искусственных нейронных сетей и интернет-рекламы. Интернет-реклама, как важнейшая составляющая современного мира. Проанализирована эффективность применения ИНС в интернет – рекламе. Рассмотрены преимущества и недостатки искусственных нейронных сетей.

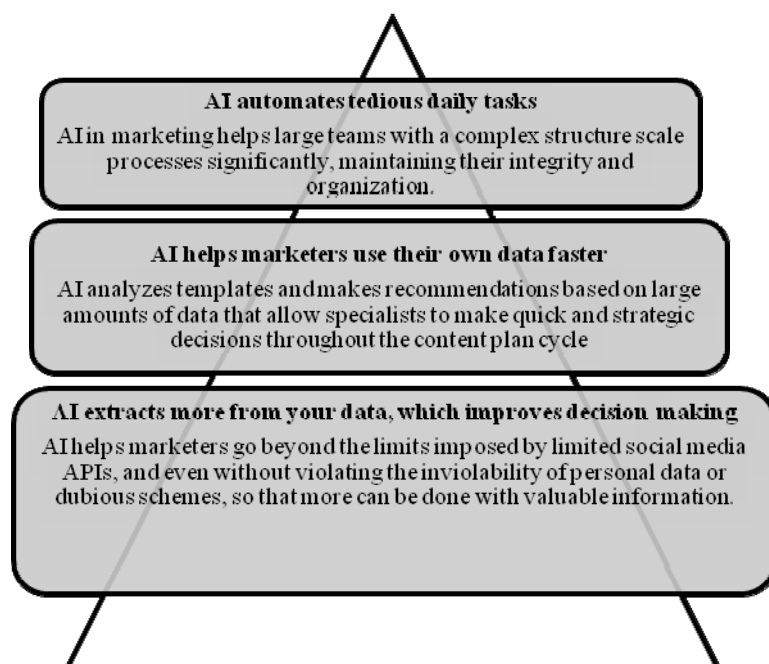
Ключевые слова: информационные технологии, реклама, рекламная деятельность, интернет-реклама, искусственная нейронная сеть, маркетинг.

Every year people automate the enterprises and the organizations more and more, exempting the person from participation in processes of receiving, conversion, transfer and use of information. In the sphere of marketing, a solution of the tasks assigned to advertising helps to make decisions and to increase competitiveness – artificial intelligence. Work of artificial intelligence is based on drawing up genetic algorithms and further "playing" of artificial situations.

Artificial intelligence can process, analyze and structure information. The most recent stage in the development of AI (artificial intelligence) is "deep" learning. This type of technology allows you to model the work of the human nervous system, a feature of which is the ability to self-study based on previous experience. If AI only allows you to process information, then an artificial neural network is the next step in the development of this technology – it itself "makes" decisions and with each new task improves the quality of the work performed. More precisely, the INS (artificial neural network) help not only reduce the time and cost of analyzing and structuring information, but also independently makes new decisions in the process of work. After a long "training," the system begins to give out more and more original and fresh ideas for solving marketing problems [1].

In the last couple of years, and especially now – during quarantine due to coronavirus infection, online advertising has become the most popular marketing tool [2]. Online advertising

has many advantages: quick and effective achievement of the target audience, interactive marketing, the ability to advertise in local and national markets. In combination with the capabilities of an artificial neural network, Internet advertising significantly outstrips the existing technology of work in this area of activity [3].



Let's look at a specific description of setting a task in online advertising using the INS. For example, there is a company for the production and sale of a certain type of women's and men's clothing from premium quality. This organization has three outlets with a limited number of assortments in cities: Moscow, St. Petersburg, Novosibirsk. The main way of doing business falls on the social network Instagram. The marketing campaign of this organization is based on very high-quality and personalized online advertising. Namely: targeted advertising, Instagram posts and stories, e-mail newsletter, push – notifications. The company's marketer decides to contact a third-party organization that provides services for using an artificial neural network in Internet advertising. The organization for the production and sale of a certain type of women's and men's clothing makes a request in the search and analysis of information on positions: male or female under 30 years old; the number of subscribers is higher than 3000, for example; the presence of pages on Instagram, Twitter, Telegram; mention of various organizations selling this type of clothing in publications – 10 times every half a year, in personal chats – 5 times a month; a certain number of clicks and search queries in Google; the presence of a partner who is not married/not to her husband is free/free; active social life (meaning not only active maintenance of social pages, but also real life and live communication). Of the allocated number of people suitable for these requests, they seek information specifically about each of them: the color most attracted by the client; the amount of time spent on the Internet; an approximate schedule of working weekdays and &; and so on. An artificial neural network examines each potential client and learns their preferences. Based on the data studied, provides various solutions and recommendations for improving the effectiveness of a marketing campaign using online advertising.

With the support of an artificial neural network, Internet advertising becomes an advanced technology in the field of marketing. INS offers personalized, unique and original solutions. Based on the learned information about potential customers, this technology structures and processes a huge amount of diverse information faster than a person, which allows you to accelerate work processes, reduce the cost of expenses and wages of employees and be more competitive and in demand in the global market [4]. The artificial neural network determines the future technology of

organizations and enterprises, opens up new opportunities, both in the field of marketing and in other areas of activity. But in addition to the advantages, it also has disadvantages. INS Learning is a multi-cycle configuration of internal elements and the relationships between them, which is a long enough process. Along the way of tuning this technology, there are many dead ends, so real professionals in this field are required, and there are not many of them at present. Another disadvantage is the lengthy cost of these procedures, which often prevents the application of INS. It is also worth remembering that these are not widely available technologies in our time, an artificial neural network is developing and is at the stage of formation and determines the "future."

As a solution to the above shortcomings, I would like to note that it is the large investments of financial resources in the development of this technology and the qualitative training of new specialists in this field that will "raise" artificial neural networks. To solve the problem of the labor intensity of the process at this stage, it is necessary to minimize the number of neurons in order to fulfill certain tasks. Which means reducing the amount of errors and dividing the required tasks by classes (systematize and split by certain qualities). Adjusting the INS to specific goals and requirements will speed up the "learning" process and increase the level of approximation of solutions to real life.

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ANALYSIS OF RUSSIAN MARKETING TERMS, BORROWED FROM ENGLISH LANGUAGE

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This article discusses the introduction of marketing terminology in Russian language, the classification of types of borrowings, the basic concepts and concepts of marketing and the prospects for its development of marketing in the future.

Keywords: marketing, types of borrowing, terms, development prospects.

АНАЛИЗ РУССКОЯЗЫЧНЫХ ТЕРМИНОВ МАРКЕТИНГА, ЗАИМСТВОВАННЫХ ИЗ АНГЛИЙСКОГО ЯЗЫКА

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В данной статье рассмотрено внедрение маркетинговой терминологии в русский язык, классификация видов заимствования, основные понятия и концепции маркетинга и перспективы его развития маркетинга в будущем.

Ключевые слова: маркетинг, виды заимствований, термины, перспективы развития.

Over the past ten years, there has been an active introduction of new market management and economic terminology in marketing, both in the special literature and in oral communication. The introduction of a new term should be justified by the inability to “fit” new content into the old terms, when the corresponding concepts are not available in Russian language. Also, a new term must comply with the rules of the Russian language. The introduction of a new term makes it easier for specialists to communicate. Here, first of all, we mean the special language, slang of advertisers, employees of consulting firms who work with original foreign sources of information [3].

Marketing as a science originated in the United States 100 years ago during the Great Depression. Its founder, Philip Kotler, wrote one of the main books "Fundamentals of marketing". In this regard, linguistics directly affected marketing, as the borrowing of terms from English language, which gave rise to the term marketing, influenced the terminology. An even more important point is that all the top educational literature of this specialty is in English, and no translator can convey the meaning as the author did [4].

Russian-language terminology of marketing is borrowed almost completely. There are very few terms that have emerged in Russia. Based on the research data, only a few terms were found that originated in Russia, compared to 98 % of borrowed terms.

According to Lotte classification, there are 4 types of borrowings. The first type is original borrowings, which are fully transferred to a foreign language in the form in which they are

presented in the native language. For example, “branding”, which means a marketing practice in which a company creates a name, symbol or design that is easily identifiable as belonging to the company; “background-marketing”, which means information about the company, data about the owners and top managers, which serves as the basis for developing the concept of an advertising or PR campaign.

The second type of borrowings are the terms consisting of borrowed elements. For example, “geodemography” – the principle of market segmentation, which takes into account gender, age, and the number of family members; “multi-media-marketing” – implementation of marketing through the use of two or more means of communication.

The third type is mixed borrowings. They include words such as “business plan” – a detailed plan of action of the company, containing information about the company, product, marketing. This category also includes the popular concept of “image maker” – a person who creates the image of an organization by creating a mission, values, and strategy [5].

It is worth noting that a number of marketing specialists have tried to expand the traditional concept of the complex (4P) by introducing other elements that begin in English with the letter P (people; personal; physical evidence; physical surrounding; process; package; purchase; probe, testing, public relations), thus offering the concepts of "5P", "6P", and "5P"., "7P", "9P" [2].

Marketing will continue to develop. Marketing departments will play a leading role in building strategies, they will push traditional systems to greater market opportunities by mastering market information in real time. They will play a leading role in the dissemination of data and in building relationships with local partners and customers. An important role will be given to building a brand and strategy. However, the pace of technology development is only accelerating, which provides new opportunities to reduce the cost of interaction with consumers. In order to cope with the rapid increase in the number of competitors, advertising options, and a wide variety of customers, and at the same time ensure profit, successful companies have to simultaneously reduce their dependence on their main features and engage in open interaction within partner networks.

Now it is difficult to imagine our life without marketing, moreover, one of the most popular professions these days, according to experts, is a marketer. Marketers are constantly learning: they participate in conferences, watch webinars, and take advanced training courses. However, one more important component of marketing is English language. Studying marketing as a science is useful for any person. Knowledge of English helps to understand the terminology of marketing. The study of any field of activity is impossible without studying the terminology, which helps to understand where the word came from, and what it means. If you are fluent in professional language, you will have more opportunities to express yourself and show good results. Being competent in marketing can be useful not only in work, but also in everyday life.

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FORECASTING METHODS IN ENTERPRISE INNOVATION ACTIVITIES

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This article examines forecasting methods in enterprise management and how they can be applied to create innovations, and also highlights their advantages and disadvantages.

Keywords: innovation, innovative activity, forecasting methods, factographic methods, expert method.

МЕТОД ПРОГНОЗИРОВАНИЯ В ИННОВАЦИОННОЙ ДЕЯТЕЛЬНОСТИ ПРЕДПРИЯТИЯ

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В данной статье рассмотрены методы прогнозирования в управлении предприятием и их применение при создании инноваций, а также выделены их достоинства и недостатки.

Ключевые слова: инновация, инновационная деятельность, методы прогнозирования, фактографические методы, экспертные методы.

Nowadays, innovation is essential for an organization to function successfully. In order to create innovations in the organization, it is necessary to create a system of organized innovation activities.

Innovation activity is a complex and multivariate object of management. Innovation activity should be considered a complex system, with all the system attributes and characteristics. The effectiveness of such activity depends on the built-up innovation management [1].

In modern conditions, there are stable mechanisms for managing scientific and technical activities that reflect the features of the integration of science and production, the main of which are: the orientation of research and development to the needs of the market; strengthening of the influence of market factors and market conditions on defining goals and strategies of enterprises. The tools used in innovative companies include such methods as: planning methods, forecasting methods, heuristic methods for reviewing and selecting projects, heuristic methods for managing researches and development work, methods of training staff and management [2].

From all of the above, we have chosen the forecasting method, since the organizational effectiveness depends mainly on forecasting, namely, on how reliably they foresee the prospects for further development.

The forecasting method is the interrelation of ways and methods of thinking that are indicative of the future development of an object. This method covers a variety of initial parameters, such as experience, identification of patterns, trends, and possible prospects [3].

The relevance of this method lies in the fact that the forecasting problem for most Russian companies is becoming one of the most significant criteria for successful operation. To ensure

effective management, it's important to be able to determine the nature of the process in the future, as well as to classify and assess risks in advance and set specific tasks for their management. It is the high number of different problems that lead to the appearance of forecasting methods, and that is the reason why a manager must possess planning skills, and an executive must be able to make the right strategic decision. The choice of the forecasting method is an important step, since the reliability of the information will depend on the chosen method. There are two forecasting methods: factographic methods and expert methods.

The method of expert assessment has become widely used in innovation activities. It is primarily associated with the collection, systematization and processing. This method is used to predict scientific and technical events that are a source of innovation. The advantage of this method is that it allows you to predict the appearance of fluctuations in various areas without finding the function that is used in the factographic method. The disadvantage of this method is that the assessment is subjective. It means, that the assessment may change due to the influence of psychological factors.

The most common method of expert assessment in Russia is the method of points, which is carried out through questionnaire surveys. In this method ten or less experts form a group. This group selects several major factors that have an impact on the problem. Experts rate each parameter of the object on a scale from 0 to 10. After that, the received expert assessments are analyzed.

The most popular factographic method in Russia is the extrapolation method. This is one of the main forecasting methods, which is based on forecasting events taking into account the historical data and its analysis. They can only be used if there is quantitative information about the object. The advantage of this method is that there are a lot of application techniques, and it is also possible to take more account of the indicators that have been achieved in recent years. The disadvantage of this method is that it is impossible to consider fluctuations and shifts in the development of a particular object.

The most common extrapolation method in Russia is a method of least squares. The point of this method is to minimize the sum of the squared deviations between the observed (actual) values and the corresponding estimates (calculated values) calculated from the selected constraint equation. This method best corresponds to the idea of averaging both the single influence of the factors accounted for and the total influence of the factors unaccounted for [4].

As practice shows, to achieve the best result in forecasting, the methods should be used together. Complex methods are applied to predict the development of complex objects, to research and develop scientific problems [5].

In conclusion it can be said that having some forecasting skills is useful for people working in innovation, as it will help avoid risks and tell about the development of the object more accurately. Nowadays, people need to develop forecasting methods in innovation, since in most regions of Russia innovation activity is poorly, disproportionately and unevenly developed, and the existing methodology and tools are not fully used and have insignificant impact.

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УДК 316.37

THE PROBLEMS OF INDIVIDUALISM IN SOCIOCULTURAL ENVIRONMENT

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In this article two socio-cultural models are considered: the Soviet one, which is based on mass consciousness formation where a person is a part of the system, and the model of modern Russia, which pays a lot of attention to personality. The modern trends are analyzed within the topic framework of demonstration of individuality, tolerance, self-love and love for the world around. The reasons of the model forming of interaction and society are defined.

Keywords: tolerance, body positivity, individuality, bullying.

ПРОБЛЕМАТИКА ИНДИВИДУАЛИЗМА В СОЦИОКУЛЬТУРНОЙ СРЕДЕ

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В данной статье сравниваются две социокультурных модели: советская, основанная на формировании массового сознания, где человек является частью системы, и модель современной России, в которой много внимания уделяется личности. Проводится анализ современных тенденций общества в рамках темы проявления индивидуальности, толерантности, любви к себе и окружающему миру. Определяются причины формирования модели взаимодействия с собой и обществом.

Ключевые слова: толерантность, бодипозитив, индивидуальность, буллинг.

In the Soviet society, built on collectivism principles, mass ideology forms in the culture where a person is a part of the society and the system. This model was acceptable to the type of society within the framework of planned economy, “study, work, go for it in the cause of your motherland!” [1] Everywhere there was propaganda of spiritual values which “stimulated people to social activity, not for the sake of money, not for the sake of their own good, but for the sake of spiritual values” [2]. Although the concept of "individualism" originated in France during the July Monarchy (1830-1848), this term was not relevant for the Soviet times.

Social pressure during the USSR epoch had a very strong influence on the fate. Since the childhood you was inculcated that the "elder" one is always a head and you feel pressure to conform, as not to be an upstart [1]. Thus, the society got rid not only of marginals but also of the creative units of that time whose thinking was out of the standard. As individualism was the persistence and impregnability treat of the of the USSR doctrine, it was criticized for everything, and considered hostile and unacceptable. In the 30s of the twentieth century, not only the police, but also people around monitored the life of each person [3]. Open expression of thoughts differ from

the ideologically "correct" moods could become a cause of neighbors' and even close people's denunciations. As for appearance, it was allowed to wear only the clothes that were appropriate to the state's standards [1].

When the statement model was changed everything changed too. With the transition to market economy the idea of an individual was formed as an idea of a creator. People started to have much more rights and freedoms in public life. With this transition the cultural model in society and the standards of beauty were changed. The possibility of showing individuality generated to many subcultures: rockers, rappers, skinheads and others (1990s) [4]. For some time, the public condemned these movements but eventually they became tolerant.

Modern culture appreciates the emphasis on a person's features, unusual thinking and ideas which contradict the ideology of Soviet society. For this reason, there are such family problems as "bullying" because of appearance and interests [5]. This word was borrowed from the West, like many others, implies "persecution", that is humiliation, aggression towards a particular person, an attempt to exclude from a certain social group against the will of a person [5]. Always there were disagreements between generations for some reasons, since society progresses and develops. The modern society, it is important to adapt to new trends of the universe. Otherwise, there may be a gap between the mind of "old school"-person and the current reality.

Since 2010, young people in Russia have tended to accept everyone and everything in general [6]. In the contemporary world, it is bad not when you are judged, but when you have judged someone. This worldview also came to us from the West with the "body positivity" movement [6]. This ideology emerged in the 1960s in the USA. Its essence is expressed in love and acceptance of one's body. The main idea is that a person feels comfortable. However, this movement has some disadvantages: mass laziness and new ideals can influence human health negatively. In the 60s, the fashion for unnatural thinness gave rise to eating disorders [7]. It means excessive restrictions in food or uncontrolled eating. According to the data of 2020, an eating disorder usually appears by reason of a mental injury and genetic predisposition [7]. But in the 1960s, eating disorders appeared due to the promotion of fitness and various diets in advertising of thin girls. Comparing the advertising covers of VOGUE magazine of the 1940s, 50s and 60s, we can conclude that the girls on covers became much thinner every ten years.

In modern Russia, it is difficult to identify the only one ideal of beauty. People's views usually vary between healthy lifestyle and body positivity. But according to statistics of the popular social network "Tik-Tok". In 2021, there are more requests for the hashtag "Healthy Lifestyle" (1.4 billion publications) than the hashtag "Body Positivity" (255.8 million publications). Considering the fact that body positivity is quite new movement, that is a worthy opponent of the healthy lifestyle ideology.

To conclude, each cultural environment implies its own form of realization. And each form of realization can be adaptive or destructive. The advantage of individualism is public education in issues of aesthetics, self-expression, and peculiarities. But there are also some disadvantages, such as the harmful transformation of the human body shortcoming into mass orientations.

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УДК 330

FRANCHISING AS A FORM OF SMALL AND MEDIUM-SIZED BUSINESS DEVELOPMENT

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The article discusses one of the priority methods in the development of small and medium-sized businesses in Russia. Discusses the main types of franchising are considered.

Keywords: franchising, franchisee, franchisor, royalty, trademark, small and medium-sized business development.

ФРАНЧАЙЗИНГ КАК ФОРМА РАЗВИТИЯ МАЛОГО И СРЕДНЕГО БИЗНЕСА

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В статье раскрывается сущность одного из приоритетных способов развития малого и среднего бизнеса в России как франчайзинг, рассматриваются основные виды франчайзинга.

Ключевые слова: франчайзинг, франчайзи, франчайзер, роялти, товарный знак, развитие малого и среднего бизнеса.

Small and medium businesses are the most important sector of the economy. Their development affects economic growth, market saturation with the high-quality goods, a competitiveness ensuring, developing scientific and technological progress, and additional workplace creating. In this regard, it is necessary to use the most effective ways to develop small and medium-sized businesses. One of such methods is franchising [1].

Franchising is a license for a trademark use with mutual obligations and exemption for doing business between the franchisor (transferring company) and the franchisee (receiving company or individual entrepreneur), provided for a certain compensation and issued in accordance with current law.

A franchisor is a company that transfers the right to use its own brand (trademark). The franchisor usually studies and develops his business, earns a reputation in the market and brings his own “style” into business. When the company has “settled”, it can sell the franchise to businesspersons.

A franchisee is a company that has the ability to purchase a franchise, at the same time, they pay royalties (payment for intellectual property) for the integration of a trademark.

A franchise is a business system that allows a franchisee to use a brand and a company's trademark to develop their business.

For franchise obtaining, the franchisee has to pay the initial installment to the franchisor, and afterwards make monthly payments. This promotion method can be compared to business renting, since the franchisee does not own the trademark, but has the right to use the trademark.

Franchising can be beneficial for both the franchisor and the franchisee. Both participants will receive economic benefits from the franchise: the franchisor receives additional income through the initial payment, and subsequently royalties. The costs are saved during the own opening by the franchisee, the subsequent development and operation of the franchise.

There are several types of franchising:

1. Commodity franchising.
2. Industrial franchising.
3. Service franchising.
4. Franchising business format.

Commodity franchising is the providing to franchisee the right for franchise selling franchise goods. That means the product sale must be carried out only under the brand of the franchisor. The relationship framework for commodity franchising is shown in Figure 1.

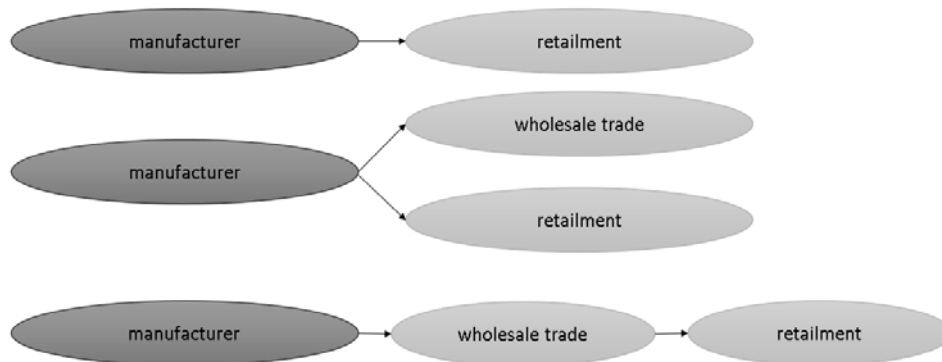


Figure 1 – Framework of relations in commodity franchising

The main terms of commodity franchising are [2]:

1. A wide product range, which can be chosen by the consumer.
2. Brand popularity.
3. Brand / trademark.

Industrial franchising is the most efficient organization of the producing of a certain type of product. This type of franchising implies the transfer by a company that owns the manufacturing technology of some products, the right to manufacture and selling them under its own brand name, as well as the sale of commodity and exclusive ingredients that are produced using secret technologies [3]. This can be clearly seen in Figure 2.

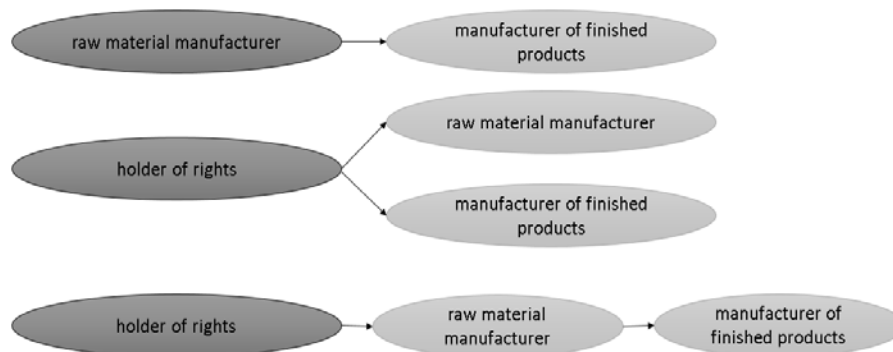


Figure 2 – Framework of relations in industrial franchising

Service franchising is a combination of product and producing franchises. With this type of franchising, the franchisee has the right to engage in a certain type of activity under the franchisor's trademark, but the franchisor, has a number of patented rights, which are transferred to the franchisee. It is illustrated in Figure 3.

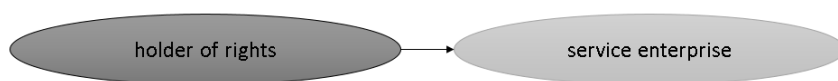


Figure 3 – Framework of relations in service franchising

Business format franchising is the acquisition of a complete business system. In this case, the franchisor transfers all the organizing technology and running a business to the franchisee. Then several independent enterprises are formed, that causes the identification of franchisee with the franchisor. An example of such relationship is shown in Figure 4.

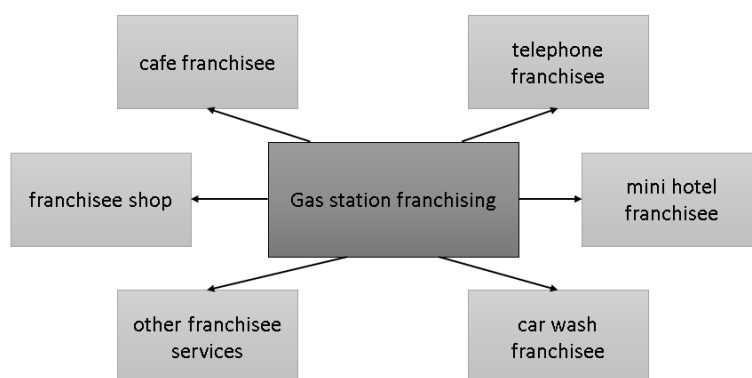


Figure 4 – Framework of relations in business format franchising on the example of a gas station

Summing up the investigation, we can conclude that franchising is an effective way of doing business in entrepreneurial activity, since it reduces entrepreneurial risks, allows attracting investments in the country's economy. Significantly expanding the sales market for products, creating additional jobs and strengthening the innovative potential of small and medium business, while maintaining the independence of the franchisee as an entrepreneur.

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УДК 1.(09)

THE INFLUENCE OF SPACE ON MAN AND SOCIETY IN THE PHILOSOPHY OF RUSSIAN COSMISM

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The influence of space processes on man and society in the philosophy of Russian cosmism is revealed.

Keywords: space, cosmism, person, society, biorhythms.

ВЛИЯНИЕ КОСМОСА НА ЧЕЛОВЕКА И ОБЩЕСТВО В ФИЛОСОФИИ РУССКОГО КОСМИЗМА

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Раскрыто влияние космических процессов на человека и общество в философии русского космизма.

Ключевые слова: космос, космизм, человек, общество, биоритмы.

The philosophy of cosmism studies the development of society in close unity with cosmic processes. Cosmism as a philosophical trend has existed for a very long time; this is indicated by the fact that since ancient times people concerned about the cosmos and about their unity with it. An example is the image of the world tree. The tree represented cosmos (the big world), while a man represented the small world. Later, people began to think not only about the unity with the cosmos, but also about its influence on humans. A. L. Chizhevsky and his followers made a significant contribution to the study of this topic in the philosophy of Russian cosmism. The aim of the research is to study the influence of space on society in the modern philosophy of Russian cosmism.

The idea of the unity of the living and the inanimate, the man and the Cosmos, mental and physical, is the main one for A. L. Chizhevsky. The great Russian scientist in his research came to the conclusion that humanity inhabiting the Earth is under the constant, powerful and complex influence of the Cosmos, which we only learn to identify and understand. The vital activity of both an individual and all mankind is in close connection with the life of the entire Universe. In his works, he indicated the range of waves coming from space, which could activate various kinds of pathogens. Ordinary solar flares are less dangerous for humans. Due to the activity of the sun, particles with a huge store of energy appear. They enter the human body and lead to physical and mental disorders [1].

One of the representatives of the modern philosophy of Russian cosmism, V. A. Galichiy, notes that particles may not enter the human body directly, but affect all the Earth's environments. It

is dangerous for a person to be in an altered environment, as this leads to mental health problems. Violations are manifested in a change in human biorhythms. Biorhythms are a cycle of biological processes. Its change disrupts the functioning of the body and leads to poor physical condition [2].

A person is influenced not only by the Sun activity, but also by the natural satellite of the Earth – the Moon. As you know, it causes ebb and flow on our planet, i.e., it affects the water. A person is mostly composed of water, therefore, in our body the moon also causes ebb and flow. There is also another way of the influence of the moon through the ebb and flow. For example, when the tide occurs, there is more *Escherichia coli* on most beaches and recreation areas. When it enters the human body, an intestinal disorder occurs. American scientists have established an increased concentration of this microbe and recommended swimming at high tide, as clear water arrives. This naturally affects the human condition [3].

R. Baldwin published the results of his research, from which you can find out what phases of the moon exist and how exactly they affect us. Some phases have a positive effect on us, that is, the body feels a surge of strength, and some phases worsen our condition [4].

How do cosmic processes affect society as a whole? M. L. Zakharov, relying on the philosophical heritage of A. L. Chizhevsky, emphasizes that there is a connection between the Sun activity and social processes. Since the energy from a solar flare is transformed into psychic or nervous energy, which leads a person to social activity. A socially active person is looking for companions, the same "irradiated" as he is, which leads to the creation of a certain community. Later they begin conceiving coups, wars, revolutions, organize rallies. This is because their energy is directed in the wrong direction. If their activity is directed to the good of society, then it is possible to improve the life of many fields of life of the organism [1].

Based on the above, we can conclude that space has a huge negative impact on the mental and physical health of a person. In this regard, several promising questions arise for further research. First, how do you reduce the negative impact? Secondly, if space has a negative impact on a person, is it worth continuing to try to conquer and populate it? The negative impact can be reduced by protecting our atmosphere. This is a matter of the ozone layer, but we are constantly destroying it, since the ecological situation of the planet is in a terrible state. To get rid of the influence, we must first remember who we really are, do not chase after money and do not forget about the state of the place we live in. When we improve the ecological situation, then the negative impact of space will decrease. The answer to the second question lies on the surface. In the modern world, we cannot imagine life without satellite television, navigators, the Internet, and weather forecasts. Developing, astronautics develops and implements advanced technologies. In addition, the population of the Earth is already very large, a lack of resources begins, so we need to find another home in space.

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УДК 1.(09)

IMPORT SUBSTITUTION IN THE SPACE INDUSTRY

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The process of import substitution in the space industry is analyzed, the ways of modernization of this process are suggested.

Keywords: space industry, import substitution, components of space technology.

ИМПОРТОЗАМЕЩЕНИЕ В КОСМИЧЕСКОЙ ОТРАСЛИ

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Проанализирован процесс импортозамещения в космической отрасли, предложены пути модернизации данного процесса.

Ключевые слова: космическая отрасль, импортозамещение, компоненты космической техники.

Now there is a crisis in the space industry of the Russian Federation. This can be seen by comparing the past and present success of the industry. Before the onset of the crisis, Russia purchased components for rocketry abroad – in the United States and the European Union. The imposition of sanctions against Russia served as the reason for the development and implementation of the import substitution policy, which will make it possible not only to get rid of the dependence of the Russian economy on other states, but also to enter the world market, which will have a beneficial effect on the development of the domestic economy. In this situation, it is necessary to analyze the state of domestic production of components for the space industry. The object of research is the space industry. The goal is the policy of Russia in the field of import substitution of components for the space industry.

It should be noted that the development of elements for the production of space technology, replacing imported ones, is carried out on the basis of the joint work of design bureaus and higher educational institutions.

Now, a plan for state support of university science is being implemented. Events are organized that realize the creative potential of students [1].

Student projects contribute to the identification of urgent problems and the formation of the direction for the development of the aviation industry. This activity also allows students to learn about the features of arrangement and organization of domestic aviation and astronautics, contributes to the involvement in the process of industrial development.

Particular attention is paid to training and import substitution plans. On August 30, 2017, the State Corporation Roscosmos and the Ministry of Education and Science of the Russian Federation signed an agreement on cooperation in training personnel for the rocket and space industry and for further work in the organizations of the state corporation [2].

«The agreement is aimed at establishing partnerships and developing long-term and effective interaction between the parties in the following areas: increasing the efficiency of personnel training, supporting and developing the Olympiad movement in natural sciences (including astronomy), creating conditions for the inclusion of the academic subject «Astronomy» as compulsory in the curriculum of basic general education, as well as the introduction of a system for conducting scientific experiments using nano-class spacecraft» [3].

Having studied the situation deeper, one can immediately offer several options for solving the problem. To begin with, it is worth accumulating a scientific base. Use the achievements of outstanding scientists and universities. Begin to conduct more design competitions where models of inventions are considered. Thus, new inventions could be found that are driving the progress of the development of the industry. It is necessary to implement and develop industrial practice for students, which will raise the general level of knowledge, increase the independence and preparedness of novice specialists. The beginning of the development of this area can interest investors, which will provide financing. It is worth updating the equipment, since it will allow producing modern parts, which also leads to progress.

In conclusion, it should be emphasized that the program for the import substitution of components for the space industry is under development, and in order to increase the efficiency of the implementation of this program, the inventions of higher educational institutions should be used more widely. After that, cardinal changes can be expected, which will ensure the development of the state's economy.

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УДК 130.2

LANGUAGE AND CULTURAL CODES IN ADVERTISING

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The article is devoted to the description of the concept of "cultural code" in advertising discourse. Examples of international advertising of well-known brands are also analyzed.

Keywords: language, culture, cultural code, advertising.

ЯЗЫК И КУЛЬТУРНЫЕ КОДЫ В РЕКЛАМЕ

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Статья посвящена описанию понятия «культурный код» в рекламном дискурсе. Также анализируются примеры международной рекламы известных брендов.

Ключевые слова: язык, культура, культурный код, реклама.

Advertising has long been a direct part of culture, and high-quality advertising text includes the cultural codes of certain communities and target audiences.

The use of the cultural code at the level of verbal and nonverbal communication contributes to the success of an advertising company, a deeper impression of this advertising in the memory of the target audience, its entry into the culture of a particular community.

The concept of «cultural code» that is of interest to modern experts in different scientific fields, however, has no clear definition. So, N.V. Bukina believes that a cultural code is information encoded in a certain form that allows us to identify a culture [1].

In modern advertising, cultural codes are updated in order to attract the widest possible range of potential consumers, pushing them to perform a predetermined action – the acquisition of the advertised object.

Brands operating around the world need to place a strong emphasis on culture in their advertising, especially if that brand operates in markets that are culturally different from where they are based. Messages, symbols, rituals and even colors can have different meanings and messages in different cultures.

For example, an ad for Procter's Wash and Go shampoo & Gamble in Poland did not take into account that in this country families practically do not have pools and mostly take a bath, and its advertising, showing a woman getting out of the pool and washing her hair in the shower, did not meet the requirements of consumers in this country. Therefore, this advertising campaign failed. Helene Curtis has changed the name of its shampoo in Sweden from «shampoo for every night» to «shampoo for every day», because Swedes usually wash their hair in the morning, not in the evening [2].

It is essential to study language and culture carefully in any international advertising. The well-known company «Pepsi Cola» often uses cultural codes that are understandable to the native speakers of each country in which the advertising is shown. In China, the advertising of the drink often uses elements of the plot of the Chinese drama or the celebration of the traditional Chinese New Year (literally translated «Spring Festival»), close and understandable to the target audience, as well as the slogan – «Bring joy home». In Russia and the United States, «Pepsi Cola» advertising uses dynamic actions, sports and youth culture, which allows us to talk about different cultural values for these countries [3].

As a rule, the use of the country's cultural traditions in advertising leads to success. So every detail of the advertising of the same company «Pepsi» in 2018 is exactly familiar to the Mongolian audience. In a thirty-second video, many traditional elements of the national culture are picturesquely demonstrated: national dress, cuisine, ways of eating, sitting on the floor of a yurt, activities – games, trade, animal husbandry, and a nomadic way of life. And in every yurt, viewers invariably see a bottle of the popular drink.

The importance of international advertising is beyond question. According to UN experts, more than 60 % of world gross domestic product is produced in joint ventures, where international teams work. Back in 2016, in Russia, the Internet provided 16 % of gross domestic product, providing more than 80 million users [4].

We believe that adaptation of ad aimed at a foreign target audience, it is necessary to take into account their language characteristics. It is about the quality of translation of the advertising slogan. However, some companies do not attach much importance to this.

Literal translation of an advertisement into foreign languages is rarely effective. The same advertisement for Wash and Go shampoo by Procter & Gamble in Russia did not take into account the meaning of the word Wash (louse is an insect). In some cases, advertisers are forced to change the names of products. Kellogg has renamed Bran Buds in Sweden because it sounds like «a burnt out farmer» in Swedish [2].

Pepsi Cola also had translation-related errors. In a number of Asian countries, it was forced to change its advertising slogan, as «Come alive with Pepsi» (come alive with Pepsi) literally translated as «Bring back your ancestors from the dead» [3].

All in all, it is extremely important to thoroughly study the language and culture in any international advertising. Cultural codes in modern advertising are always associated with national historical memory, national character, peculiarities of ideas about their native land, religion and mythology. It becomes obvious that the perception of reality depends on a particular cultural tradition. Culture encompasses both the material and the spiritual side of the life of society.

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УДК 291.7

RACISM AND ITS MANIFESTATIONS IN THE 21ST CENTURY

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This paper examines the concept of racism from the point of view of national differences. The factors of the emergence of racism, how negative attitudes are formed, and how it develops are also considered. The author analyzes and compares the evolution of this concept, as well as its impact on the world as a whole.

Keywords: racism, fascism, nordism, emigrants, , ккк, black lives matter (BLM).

РАСИЗМ И ЕГО ПРОЯВЛЕНИЕ В 21 ВЕКЕ

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В данной работе рассмотрено понятие расизма с точки зрения национальных различий. Также рассмотрены факторы возникновения расизма, то, как формируется негативное отношение, и как происходит его развитие. Проведен анализ и сравнение развитие расизма в прошлом и настоящем времени, а так же его влияния на мир в целом.

Ключевые слова: расизм, фашизм, нордизм, эмигранты, ку-клукс-клан, ККК, "Жизни темнокожих имеют значение" (BLM).

Racism is a set of views that implies a biased (usually negative) attitude towards members of other races. A typical but not obligatory characteristic of racism is the confidence in the intellectual, moral, or any other superiority of one's own race. In addition people tend to treat strangers with prejudices, with distrust and fear. And if a person looks very different we intuitively accept him as an outsider [1].

The emergence of racism is associated with the era of geographical discoveries of Europeans. To justify the colonization policy often followed by the destruction or enslavement of local residents, theories are formed about the primordial inferiority of some peoples.

The founder of "scientific racism" (and in particular — Nordism) is considered to be the French historian Joseph de Gobineau, who proposed in his "Experience on the inequality of human races" (1853-1855) the thesis about the influence of the racial structure of the societies under consideration on the features of their cultures, social systems, economic models, and ultimately — on their civilizational success [2]. The Nordic race, according to Gobineau, throughout history has shown superiority over others in the organization of society and cultural progress. The greatness of the ancient Greek and Roman civilizations, he explained by the assumption that at the time of the rise of civilization, the ruling elites in these countries were Nordics [3].

Racist theories were profitable for benefits through the exploitation of "inferior" groups and were fixed in relevant laws, such as the prohibition of interracial marriage. Discrimination on the basis of race, in turn, contributed to the emergence and strengthening of economic and social differences, which were already beginning to be taken as "cultural differences". The latter, in turn, served as new proofs of the unequal value of the races [4].

Until the end of the 19th century, classical racism openly claimed the superiority of white people. In the twentieth century a typical example of the repetition of such views was the views of the Nazis who inspired the destruction of millions of people during the Second World War. In the second half of the twentieth century, racism was ostracized at the world level, but continued to be practiced officially (for example, apartheid in South Africa). Nowadays, racism is often directed against immigrants [5].

The essence of racism boils down to the fact that people negatively relate to representatives of other human races, while praising their own. Negative attitudes can range from soft disrespect to genuine hate, fear, and contempt. History knows many terrible genocides, the only cause of which was racism.

It should be noted that this term first appeared in 1932 in the French dictionary of Larousse, which was a reference book on the main political and political science terms. In it, it was presented as a system that asserted the superiority of one racial group over others.

To better understand what racism is and how it manifests itself in the modern world, it is important to take into account that today it is almost entirely based on xenophobia, and not on pseudo-scientific theories and concepts, as it was until the mid-20th century. It is scientifically proven that at the genetic level, the differences are very small and are only due to the fact that in different regions people were forced to adapt to different living conditions. Therefore, today, the argument that some races are less perfect has lost all meaning.

An outstanding example of a racist organization in the 19th century was the Ku Klux Klan. At first, this organization did not commit anything criminal. Former soldiers simply collected together and put on strange outfits — masks, white coats, pointed high hats. So they superstitious blacks and hid their faces from the police and authorities. Over time, the movement attracted new participants. The clan expanded into 11 southern states, and included sheriffs, judges, and officials. KK killed black politicians and activists, intimidated black people not to go to the polls. The klansmen burned churches and schools, drove black farmers off their land, and held lynch courts. The attackers acted decisively and ruthlessly, leaving no witnesses [6].

Many people still see the prerequisites for a disdainful attitude towards representatives of certain peoples. For example looking at the low level of technological development of African countries they conclude that their residents do not have enough intellectual abilities to build a normal economy, develop education and science. At the same time they do not think that the inhabitants of African countries are initially in conditions in which they cannot get a good education that allows them to develop, build and create [7].

One of the most significant examples of racism is the Black Lives Matter movement, advocating for racial justice. It received legal status in 2014 after the deaths of two African-Americans Michael Brown and Eric Gardner, as a result of mass riots. The focus is on the abuse of power among police officers, who, according to the BLM, are much more likely to use weapons against black people. A magazine about life, cheese and intermediate states- «RoyalCheese». Statistics, however, suggest otherwise. About half of those killed by the police are white and only a quarter are black. At the same time, if we transfer these data to a quantitative ratio, the result will be as follows: white Americans – 13 deaths per million; black Americans — 31 deaths per million.

Racism is a very serious problem today. This ideology makes a person believe in their own integrity and see threats in other peoples. In all civilized countries today, legal restrictions that are somehow related to race or nationality are excluded. Nevertheless, today there is a reverse racism, it is very difficult to come to a common dialogue, because everyone strives to preserve and subordinate their own culture to other peoples. However, now the development of humanity has

accelerated many times, and it is likely that in the coming decades the problem of racism will lose its relevance.

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SUGGESTIVE LINGUISTICS IN RUSSIAN AS A TOOL OF THE INCREASE IN SALES

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This article considers importance of knowing language characteristic for their using in advertising. Characteristic of the Russian language and the most effective elements of advertising structures for the Russian-speaking audience are educed.

Keywords: inculcation, linguistics, advertising, sales, Russian language.

СУГГЕСТИВНАЯ ЛИНГВИСТИКА В РУССКОМ ЯЗЫКЕ КАК СРЕДСТВО УВЕЛИЧЕНИЯ ПРОДАЖ

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В данной статье раскрывается значимость знания особенностей языка для использования их в рекламе. Выявлены особенности русского языка и наиболее действенные элементы рекламных конструкций для русскоязычной аудитории.

Ключевые слова: внушение, лингвистика, реклама, продажи, русский язык.

Any language is a complex system of influence that has been formed throughout the history of humanity. Of course, words and phrases are important for a person's perception of information but also sound and rhythm have a great influence on the perception of this information that mostly influence on individual's subconscious.

"Suggestion is inculcation of an action directly in a fatal way so that it is impossible to deviate from the inculcation, and the instrument of this inculcation is a sign, a word" [1]. Applied suggestive linguistics allows you to create texts using special computer programs-editors that can affect subconscious and change personal relation.

Each language has its own unique characteristics. For example, Russian is a dextrocerebral language, and is mainly focused on emotions; English is a sinistrocerebral and quite logical language. Another important feature of the Russian language is the predominance of negative sounds. The fact is that historically people had to defend themselves from enemies and intimidate with hissing, wheezing or whistling them. As a result, the percentage of negative sounds in the Russian language reaches to 70 % [2]. We can say that creating advertisement is obligatory for companies to take in to account all this characteristics of consumers during products promotion on the Russian speaking market. Otherwise, there may be problems in perception. Advertising is usually much louder than the other content, it attracts attention, if person is against. If advertising

text is chosen incorrectly and sound is very loud it means the person may feel tired or have a headache later. And he may have a negative representation about the advertising. This negative image will be in subconscious. Eventually company can lose potential customers.

We can allocate some elements of the message construction in Russian language that can help increase influence on the consumer.

1. The concreteness and imagery of the using words and phrases. You should use only those words that are easily to imagine but you don't use too abstract concepts. Keywords should be similar in meaning to each other and also be understandable for each person. For example, the words: *eye*, *house*, *sour*, *sweet* are easily to imagine, they are familiar and understandable for everyone. At the same time, it is difficult to choose some associations for the words: *electorate*, *exclusive*, *communication*. Using these words confuses the consumer or this advertisement might be not interesting for him.

2. Effect of sound combinations. Some sounds and combinations can be associated with specific images or cause specific emotions. For example, the sound [i:] is often perceived as something small. And images that have this sound in their names will appear smaller. The sound [ɔ:] induces peace and relaxation, [ɑ:] and [e] can be associated with emotional charge.

3. The Russian word [*net*]. This word shouldn't be used in advertising. This word induces bad associations and negative emotions. The consumer feels to be pressured to do something, or the product is not effective and bad.

4. Indication of specific figurative qualities. It's necessary to use adjectives that form required images for the manufacturer and allow the consumer to figure the product to himself. For example, word *apple* should be described as a "ripe apple". If a person likes very sour apples, he thinks of a very delicious product.

5. Speech dynamics. The voice timbre is one of the most significant factors affecting a person. The lower voice is the most effective tone.

6. Phonosemantics. Phonosemantics is a part of linguistics which supposes that every sound has its own meaning. You can formulate the same idea in different ways, and it causes different emotions. For example, in Russian, the advertising slogan of the RitterSport chocolate sounds like [Kvadratish. Praktish. Gut]. In this example, phonosemantic synonyms provide a specified rhythm and latently affect the attitude of a potential buyer [3].

We have studied specifics of using linguistic techniques for the Russian speaking audience and suggest using them in creating advertising slogans and texts to promote products.

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POPULARIZATION OF MARKETING INTEGRATIONS INTO THE TIKTOK SOCIAL NETWORK

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This article lists aspects that reflect the specifics of the functioning of the algorithms by which marketers are able to promote their product on the TikTok social network.

Keywords: social networks, content, promotion, targeted advertising, algorithms, integration.

ПОПУЛЯРИЗАЦИЯ МАРКЕТИНГОВЫХ ИНТЕГРАЦИЙ В СОЦИАЛЬНУЮ СЕТЬ ТИКТОК

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В данной статье перечислены аспекты, которые отражают специфику функционирования алгоритмов, с помощью которых маркетологам удаётся продвигать свой продукт в социальной сети TikTok.

Ключевые слова: социальные сети, контент, продвижение, таргетированная реклама, алгоритмы, интеграция.

In realities of modern life, we deal with the marketing products from completely different companies in our daily routine. And it is no secret that their main task is to distinguish their own company from the rest to the consumer. But now we are going to talk about the social network, which name everyone knows, and which has not gone unnoticed by marketing specialists.

Currently, more and more people are using social networks. Many of them can no longer imagine their lives without them, spending hours and even days in it. We share our lives, send photos and just chat with friends. In other words, social networks have become a necessity and people are beginning to depend on them. Today's marketing experts are happy to take advantage of the new opportunity to promote products on social media.

They use a certain set of marketing communications for promotion. It consists of several main channels of interaction: public relations, Internet communications, advertising, sales promotion, personal sales, etc [1].

A marketer has the ability to create content, which will be distributed over the network by itself with people sharing this content with each other and, which, in turn, has more credibility than official advertising [2]. Consequently, potential buyers trust more to familiar or even unfamiliar people, being confident that this information is definitely true.

When using social networks as a promotion tool, marketers receive a large number of advantages, for example, targeted advertising, aimed at a very specific group of people who are interested in it [3]. Due to this, the company gets an almost entirely loyal audience that is interested in a particular product or service.

TikTok is an application that combines the functions of Instagram and Snapchat, which are popular social networks all over the world. Their only task is to create videos. Basically, they are clips, sketches or reactions to trends that are popular at the moment.

There are several features due to which TikTok is rapidly gaining popularity: the phenomenon of clip thinking, growing popularity of video content, short, entertaining and funny videos, that attract users from all over the world. Its main advantage is that whatever your social status is, absolutely any person can appear in Recommendations. The main element of interface in TikTok is the "Recommendations" feed. It shows the main trends, the most popular videos at the moment, current music, and so on. An important feature of this social network is that the platform itself promotes potentially interesting videos for the viewer into the feed based on algorithms. A person who has millions of followers and a user who recently got into a social network have the same chances to become popular. It all depends on the quality of the content and the response of the audience (likes, comments and views). Thanks to TikTok, any brand can contact with a huge active audience, which undoubtedly makes it a tool for marketers.

The algorithms of TikTok are very similar to the algorithms of Instagram but they are much better tailored. TikTok has a very well thought-out content response system. In fact, such system is not new, it has already been used on other platforms before. The essence, of course, is in likes, comments and reposts. However, in the past, the "I like" mark did not mean that you will get the necessary content next time. It is imperative to mention one more factor – the platform records the time spent watching the video. For an account to become popular, the videos must be watched till the end.

One of the main areas for TikTok is to run challenges. The mechanism of such actions is very simple. The user takes a certain song, adds certain hashtags, records a video, and these simple actions allow a person to get millions of likes. Brands use this method to increase their awareness, product recognition or to popularize it among the audience.

The second option is Topview. It is the easiest and least energy consuming method of all. When a user opens the mobile version of the application, he sees a static banner, gif or video that take up the entire screen of his smartphone. Adverts are easy to place, a company just buys them and creates an attractive picture. But there is a significant disadvantage – the average rate of following the links to third-party sites in this placement format is 15 %.

The third option is In-feed Native Video. This is a 15-second video clip that appears in the user's news feed or recommendations. All applications for advertising are considered manually within a few days.

The fourth option is collaboration with TikTokers [4]. One of the most famous and standard ways to place your ads is through blogger integration. It is the most important to pay attention not to the number of subscribers, but to the number of likes and views. The algorithms of this platform work in such a way that if a user likes one of the bloggers at least once, then new videos of this blogger will also be included in the user's recommendation feed.

All of the above may seem very promising and interesting, but, unfortunately, one needs to understand that this application is mainly used by people in the age group between 16 and 25 years old. Therefore, not everyone on this platform will become popular.

A professional lawyer may well shoot entertainment videos related to the world of law, thereby advertising their own brand. Still, one should not expect a deep understanding of the material from the audience. People are not in the habit of using social networks for educational purposes.

It should be noted that the world's largest brands paid attention to TikTok when it first appeared on the Internet. This makes it clear that brands of any level and with any focus should at

least try promotion through TikTok. And if a brand wants to gain recognition from the audience, they should put sales second and entertaining subscribers first.

In practice, the following conclusions were made: in two weeks a new account has the opportunity to collect an audience of about 1000 active users, views of videos range from 1000 to 35,000. But it should be noted that when creating content, all the rules, algorithms and restrictions of the platform were respected. It should be understood that this is only a personal profile, where the brand is the person himself. Well-known brands have much more potential.

TikTok has an active audience of 800 million people a day. As of 2019, 8 million people from Russia, aged 10-25, are actively watching videos. The number of users is growing every hour. It is a common myth that this social network is only suitable for children and adolescents. However, almost 57 % of users are over 18 years old. 20 % of them are 25- to 40-year-olds at whom most advertising is aimed. Yes, it is still in the minority, but in Russia 18 million people visit TikTok every month. TikTok fans in Russia visit the app about seven times a day, and the average time spent on TikTok is 40 minutes. In conclusion we can say that if brands want to take advantage of TikTok, they need to start doing it right now.

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MINIMALISM IN ADVERTISING AS A TOOL TO ATTRACT THE CONSUMER ATTENTION

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This article considers minimalism as an approach to the formation of the advertising product design to increase demand. In compare with to the motley variety of goods and services, the accompanying information noise the minimalism shows better result in advertising to create a certain image in the consumer mind.

Keywords: advertising, minimalism, perception, consumers, simplicity

МИНИМАЛИЗМ В РЕКЛАМЕ КАК ИНСТРУМЕНТ ДЛЯ ПРИВЛЕЧЕНИЯ ВНИМАНИЯ ПОТРЕБИТЕЛЯ

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В данной статье раскрывается минимализм как подход в формировании дизайна рекламного продукта для увеличения спроса. Минимализм выигрывает на контрасте с пестрым многообразием товаров, услуг, сопровождающего информационного шума, позволяет быстро и просто включить в сознание потребителя созданный образ.

Ключевые слова: реклама, минимализм, восприятие, потребители, простота.

Catchy, bright, flashy advertising from previous decade does not attract attention at all. It seems that such advertising should be sold, because it will be remembered by a potential buyer for its appearance: red color, huge letters, a large amount of information with the product characteristics. So why are people paying more attention to simple signs with a minimum of text and images now?

Minimalism can be called a creation of the twentieth century. This trend originally appeared as a protest against the pretentiousness, pomposity, whimsicality of modernistic creations. Minimalism is something about deleting all unnecessary things and focusing on the importance [1]. Otherwise, simplicity is always better. The attention of consumer is focused on a couple of pictures and lines, which produce a greater effect: it is easier for everyone to process and assimilate a short slogan.

The human brain has managed to adapt to flashy headlines and attention-grabbing colors. We do not notice how we ignore and do not keep in our mind a new way which manufacturers create to be impressed. Obviously, that advertising will be attractive for the consumer which is quite simple for perception. In compare with high volume, sharp changes in frames and the dynamics of what is

happening on the screen quiet sound, pastel simple colors, the most ordinary fonts – all this is new for the consumer perception system.

Insufficient philosophy study of minimalism leads to the incorrect use of this concept in advertising. Manufacturers often do not study the information enough, which often leads to failure. After research of Internet sources and books, you can identify the postulates of the minimalism concept:

1. Minimum sounds. It is advisable to completely abandon the sound, but if the sound is necessary in the development of advertising, it should cause a sense of peace and relaxation.

2. The main idea should contain two sentences. The best option is to make a slogan that will reproduce an individual response in the minds of the majority [2].

3. Using two contrasting colors. The consumer needs only two colors in order to perceive the essence of what they see, to extract the main idea and to understand the emotions depicted in the picture [3].

4. It is recommended to use flat simplified objects for fast processing of graphic information by the brain of a potential buyer.

5. It is always necessary to supplement the text with pictures in order to direct people's thoughts to a certain conclusion. The individual interpretation can sometimes fail the manufacturer. So, the additional slogans with visual information will protect the company from the duality of perception and misunderstanding of consumer's expectation.

Modern culture requires constant growth, development, a variety of forms and trends. The essence of minimalism is precisely to encourage consumer to start living more thoughtfully. In another way, minimalism is something about quality, not about quantity. With the beginning of minimalism in advertising, the consumer has re-learned to think deeply, using their individual perception of the world, moving smoothly from one important thought to another. As a fact the consumer perceives advertising unconsciously using minimalism as something fresh and more attractive.

In that way, we can conclude that the using of the minimalism concept in brand promotion implies that a long-term understanding of the concisely presented information allows you to fix it in the minds of individuals.

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THE EFFICIENCY OF USING RELIGIOUS THEMES IN ADVERTISING

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The usage of religious themes in an advertising campaign is discussed in this article. Efficiency and negative consequences of this approach are analyzed.

Keywords: advertising, religion, consumers, sales, provocation.

ЭФФЕКТИВНОСТЬ ИСПОЛЬЗОВАНИЯ РЕЛИГИОЗНОЙ ТЕМАТИКИ В РЕКЛАМЕ

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В данной статье рассматривается вопрос об использовании в рекламной кампании религиозной тематики. Проводится анализ эффективности и негативные последствия применения данного подхода.

Ключевые слова: реклама, религия, потребители, продажи, провокация.

Nowadays in an endless strive to increase sales organizations often use unconventional methods of influencing the consumer. These methods seem to be provocative. Religion is one of the cottage industries. Jesus Christ, monks and nuns, priests, icons, scenes from the Bible and the Gospel, and other popular objects related to the concept of Christianity, are often used in advertising. These advertising campaigns always cause the strongest public response [1]. The success of such advertising campaigns is formed on the basis of the following method: most people use some familiar images in an unconventional environment. Very often advertising agencies come up with provocative stories, which become the center of major scandals and legal proceedings in a very short time, thereby drawing attention to the campaign and the product.

An advertising campaign “Unhate” of the clothing brand Benetton, developed by the agencies Fabrica and 72andSunny, is a prime example [2]. One of the main promos of that advert demonstrated a kiss between the Pope Benedict XVI and the Imam of Egypt Ahmed al-Tayyib. This was caused an abrupt negative response from the general public and the Vatican. The brand was actively criticized and the society demanded to stop the advertising campaign because it hurt and offended the feelings of believers. As a result, Benetton had to apologize and stopped using that billboard in the advertisement which caused losing a lot of large contracts. But the main goal of the campaign was achieved. Sales were increased. At that time sales raised to multibillion-dollar figures which proves the effectiveness of using such an advertising strategy. But success was temporary and analyzing the subsequent company activities can demonstrate a constant declining of any

indicators [3]. Thus, it becomes obvious that any organization that uses such a method to increase its own popularity in the market takes certain risks.

Using religious concepts in advertising campaigns may seem a very simple way to attract customers. This promotion is always provocative and challenging. It guarantees an increase of interest to the product. An organization gets impressive sales in a short time with minimal costs. This provocation seems to be an ideal advertising strategy. But it also has serious disadvantages:

1. Brand reputation deteriorates. In the modern world, this situation can lead to serious problems with the external environment: suppliers, resellers, and the loss of advertising contracts or some sales markets.

2. In some countries, such advertising can cause problems with the law. For example, in the Russian Federation, there is a law which provides various sanctions for hurtful religious feelings: from a fine to imprisonment [4].

3. The interest in the organization's products can be maintained in isolated cases. Most consumers who purchase a product in the face of hype or a brand scandal do not become regular customers. Their behavior can be described as impulsive. Such a phenomenon makes sustainability impossible. Any organization should strive for stable development.

So, the use of religious themes in advertising can be called a fairly effective way to increase sales. If a company uses such an advertising strategy, it can achieve impressive results at minimal costs, but only if the advertising campaign has a certain provocation, which can cause a stir around the brand and its goods. It must be remembered that it is impossible to repeat such success and the consequences can lead to the ruin or closure of the company. This advertising strategy is the best option for companies that are not going to exist in the market for a long time, so called "one day" companies.

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THE DEVELOPMENT OF INTERACTION BETWEEN RUSSIAN AND ENGLISH FICTION IN THE XIX – XX CENTURIES

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Despite political differences, Russian and British cultures constantly overlap. Russians have always been interested in British authors, and Britons have shown a similar interest in Russian authors. The article raises the issue of the relationship between Russian and British literature and their influence on each other. The importance of the translation of a work into the target language is discussed. Also considered are such great authors as William Shakespeare, Alexander Sergeevich Pushkin, Fyodor Mikhailovich Dostoevsky, John Ronald Reuel Tolkien, Charles Dickens and Lev Nikolaevich Tolstoy.

Keywords: United Kingdom, Russia, literature, cultural interaction, translation.

РАЗВИТИЕ РУССКО-АНГЛИЙСКИХ СВЯЗЕЙ В ХУДОЖЕСТВЕННОЙ ЛИТЕРАТУРЕ НА РУБЕЖЕ XIX – XX СТОЛЕТИЙ

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Несмотря на политические разногласия, русская и британская культура постоянно пересекаются между собой. Россию всегда интересовали британские авторы, а Великобританию – русские. В статье поднимается вопрос о взаимосвязи и взаимовлиянии друг на друга русской и британской литературы. Обсуждается важность перевода иностранного произведения на язык страны. Также рассматриваются замечательные авторы такие как: Уильям Шекспир, Александр Сергеевич Пушкин, Фёдор Михайлович Достоевский, Джон Рональд Руэл Толкин, Чарльз Диккенс, Лев Николаевич Толстой.

Ключевые слова: Великобритания, Россия, литература, взаимодействие культур, перевод.

The relationship between Russia and the United Kingdom has existed for a long time. Their influence on each other is obvious. Russia is constantly interested in the activities of the United Kingdom, and it, in turn, takes an active interest in Russia. There are a number of similarities between these two countries, and these are expressed to a large extent in literature and written art forms.

One of the most famous British writers is William Shakespeare. His works have been translated into many languages of the world, and Russian is no exception. Shakespeare's most popular works are *Romeo and Juliet*, *Othello* and *Hamlet*. At school, his works are included in the

literature curriculum, and his plays are staged at theatres. All Shakespeare's works are about how to be human and interact with other people, and about the relationship between the state and citizens. He wrote about the people themselves, which is why his works are so well liked among Russians, and they will continue to live forever [1].

The English playwright was immensely popular among writers, one of whom was Alexander Sergeevich Pushkin. He did not blindly follow the literary fashion; on the contrary, so-called "Shakespeareanism" became something significant for the poet. It showed worldview issues. Under the influence of the English playwright, Pushkin formed a view of history and of people as a whole. The main features of Shakespeare's style were objectivity and characters close to reality, as well as a "faithful depiction of time" [1].

Another great British writer is John Ronald Reuel Tolkien, who the Russian people fell in love with for his unusual approach to writing. In his works, the author created a whole world filled with magical creatures such as gnomes, elves, hobbits, orcs and others. Their images are still used in books, films and games. It was Tolkien who popularized the fantasy genre. One main feature of his writing was the creation of languages. Some of his most popular works are *The Lord of the Rings* and *The Hobbit, or There and Back Again*.

British sentimentalism and common sense, as well as British ambition, individual freedom and traditionism are all things that capture the attention of the Russian people. The comparison of Russia with the United Kingdom is becoming one of national self-awareness. In addition, through British literature, English customs were brought to Russia. They provided writers with artistic insights into topical issues.

The British people were interested in Russian realism, filled with a constant search for an objective image of the truth, a breadth of lifestyles, national character, democracy and humanism of ideological content. Russian classical works attracted the attention of the British for their genre originality, mastery of plot compositions and originality in descriptions of nature [2].

The compulsory list of literature of an educated person in the United Kingdom includes the works of Fyodor Mikhailovich Dostoevsky *Crime and Punishment* and *The Brothers Karamazov*. These works were among the first to be translated in the country [3].

Dostoevsky became a very famous writer in the West, especially in the United Kingdom and Germany. As soon as British writers gained access to quality translations, they began to analyse his work in more detail. They noticed similarities between the two authors Charles Dickens and Fyodor Mikhailovich Dostoevsky. In fact, the English writer was one of Dostoevsky's most important reference points. The work of the Russian thinker influenced British literature and outlined a trend in the development of an intellectual, dramatic and psychological novel [3].

Leo Nikolayevich Tolstoy considered the Maudes, a married couple, to be among his best British translators. However, other translators also worked on his writing. Such works as *War and Peace*, *Childhood* and *Boyhood* gained the greatest popularity in the United Kingdom [4].

The author evoked an ambiguous attitude among the British people. Their interest in his fate was traced in the pages of newspapers and magazines of that time, and this was especially true of the last days of Tolstoy's life. In any event, he was considered a "great writer". His work was highly appreciated by James Joyce. He admired the absence of excessive seriousness and monotony in the works of the Russian author. Bernard Shaw also respected Tolstoy. He saw in him an ally in the fight against hypocrisy, militarism and capitalism. In addition, John Galsworthy generally considered him an important writer in his life. He celebrated his humanism, style and language [4].

The popularity of a foreign work depends not only on the skill of the writer, but also of the translator. Thus, the work of the translator Constance Garnett led to a special influence of Russian literature on British literature. This was largely thanks to a desire to translate the entire main body of Russian literature and to find a place for it among British authors. Russian creativity has had a tremendous impact on the literary and intellectual life of the British people. This period is considered to be "long modernism". The impact of Russian literature on British literature consisted not only in borrowing, but also extended to the concept of modernism [5].

Throughout the life of a rational society, the United Kingdom and Russia have interacted with each other and exerted a certain influence on each other. Many Russian writers became the intermediaries of William Shakespeare. He brought his philosophy to society and brought theatrical performances to a new level. In his time, Tolkien popularized fantasy, creating such images as hobbits, orcs, dwarves, elves and others. These images are still used by society for this genre. Dostoevsky's work significantly influenced British literature, creating a trend in the development of an intellectual, dramatic and psychological novel. Many writers respected Tolstoy, and for some he was a companion. However, the key to the high popularity of many works written by foreign authors was a high-quality translation into the language of the country.

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INFLUENCE OF PSYCHOLOGICAL FACTORS ON MANAGEMENT DECISION MAKING

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The article examines the psychological aspects of such a process as making management decisions in an organization. The psychological types of leaders in decision-making, classification and their features are highlighted.

Keywords: psychological aspects of decision-making, management, leader, organization, effective decisions.

ВЛИЯНИЕ ПСИХОЛОГИЧЕСКИХ ФАКТОРОВ НА ПРИНЯТИЕ УПРАВЛЕНЧЕСКИХ РЕШЕНИЙ

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В статье рассматриваются психологические аспекты такого процесса как принятие управленческих решений в организации. Выделены психологические типы руководителей при принятии решений, классификация и их особенность.

Ключевые слова: психологические аспекты принятия решений, управление, руководитель, организация, эффективные решения, личность.

In the modern world there is a huge number of different organizations that are engaged in production of certain goods and services. All these organizational structures are connected by one thing, effective management. Can we talk about effective management without taking into account the influence of psychological factors?

In order to fully understand the importance of the influence of psychological factors on decision-making, it is necessary to understand how this management decision will affect the staff, the organization and its image, which is why the psychological aspect is one of the most important factors in decision-making, because we work with people and without their support, the organization will not be able to develop further and expand its influence.

The main factors influencing management decision-making are features of thinking; motivation of the LPR; personal characteristics; business qualities of the LPR; values and attitudes of the LPR that underlie its priorities; ethical principles that this manager adheres to.

Each manager has his own management style, experts distinguish five main psychological types of managers when making managerial decisions.

1. The rational type. This type of manager is characterized by a complete study of the stages of the management decision, as well as its detail.

2. Pragmatic type. The leader of this type is dominated by strong-willed decisions based on common sense and intuition.

3. Complexive type. This type is characterized by the behaviour of indecision in decision-making, because of which decision-making can be delayed, or change, depending on the psychological state of the manager.

4. Intermediary type. For this type of management decisions are less strict and straightforward, this type is inherent in listening to the opinion of the staff.

5. Heuristic type. It is based on a strong belief in a new idea [1].

Decision-making is also related to the manager's temperament. This affects not only his business communication, but also management decision-making, in turn, for example:

1. Choleric prefers speed and efficiency in decision – making. Also, he prefers to solve his problems alone.

2. Sanguine, like a choleric type, prefers speed in making decisions, but decisions are made on the basis of collective discussion, rather than individually.

3. Phlegmatic as a manager spends more time on development of a plan and strategy of a management decision than on its implementation.

4. Melancholic spends a lot of time on a qualitative analysis of a plan for implementing a management decision, taking into account all the pros and cons [1].

Temperament, personal qualities of a person and other insignificant factors can influence a manager and force him to make a wrong decision, which can have an indelible effect on the organization and its employees. It is necessary to realise that if a manager has not established good business relations with his subordinates, then cannot rely on them in case of trouble.

Good business environment at workplace will be provided only if a manager or LPR creates a psychologically comfortable, pleasant place for work. Only in such an environment is it possible to further develop employees' skills and company's prosperity. And even if a manager makes a wrong decision, employees of the organization will support him and provide maximum assistance in problem solving. Such attitude will ensure maximum productivity, which will have a positive impact on the organization [2].

Management decision-making is a key part in any management function. The need to make a decision concerns everything that is under the control of a manager, forming tasks and ways to achieve a goal. Every manager needs to understand the psychological importance of the decision-making aspect in order to succeed in the art of management and effectively manage people [3].

As a result, it should be noted that although many people do not consider psychological factor one of the most important when making any decisions, but manager needs to understand that he works with real people who have feelings and private life that he should respect. Therefore, creating a comfortable work climate is a key task for a manager, and creating such a climate, in turn, is impossible without considering psychological factors.

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Wissenschafts- und Forschungsarbeiten auf Deutsch

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ANWENDUNG VON 3D-DRUCKERN IN DER RAKETEN – UND RAUMFAHRTTECHNIK

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Der Artikel beschreibt die Möglichkeit des Einsatzes von 3D-Druckern in der Raketen- und Weltraumtechnologie. Ein 3D-Drucker ist ein spezielles Gerät für die Ausgabe von dreidimensionalen Daten. Im Gegensatz zu einem herkömmlichen Drucker, der zweidimensionale Informationen auf einem Blatt Papier ausgibt, können Sie mit einem 3D-Drucker dreidimensionale Informationen ausgeben, das heißt bestimmte physische Objekte erstellen. Die Technologie des 3D-Drucks basiert auf dem Prinzip der geschichteten Erstellung (Anbau) eines festen Modells. Druckern.

Suchbegriffe: der 3D-Drucker, die Luft-und Raumfahrtindustrie, die Herstellung, der Weltraum, drucken, die Technologien.

ПРИМЕНЕНИЕ 3D-ПРИНТЕРОВ В РАКЕТНО-КОСМИЧЕСКОЙ ТЕХНИКЕ

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В статье рассматривается возможность применения 3D-принтеров в ракетно-космической технике. 3D-принтер – это специальное устройство для вывода трёхмерных данных. В отличие от обычного принтера, который выводит двумерную информацию на лист бумаги, 3D-принтер позволяет выводить трехмерную информацию, т.е. создавать определенные физические объекты. В основе технологии 3D-печати лежит принцип послойного создания (выращивания) твердой модели.

Ключевые слова: 3D-принтер, ракетно-космическая техника, производство, космос, печать, технологии.

Der Vater des 3D-Druckes ist ein US-amerikanischer Erfinder und Ingenieur *Chuck Hull*. In 1986 legte er der Welt sein 3D-Druckgerät, das er "die Anlage für Stereolithografie" nannte, vor. Später 1988 erfand er absolut neue Technologie der Arbeit mit dem 3D-Druck: FDM = *Fused Deposition Modelling* (deutsch: Schmelzschichtung – die Modellierung mittels der Dekomposition des schmelzenden Stoffes). Heute arbeiten alle 3D-Drucker auf der Grundlage dieser Technologie, die für die kleine Anzahl der Produktion bestimmt sind.

Bis 2008 konnte beliebiger 3D-Drucker nur mit der Nutzung einer Art des Ausgabestoffes – des Kunststoffes ABC arbeiten. Aber die Firma *Objet Geometries Ltd.* entwickelte den Drucker *Connex500*, der mit verschiedenen Stoffarten gleichzeitig arbeiten kann. Heute kann solche Stoffe benutzen: Acryl, Beton, Gips, hölzerne Faser, Metallpulver, Nylon, Schokolade usw.

Der 3D-Druck wird aktiv im Raumfahrtzweig für die Herstellung der Prototypen, Ausstattung und Einzelteile der Triebwerke benutzt. Seine Verwendung lässt die Produktion verbilligen, die Betriebskennlinien erhöhen, und auch die Herstellungszeit einzelner Erzeugnisse bedeutend verringern. So, eine Firma schloss den Vertrag für die Herstellung des Raketentriebwerkes RS-25, dessen Einzelteile mit dem 3D-Drucker hergestellt sein werden. Die Produktion eines Bauelementes könnte halbes Jahr in Anspruch nehmen; der 3D-Druck ließ die Friste und Kosten verringern, den Produktionsprozess der Prototypen bedeutend beschleunigt. Andere amerikanische Firma begann die erste Station für die Umlaufstare in Neuseeland zu bauen. Gerade von da wird geplant, die erste in der Welt Rakete, deren Sauerstoff-Kohlenwasserstofftriebwerk vollständig mit dem 3D-Drucker gedruckt ist, zu starten.

Die Liste wäre nicht voll ohne Geschäftsmann und Konstrukteur Elon Musk. Sein Unternehmen führte erfolgreiche Erprobungen der mit dem 3D-Drucker gedruckten Triebwerke *Super Draco*, die im Raumschiff *Dragon* benutzt werden, durch; es arbeitet auch an dem Schubsystem *Raptor Rocket*. Die additiven Technologien werden auch in den zukünftigen perspektivischen Projekten verwendet. NASA benutzt fortgeschrittene Methoden bei der Vorbereitung von Mars-Mission: der 3D-Druck wird für die Herstellung der Prototypen, die Produktion der Einzelteile im Weltraum und sogar für die Fertigung der Komponenten des zukünftigen Raumschiffes, das zum Mars gestartet wird.

Der Raumfahrtzweig Russlands begann auch den 3D-Druck einzuführen. So der einzigartige heimatliche 3D-Drucker „*Router 3131*“ mit dem großen Druckfeld steht der Korporation „*Roskosmos*“ zur Verfügung. Er wird die Teile der Raumschiffe erzeugen. 2016 wurde der kleine Satellit „*Tomsk-TPU-120*“ an der Polytechnischen Universität Tomsk erarbeitet. Bei der Herstellung des Gerätes benutzten die Wissenschaftler und die Studenten aus dieser Universität die additiven Technologien – das Gestell und die meisten Hauptteile wurden mit 3D-Drucker gedruckt. Am 31. März 2016 verließ der 3D-Satellit die Erde und blieb auf der Umlaufbahn. Die Raumstation „*Yunona*“ von NASA ist auf die Umlaufbahn von Jupiter eingetreten. Dieses Ereignis ist auch für den 3D-Druck wichtig, weil „*Yunona*“ das erste Raumschiff mit den mit 3D-Drucker gedruckten Teilen – mit Titan-Wellenleiter-elementen ist.

Die Kosmonauten, die sich auf der Umlaufbahn befinden, haben oft nicht alles Notwendiges und warten auf die Frachten, die zur internationalen Raumstation während der planmäßigen Flüge gebracht werden. Leider während dieser Zeit ist das Raumschiff gegen die Unfälle und die Brüche der wichtigen Systeme nicht gefeit. Die Experimente mit dem 3D-Druck im Weltraum geben eine Möglichkeit, die notwendigen Ersatzteile auszudrucken, wenn irgendwelche Elemente mangelhaft werden sein. Das ist für die zukünftigen Missionen zum Mars und anderen Planeten sehr wichtig: eine lange Zeit werden die Kolonisten keine Hilfe von der Erde nicht bekommen, deshalb ist es in den bevorstehenden Expeditionen außerordentlich wichtig, alle vorhandenen Möglichkeiten für die Herstellung der Einzelteile an Bord von Raumschiffe und Raumstation zu verwenden. In der internationalen Raumstation werden solche Experimente seit 2014 durchgeführt. *Roskosmos* entwickelt auch ein ähnliches Projekt. Das Experiment mit dem Namen „3D-Druck“ muss die Möglichkeit der Nutzung des 3D-Druckers bei der Abwesenheit der Gravitation bestätigen. Dieses Gerät wurde in der polytechnischen Universität Tomsk geschaffen und mit den Ingenieuren der

Raumfahrtgesellschaft „*Energia*“ vereinbart. Zur Raumstation wird der Drucker 2021 geschickt werden.

Es ist bekannt, dass es im freien Weltraum die elektromagnetische Strahlungsradiation gibt, die die schädliche Einwirkung auf die biologischen Gewebe hat. Damit der Kosmonaut alle Schwierigkeiten des Fluges überleben kann, ist es nötig nicht nur den Schutz des Schiffes vorzusehen, sondern auch die gute Krankenversorgung. Und wenn die nicht helfen wird, dann muss man an den Ersatz irgendwelcher Organe denken. Deshalb vereinbarte die Russische Vereinigte Raumfahrtgesellschaft das Experiment für die Nutzung des 3D-Biodruckers in der Internationalen Raumstation. Sein Hersteller ist das russische Labor *3D Bioprinting Solutions*, das auf den Technologien des Biodrucks spezialisiert wird. Die Wissenschaftler hoffen darauf, dass es mit der Hilfe des magnetischen Biodruckers möglich wird sein, im Weltraum die Gewebe und Organen zu schaffen. Das Gerät wird zur ISS zum Jahr 2022 gebracht werden. Es gibt keine ähnlichen Projekte im Ausland.

Eines der Hauptprobleme bei der Errichtung der Gebäude auf den extraterrestrischen Objekten ist die begrenzte Anzahl oder das Fehlen der Baustoffe. Es gibt nur einen verfügbaren Rohstoff, den man von unserem Planeten nicht transportieren muss: das sind lokale geologische Gesteine. Es ist kein Wunder, dass die Wissenschaftler beabsichtigt sind, sie bei der Errichtung der Gebäude zu nutzen. Es handelt sich um den Prozess der additiven Produktion aus den speziellen Stoffen, die den Mond- und Marsregolith imitieren. Es sind die festen und elastischen Stoffe, die mit der Ausnutzung der pulverförmigen Substanzen erzeugt werden. Diese Substanzen sind den Gesteinen von der Mond- und Marsoberfläche ähnlich. *Wjatscheslaw Bobin* (der Chef des Zentrums des Studiums der natürlichen Stoffe beim Institut der komplexen Erschließung des Inneren von Russischer Akademie der Wissenschaft) meint, dass der Bau der Siedlungen auf dem Mond keine phantastische Perspektive ist. Das neue russische Programm der Erschließung des Mondes kann die Bedingungen für den Bau einer Niederlassung mit Hilfe 3D-Druck gewährleisten.

Die 3D-Druckausrüstung machte große Entwicklung durch. Die Stelle der großen Werkbänke nahmen die kompakten Tischdrucker mit verschiedenen Arbeitsweisen ein. Die Experten prophezeien den 3D-Druckern die glänzende Zukunft für die Raumfahrt, z.B. die mit dem 3D-Drucker gedruckten Raketentriebstoff oder Raumfluganzug. Mit der Zeit kann jeder Mensch, ohne das Haus zu verlassen, für sich ein Schuhpaar, das Kaffeeservice, Spielzeuge für das Kind oder Lieblingsessen drucken.

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LEBENSICHERHEIT ALS WERTVOLLE KOMPONENTE DER KULTUR VON STUDENTEN MIT BEHINDERUNGEN

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Der Artikel zeigt die Wertkomponente der Bildung einer Kultur der Lebenssicherheit bei Studierenden mit Behinderungen im Hinblick auf die Berufsausbildung auf. Die Studie besteht darin, die Zusammensetzung der Komponenten für die Bildung einer Sicherheitskultur von Studierenden mit Behinderungen zu ermitteln, die aus mehreren miteinander verbundenen Komponenten besteht: motivierend, informativ, kognitiv, kommunikativ und reflektierend.

Suchbegriffe: Lebenssicherheitskultur, Studierende mit Behinderungen, inklusive Bildung, Berufsausbildung.

БЕЗОПАСНОСТЬ ЖИЗНЕДЕЯТЕЛЬНОСТИ КАК ЦЕННОСТНАЯ СОСТАВЛЯЮЩАЯ КУЛЬТУРЫ ОБУЧАЮЩИХСЯ С ОГРАНИЧЕННЫМИ ВОЗМОЖНОСТЯМИ ЗДОРОВЬЯ

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В статье раскрывается ценностная составляющая формирования культуры безопасности жизнедеятельности у студентов с ограниченными возможностями здоровья в условиях профессиональной подготовки. Проведенное исследование заключается в выделении компонентного состава формирования культуры безопасности студентов с ограниченными возможностями здоровья, состоящий из нескольких взаимосвязанных составляющих: мотивационного, информационного, когнитивного, коммуникативного и рефлексивного.

Ключевые слова: культура безопасности жизнедеятельности, студенты с ограниченными возможностями здоровья, инклюзивное образование, профессиональная подготовка.

Die Bildung einer Lebenssicherheitskultur hat die Eigenschaft der «Universalität» und ist ein Phänomen, das notwendigerweise in allen Bereichen des menschlichen Lebens ausnahmslos als integraler Bestandteil seines Verhaltens, der kompetenten Tätigkeit eines Spezialisten und Teil der Kultur vorhanden ist als Grundlage sozialer Normen und Werte.

Die Kultur der Lebenssicherheit spielt eine wichtige Rolle in den modernen Bedingungen des sozioökonomischen Lebens, die durch ein hohes Maß an Komplexität, Unvorhersehbarkeit, Unsicherheit und Inkonsistenz gekennzeichnet sind. Unter diesen Bedingungen stimuliert die Kultur der Lebenssicherheit die subjektive Bereitschaft, die Fähigkeiten (Kenntnisse, Fähigkeiten, Fertigkeiten und persönlichen Qualitäten) der Person zur sicheren Verwirklichung ihrer selbst im

Alltag und im beruflichen Umfeld zu nutzen. In diesem Zusammenhang wird die Tätigkeit des Lehrers durch das Niveau von Kultur, Wissen, Wertorientierungen, Stereotypen des Bewusstseins, Verhaltens bestimmt und ist einer der wichtigsten Bestandteile des pädagogischen Prozesses bei der Bildung einer Kultur der Lebenssicherheit, des Inhalts und des Lebens Form, die die Rolle und den Platz der Studenten in der Welt um ihn herum vorbestimmt [2].

In den Werken berühmter Wissenschaftler Yu. L. Vorobyova, L. N. Gorina, N. A. Lyz, I. N. Die deutsche Lebenssicherheitskultur wird als ein Prozess der Vorbereitung auf sichere Aktivitäten durch Bildung gesehen; G. A. Kalacheva, V. N. Moshkina – durch Bildung; EIN V. Budanova – Ausbildung. Aufgrund der Tatsache, dass der pädagogische Prozess unweigerlich mit der Bildung einer Kultur der Lebenssicherheit verbunden ist, die neben dem Wissen auch Ideale der Welt, einen gesunden Lebensstil, moralische Werte und die Erfahrung der Kommunikation mit anderen Menschen umfasst Motive persönlicher Aktivität, in unserer Forschung verwenden wir das Konzept der «Bildung» als das am besten geeignete für die untersuchten. Diese Elemente der Kultur werden von den Studenten während des Studiums der allgemeinen Berufsdisziplinen beherrscht und auch als Prinzip verwendet, das sich an der Bildung ihres sicheren Lebens orientiert [1].

Berühmte pädagogische Persönlichkeiten L.N. Makarova und I.N. Nemkova definiert es als eine integrative, dynamische Bildung auf Strukturebene, die zur sicheren und kreativen Selbstverwirklichung im Prozess der Persönlichkeitsaktivität beiträgt [4]. Gleichzeitig wird die Bildung einer Kultur der Lebenssicherheit von den Autoren als strukturelle Entwicklung und Integration der persönlichen Qualitäten und Fähigkeiten der Schüler in das Leben betrachtet, als konstruktive qualitative Transformation der inneren Welt, die zur Möglichkeit führt der sicheren, kreativen Selbstverwirklichung bei jeder Tätigkeit im Klassenzimmer in allgemeinen Berufsdisziplinen; Yu. L. Vorobiev, V. N. Moshkin repräsentiert die Kultur der Lebenssicherheit als eine Methode zur Neutralisierung der Gefahren der modernen Gesellschaft durch die Ausbildung der notwendigen menschlichen Qualitäten, die seinen Aktivitäten zugrunde liegen [3].

Im Verlauf der Analyse des oben genannten Materials werden wir unter der Kultur der Lebenssicherheit in unserer Studie die strukturelle Ausbildung im Klassenzimmer in allgemeinen Fachdisziplinen verstehen, was zu einem konstruktiven Verhältnis zukünftiger Fachkräfte zur Umwelt beiträgt Grundlage der ständigen Selbstverbesserung und der Fähigkeit, im Lebensprozess intellektuelle, informative, gesellschaftspolitische, energetische und andere Interaktionen mit den natürlichen, technogenen und anthropogenen Bereichen einzugehen.

Eine vollständige Betrachtung eines Objekts ist unmöglich, ohne seine Struktur zu identifizieren. Die Hauptkomponenten der Bildung einer Kultur der Lebenssicherheit der Schüler sind der Rahmen für den Aufbau eines pädagogischen Modells, in dem die Prinzipien der Organisation und Funktionsweise eines Lehrers im Klassenzimmer in allgemeinen Berufsdisziplinen reproduziert werden. Das Design dieser Komponenten wird uns als theoretische Verallgemeinerung vorgestellt, die es uns ermöglicht, eine einzelne Struktur zu erstellen, die die Komponenten des untersuchten Potentials und ihre Verbindungen widerspiegelt.

Als strukturelle Komponenten der Kultur der Lebenssicherheit von Studierenden mit Behinderungen beim Besuch der Disziplin «Lebenssicherheit» haben wir folgende Komponenten bezeichnet: kognitiv, aktiv, valeologisch, kommunikativ, axiologisch, auf verschiedenen Ebenen gebildet.

In Übereinstimmung mit den hervorgehobenen strukturellen Komponenten der Kultur der Lebenssicherheit von Studenten, unter Berücksichtigung der angegebenen Anforderungen und unter Berücksichtigung der Vielfalt der Aktivitäten von Studenten, haben wir die folgenden Kriterien definiert: Wissen, Fähigkeiten und Fertigkeiten, Gesundheit, Kongruenz, Werte.

Die Offenlegung des Wesens und der Notwendigkeit der strukturellen Komponenten der Lebenssicherheitskultur sollte mit der kognitiven Komponente beginnen. Wissen dient der Entwicklung, Bildung eines Menschen und ist eine Voraussetzung für seine Teilnahme an verschiedenen Ereignissen und Umweltphänomenen. Das Kriterium für die Bildung der Aktivitätskomponente sind Fähigkeiten und Fertigkeiten, Indikatoren: Einsatz von Methoden zum Schutz vor Gefahren unter modernen Bedingungen; Streben nach kreativer Selbstverwirklichung in

ihren eigenen Aktivitäten; die Fähigkeit des vorausschauenden Sehens und die Schaffung von Schutzmechanismen, die eine minimale Wahrscheinlichkeit möglicher Gefahren voraussetzen. Das Kriterium für die Bildung der valeologischen Komponente ist die Gesundheit mit Indikatoren wie: der spirituellen Komponente eines gesunden Lebensstils (HLS) (der Fähigkeit, externen und internen Störungen zu widerstehen); die körperliche Komponente eines gesunden Lebensstils (körperliche Aktivität, Verhärtung); die Fähigkeit, grundlegende soziale Funktionen zu erfüllen. Das Kriterium für die Bildung der Kommunikationskomponente ist die Kongruenz in der Kommunikation (aus dem Lateinischen «congruen», «ntis» – Korrespondenz, Kompatibilität, Zufall), deren Indikatoren sind: Besitz verbaler und nonverbaler Kommunikationsmittel; das Bedürfnis nach Kommunikation; Anpassungsfähigkeit. Das Kriterium für die Bildung der axiologischen Komponente sind Werte als besonderes soziales Phänomen von positiver Bedeutung für die Aktivitäten von Menschen mit Indikatoren wie: Empathie; moralische Einstellungen (Freundlichkeit, Aufrichtigkeit, Toleranz); soziale Position.

Auf der Grundlage eines integrierten Ansatzes, der auf einem Verständnis der Vorbereitung von Fächern des Bildungsprozesses auf ein sicheres Leben basiert, haben wir die strukturellen Komponenten, Kriterien und Ebenen der Bildung der Kultur der Lebenssicherheit von Schülern der Sekundarstufe II festgelegt. Nämlich: die Organisation des Prozesses und das Ergebnis der Schaffung kultureller Werte der professionellen und kreativen Selbstverwirklichung des Lehrers und Schülers.

Grundlage der Studie war die staatliche autonome Berufsbildungseinrichtung der Samara-Region «Togliatti sozio-pädagogische College». Die Bildungsorganisation führt Bildungsprogramme für die sekundäre Berufsbildung durch, einschließlich angepasster Bildungsprogramme für Menschen mit Behinderungen und Menschen mit Behinderungen. Das College erhielt eine unbefristete Lizenz Nr. 4443 vom 19. April 2012 (Akkreditierung Nr. 1838-12 vom 5. Juni 2012) für das Recht zur Durchführung von Bildungsaktivitäten.

Die staatliche autonome Berufsbildungseinrichtung der Region Samara «Das sozialpädagogische College Togliatti» belegt nach den Ergebnissen der Überwachung der Wirksamkeit der Berufsbildungsorganisationen der Region Samara unter 62 Bildungseinrichtungen in der Region den 2. Platz. Das College hat 1536 Studenten: Vollzeitausbildung – 529, Teilzeitausbildung – 904, Vollzeitausbildung für Menschen mit Behinderungen – 103 Studenten. Laut den Forschungsergebnissen sind 80 % der College-Absolventen beruflich darauf ausgerichtet, in ihrem Fachgebiet zu arbeiten.

Die Ausbildung von behinderten Menschen und Menschen mit Behinderungen an der sozialpädagogischen Hochschule erfolgt sowohl inklusiv als auch in getrennten (Fach-) Gruppen. Um die Verfügbarkeit der beruflichen Bildung sicherzustellen, werden Fernlernetchnologien eingesetzt. Der Einsatz von Fernlernetchnologien führt zu einer deutlichen Erhöhung der Verfügbarkeit von Bildung für solche Schüler. Gleichzeitig ist anzumerken, dass der derzeitige Entwicklungsstand der Fernunterrichtstechnologien es ermöglicht hat, die Wirksamkeit eines solchen Trainings dem üblichen Vollzeit-Training näher zu bringen.

Das College verfügt über einen Sinnesraum, der sensorische Prozesse und Psychoentspannung stimulieren und Störungen im Bereich des emotionalen Willens überwinden soll. Ein günstiges Bildungsumfeld bietet ein System von Freizeit-, Kultur- und Ausflugsaktivitäten, die eine zusätzliche Integrations- und Rehabilitationsfunktion haben.

An dem Experiment nahmen 62 Studenten des I-Kurses teil. Im Verlauf des Experiments wurde eine Versuchsgruppe ausgewählt – 25 Studenten, die während der Schulzeit ein Lebenssicherheitstraining absolvierten. Dabei war die Entwicklung einer Lebenssicherheitskultur einer der Hauptfaktoren für die Bildung von Kenntnissen und Fähigkeiten in der allgemeinen Berufsdisziplin; die Kontrollgruppe – 27 Studenten, die in der Unterrichtszeit in diesem Fach geschult wurden, wobei die Bildung einer Kultur der Lebenssicherheit durch Unterrichtsaktivitäten gemäß einem Standardarbeitsprogramm erfolgte.

Um im Ermittlungsexperiment den Bildungsgrad der kognitiv-semantischen Komponente der Lebenssicherheit der Studierenden zu bestimmen, wurde ein Fragebogen durchgeführt. Jede

richtige Antwort wurde auf 3 Punkte geschätzt. Die Anzahl der erzielten Punkte gab den Grad der Bildung der kognitiven Komponente an (24-30 Punkte – ein hohes Niveau; 15-21 Punkte – ein durchschnittliches Niveau; 3-12 Punkte – ein niedriges Niveau).

Die erhaltenen Daten zeigten, dass 60,30 % der Studenten einen geringen Grad an Bildung der kognitiven Komponente hatten, 23,74 % – mit den vorgeschlagenen Aufgaben auf einem durchschnittlichen Niveau fertig, 5 % der Studenten hatten einen hohen Grad an Bildung der kognitiven Komponente.

Die Ergebnisse des Ermittlungsexperiments weisen auf eine überwiegend geringe Bildung der kognitiven Komponente der Lebenssicherheit bei Studierenden mit Behinderungen im College hin. Bei der Implementierung des Modells zur Bildung einer Kultur der Lebenssicherheit von Studenten in der Versuchsgruppe gab es jedoch einen positiven Trend: Die Anzahl der Probanden mit mittlerer und hoher Bildung der kognitiven Komponente stieg um 9 % bzw. 10 %.

Die erhaltenen Daten zeigten signifikante positive Veränderungen bei den Probanden der Versuchsgruppe, die dementsprechend das allgemeine Bildungsniveau der Kultur der Lebenssicherheit unter den Studenten im Allgemeinen beeinflussten.

Als Ergebnis der Studie wurde die Bildung der axiologischen Komponente der Lebenssicherheit festgestellt, die bei den Studenten, aus denen die Versuchsgruppe besteht, aufgezeichnet wurde. Die Analyse zeigte, dass in dieser Gruppe die Anzahl der Probanden mit einem hohen Grad an Bildung der axiologischen Komponente um 8,9 % zunahm, während in der Kontrollgruppe – um 0,6 %; Die Anzahl der Probanden in der Versuchsgruppe mit einem geringen Anteil der axiologischen Komponente nahm in der Kontrollgruppe um 30,1 % ab – um 1 %.

So war die gezielte Ausbildung der Studierenden in Lebenssicherheit, die Bildung von Fähigkeiten und ihre praktische Anwendung effektiv, und die entwickelte Struktur zur Bildung einer Sicherheitskultur unter Studierenden in einer Sonderwirtschaftszone hat sich als wirksam erwiesen.

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ÜBERWINDUNG DER SPRACHBARRIERE IN DER INTERKULTURELLEN KOMMUNIKATION

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Der Artikel diskutiert die Frage nach der Sprachbarriere und berücksichtigt auch deren sprachliche und psychologische Aspekte.

Suchbegriffe: Sprachbarriere, sprachlicher Aspekt, Interkulturelle Kommunikation, Sprachgruppen.

ПРЕОДОЛЕНИЕ ЯЗЫКОВОГО БАРЬЕРА В МЕЖКУЛЬТУРНОЙ КОММУНИКАЦИИ

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В статье рассматривается вопрос о том, что такое языковой барьер, а также рассматриваются его лингвистический и психологический аспекты.

Ключевые слова: языковой барьер, лингвистический аспект, межкультурное общение, языковые группы.

Was ist eine Sprachbarriere und warum ist sie ein Hindernis für unsere interkulturelle Kommunikation? Warum ist die Angst vor der Sprachbarriere oft größer als die tatsächliche Begegnung damit?

Wenden wir uns der Definition zu: Die Sprachbarriere ist eine der vielen möglichen Schwierigkeiten beim Erlernen einer Fremdsprache. Gleichzeitig ist dies der Begriff, den wir normalerweise im übertragenen Sinne verwenden, um die Schwierigkeiten zu bezeichnen, die bei der Kommunikation mit Menschen aus verschiedenen Sprachgruppen aufgetreten sind.

Beim Studium der Sprachbarriere haben wir festgestellt, dass sie sprachliche und psychologische Aspekte hat. Das Problem mit dem sprachlichen Aspekt ist, dass die Fähigkeit, Theorie in der Praxis anzuwenden, null oder fast nicht vorhanden ist. Oft können wir einfach nicht von unserer Muttersprache wechseln und nicht alle unsere Wissensdatenbanken für den beabsichtigten Zweck verwenden. Außerdem können wir die zuvor gelernten Wörter und Sätze nicht automatisch in echte Live-Kommunikation umsetzen, was ziemlich plötzlich passieren kann[1].

In einem psychologischen Aspekt ist die Sprachbarriere in die Barriere des Sprechens und die Barriere des Verstehens unterteilt. Im ersten Fall können wir uns nicht zum Sprechen zwingen, und im zweiten Fall können wir nicht verstehen, was der Gesprächspartner zu uns zu sagen versucht. Am Ende ziehen wir es vor, einfach nur zu schweigen.

Es gibt auch die Meinung, dass nicht jeder mit der Sprachbarriere konfrontiert ist und dass dieses Problem individuell ist. Das Problem ist wirklich individuell, da sich die Einstellung jedes Einzelnen zur Barriere auf unterschiedliche Weise manifestieren kann, aber zu sagen, dass nicht jeder damit konfrontiert ist, ist nicht richtig[2].

Psychologen stellten fest, dass die Entstehung einer Sprachbarriere verhindert werden kann, wenn eine Person einige wichtige Mythen kennt, die zwar keine Evidenzbasis haben, uns aber gleichzeitig sehr daran hindern, ohne unnötige Sorgen die richtige Einstellung zur Kommunikation zu entwickeln und Sorgen über mögliche Sprachfehler. Einer dieser Mythen ist die Notwendigkeit eines großen Wortschatzes. Um diesen Mythos zu zerstören, reicht es aus, nur darüber nachzudenken, wie wenige Wörter wir tatsächlich in unserer täglichen Kommunikation in unserer Muttersprache verwenden[3].

Der berühmte amerikanische Vielsprachige Tim Doner glaubt, dass Sie, um die Sprachbarriere zu überwinden, das Sprachenlernen so weit wie möglich in Ihr Leben integrieren und sich wirklich für die Kultur des Landes und der Menschen interessieren müssen, deren Sprache Sie lernen. Tim versichert, dass es auch wichtig ist, die Sprachkomfortzone zu verlassen. Dies hilft, die Sprachbarriere schneller zu überwinden. Wenn Sie nur alles von außen betrachten und allen Arten von Dialogen in einer Fremdsprache gleichgültig gegenüberstehen, wird der Prozess des Brechens unterbrochen. Die Barriere wird zu lange dauern. Der russische Polyglotte Dmitry Petrov ist der Ansicht, dass es neben der Notwendigkeit, die Komfortzone zu verlassen, um Sprachschwierigkeiten zu überwinden, auch sehr wichtig ist, zu lernen, wie man den Kommunikationsprozess in einer Fremdsprache genießt.

Zusammenfassend lässt sich darauf hinweisen, dass zum größten Teil alle Gründe für die aufkommende Sprachbarriere in jeder Phase der interkulturellen Kommunikation eng miteinander verbunden sind. Grundsätzlich haben diese Gründe einen gemeinsamen Grundcharakter – Selbstzweifel und Angst, einen Fehler zu machen, und dies ist absolut normal. Man muss sich nur daran erinnern, dass die Sprachbarriere mit Hilfe der Übung überwunden wird, und je mehr davon, desto besser, und dafür ist es nicht notwendig, alle Wörter zu stopfen, die wir nicht verstehen, weil, wie bereits erwähnt, die das Bedürfnis nach einem großen Wortschatz ist ein Mythos.

Vergessen wir auch unsere individuellen Eigenschaften nicht – für einen sind Schwierigkeiten bei der Kommunikation in einer Fremdsprache aufgrund ihres Charakters leichter zu ertragen, für den Anderen jedoch etwas schwieriger.

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KATEGORIE DER HÖFLICHKEIT UND AUSDRUCK DER DANKBARKEIT IN DER DEUTSCHEN SPRACHE

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In dem Artikel wird die Höflichkeit als Objekt der Pragmalinguistik als Bestandteil der Übersetzungstätigkeit beschrieben und auch einen bestimmten Satz von Sprachmitteln in bestimmten Sprachakten analysiert.

Ziel der Arbeit ist es, den stereotypen Satz von Sprachmitteln zu untersuchen, die von Vertretern der deutschen und russischen Gesellschaft verwendet werden, um die Kategorie der Höflichkeit in bestimmten Sprachakten im Kommunikationsprozess zu implementieren.

Suchbegriffe: Sprachakte, Höflichkeit, Dankbarkeit, Entschuldigung, Bitte, höfliche Ablehnung.

КАТЕГОРИЯ ВЕЖЛИВОСТИ И ВЫРАЖЕНИЯ БЛАГОДАРНОСТИ В НЕМЕЦКОМ ЯЗЫКЕ

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В статье описывается категория вежливости как объект прагматической лингвистики, как составная часть переводческой деятельности, а также анализируется определенный набор языковых средств в определенных речевых актах.

Цель работы – изучение стереотипного набора речевых средств, используемых представителями немецкого и российского общества для реализации категории вежливости в определенных речевых актах в процессе общения.

Ключевые слова: речевой акт, вежливость, благодарность, извинения, просьба, вежливый отказ.

Im Prozess der Kommunikation, die Menschen immer jede Beziehung zueinander ausdrücken, nicht nur verschiedene Informationen austauschen. Eine respektvolle oder freundliche Haltung gegenüber dem Gesprächspartner während der Kommunikation ist das Konzept der „Höflichkeit“. Die Kategorie der Höflichkeit ist ein wesentliches Attribut der alltäglichen häuslichen Kommunikation.

In dieser Phase der Entwicklung der Linguistik als Wissenschaft sind sich Wissenschaftler einig, dass Höflichkeit eines der Hauptattribute der menschlichen Kommunikation und der stärkste Regulator des Verhaltens von Menschen in der Gesellschaft ist.

Die Relevanz dieser Artikel die Tatsache zurückzuführen, dass in der Welt das Bedürfnis nach Wissen über verbale und nonverbale Methoden des Ausdrucks von Höflichkeit zwischen

Menschen verschiedener Kulturen im Zusammenhang mit der aktiven Verbreitung und Verankerung der internationalen Zusammenarbeit wächst.

In diesem Artikel werden die sprachlichen Mittel des Ausdrucks der Kategorien der Höflichkeit in der modernen russischen und deutschen Sprache untersucht.

Ziel ist es, die wichtigsten Sprachmittel zu studieren, die von den Gesprächspartnern der deutschen und russischen Gesellschaft verwendet werden, um die Kategorien der Höflichkeit in bestimmten sprachlichen Handlungen im Kommunikationsprozess auszudrücken.

Gegenstand der Studie sind Kommunikationsteilnehmer, die im Alltag sprachliche Mittel der Kategorie Höflichkeit einsetzen, um Dankbarkeit, Bitte, Entschuldigung und Ablehnung auszudrücken. Thema sind die sprachlichen Mittel der Kategorie Höflichkeit, die von den Teilnehmern der interkulturellen Kommunikation genutzt werden.

Moderne Sprachkategorien sind Teil der sprachlichen Aktivität einer Person. In dieser Kategorie fand die Theorie der sprachlichen Handlungen ihren Ausdruck. Es war die Theorie der sprachlichen Handlungen, die die moderne Entwicklung dieses riesigen Gebietes in der Linguistik beeinflusste, das heute Pragmatik oder Pragmalinguistik genannt wird [9, S. 27].

Aus der Sicht der Pragmatik ist die Theorie der sprachlichen Handlungen vollständig mit den Kategorien der Höflichkeit verbunden, die die Haupteinheiten der häuslichen Kommunikation sind. Laut der Wissenschaftlerin N.I. Formanovskaya: „Die kommunikativen Bedürfnisse der Menschen im Sprachlernprozess sind weitgehend mit der Notwendigkeit verbunden, im Laufe ihrer sprachlichen Tätigkeit konkrete Maßnahmen zu ergreifen, indem sie die Sprache als Instrument der sprachlichen Handlungen verwenden“ [9, S. 34].

In der deutschen Sprache gibt es, wie in jedem anderen auch, solche sprachlichen Handlungen wie:

1. Bitte.

Erstens ist die Bitte immer eine potenziell grobe Sprachaktion, da sie die Fähigkeit der Kommunikatoren einschränkt, Entscheidungen zu treffen. Was den Zweck der Anfrage betrifft, so hat die kommunikative Kompetenz des Sprechers die Vorstellung, dass man höflich fragen muss, was bedeutet, dass eine bestimmte Art der Rede dem Zuhörer Respekt ausdrückt, sonst kann die kommunikative Wechselwirkung der Gesprächspartner nicht realisiert werden. Es ist auch notwendig, die soziale Komponente der Situation der Anfrage zu berücksichtigen, nach der es mehrere Arten von Anfragen gibt: symmetrisch und asymmetrisch. Ein Antrag, der von einem Subjekt zu einem anderen geschickt wird, wenn beide Subjekte den gleichen sozialen Status haben, gilt als symmetrisch. Eine asymmetrische Anfrage ist eine Anfrage, bei der Subjekte einen anderen sozialen Status haben, d.h. eine Anfrage eines Subjekts mit einer bestimmten Kompetenz, die der Kommunikationspartner nicht hat, und eine Anfrage an diesen Bereich gerichtet ist. [10, S. 143].

Ein weiterer Faktor, der bei der Beschreibung der Anforderungssituation eine große Rolle spielt, ist laut den Forschern das Gewicht der Anfrage. Anfragen, die schnell und einfach durchgeführt werden können, die keine Risiken oder Kosten haben, haben das geringste Gewicht, zum Beispiel ein Antrag auf Salzlieferung [7, S. 34].

Es ist ein „unpersönlicher Infinitiv, kein „personifizierter“ Imperativ. Solche Infinitivkonstruktionen bieten kein "Du" und schließen jede Möglichkeit einer Antwort aus [2, S. 195].

2. Dankbarkeit.

Dankbarkeit ist eine höfliche Reaktion des Sprechers auf die positive Wirkung eines anderen Kommunikators gegenüber dem Sprecher. Danke ist auch eine Antwort auf eine Begrüßung oder Einladung. „Dankbarkeit ist ein Gefühl, ein Ausdruck der Anerkennung für etwas Gutes, um die Bemühungen des Gesprächspartners zu fördern“ [13, S. 351].

3. Höfliche Ablehnung.

Die Rolle der höflichen Ablehnung besteht darin, unangenehme Informationen für den Empfänger zu mildern.

4. Entschuldigung.

E. Hoffman sieht Entschuldigungen als „eine Tätigkeit zur Verbesserung und Korrektur einer Situation, deren Funktion eine Änderung der Bedeutung oder Bedeutung ist, die der Handlung zugeschrieben werden könnte. Das Ziel solcher Aktivitäten ist es, Dinge zu tun, die nicht als aggressiv angesehen werden können, sondern Dinge, die anerkannt werden können“ [18, S. 156].

Die Kategorie Höflichkeit ist ein wichtiges Element jeder kommunikativen Situation und umfasst sprachübergreifende und interkulturelle Situationen auf allen Ebenen. Höflichkeit ist eine Garantie für eine erfolgreiche Kommunikation, die als Verhalten definiert ist, das bestimmten sozialen Einstellungen entspricht.

Der Ausdruck der Bitte in der deutschen Sprache kann auf verschiedene Arten ausgedrückt werden: explizit oder implizit, unter Beteiligung verschiedener sprachlicher Mittel, bedeutet die Milderung der Bitte, um nicht zu einem unvermeidlichen Verlust der öffentlichen Person zu führen.

Wir heben die folgenden sprachlichen Mittel hervor, um eine Anfrage in deutscher Sprache auszudrücken:

- Frage mit dem modalen Verb „können/könnte“;
- Fragesätze mit dem modalen Verb „dürfen/dürfte“;
- Frage mit dem modalen Verb „wollen“;
- Infinitivkonstruktion „würde + Infinitiv“;
- Infinitiv.

Die Situationen der Anfrage in der deutschen Sprache werden oft in Form einer Frage formuliert. Grundsätzlich sind Fragen immer eine Art Bitte um Antwort. Zum Beispiel „Können/könnten Sie mir (bitte) das Kleid geben? – In der russischen Sprache wird diese Formulierung der Bitte in alltäglichen Dialogen als sehr höflich wahrgenommen.

Im Deutschen sind Fragevorschläge ohne Fragewort die gebräuchlichste Form des Ausdrucks einer Anfrage. Ein höflicher Effekt kann durch die Verwendung des Adverbs „gern/gerne“ erreicht werden. Zum Beispiel: „Frau Aro, ich würde gerne wissen, wie ich diese Aufgabe erledigen kann“, oder folgenderweise „Ich würde gerne ein paar Kilogramm Tomaten kaufen“.

Wenn man über Modalverben und ihre wichtige Rolle beim Ausdruck einer höflichen Anfrage spricht, kann man die Wörter eines Linguisten zitieren:

„Bei der höflichen Bitte benutzt man entweder die Modalverben „könnte“ und „dürfte“, die Hilfsverben „wäre“ und „hätte“ oder die Umschreibung mit „würde“. – Dürfte ich Sie um Hilfe bitten? / Könnten Sie mir sagen, wie spät es ist? / Ich hätte gern ein Stück Schweizer Käse! / Würdest du mir bitte meine Uhr zurückgeben?“

Fragen mit dem Modalverb „können/könnten“: Das Verb „können“ wird verwendet, um eine Bitte höflich auszudrücken, aber es wird notwendigerweise mit der Bittepartikel oder mit anderer Partikel verwendet, die auch dazu dienen, die Anfrage zu mildern. Zum Beispiel: „Können Sie mir Ihre Vorlesungen über Deutsch geben?“

Neben der Partikel „Bitteschön“ können auch inoffizielle Beschwerden wie „Lieber Lucas“ oder die negative Partikel „nicht“ gemildert werden. Zum Beispiel „Kannst du das nicht machen?“. Manchmal wird auch die Partikel „mal“ verwendet. Zum Beispiel „Leihen Sie sich Ihr Auto mal aus?“.

Das Modalverb „wollen“ wird in Fragesätzen am wenigsten verwendet. In der Konstruktion wollen + Infinitiv drückt das Verb „wollen“ eine Anfrage aus, die formal identisch mit der Frage ist, was ein Gefühl höflicher Rede erzeugt. „Wollen Sie mir bitte sagen, was Ihre Kursarbeit ist?“.

Bemerkenswert ist, dass die Konstruktion würde + Infinitiv eine gewisse Distanz zwischen den Kommunikatoren bedeutet. Deshalb scheint es im Kontext der Anfragen an den Freund nicht ganz richtig zu nutzen, aber zum Beispiel in einer Situation der Schlange vor der Kasse für ein Ticket in den Zug ganz richtig als eine Frage an dem Fremden: „Würden Sie mich bitte vorlassen? Mein Zug fährt gleich“.

Der Infinitiv als Mittel zum Ausdruck der Bitte wird in der Arbeit, die Kulturen durch Vokabular und Pragmatik vergleicht, ziemlich ausführlich behandelt. Es ist ein „unpersönlicher“ Infinitiv, im Gegensatz zu einem „personifizierten“ Imperativ.

Die Partikel „Bitte“ – bitte in allen Fällen des sprachlichen Ausdrucks der Bitte gibt ihm einen Hauch von höflicher Form: „Bittesprachen Sie leiser. / Wiederholen Sie bitte. / Bitte sprechen Sie etwas langsamer“. Man kann sogar sagen, dass in solchen Fällen „Bitte“ gleichbedeutend mit anderen Formeln der Behandlung von Ausländern ist, zum Beispiel die Wörter „Entschuldigung“, „Verzeihung“.

Das Ritual, Dankbarkeit auszudrücken, ist im Deutschen sehr verbreitet. Die häufigsten und allgemein akzeptierten Ausdrücke der Dankbarkeit – Danke, Danke schon, viel Dank, Danke vielmals-tragen normalerweise keine emotionale Belastung. Im Ausdruck Dank. Auf Wiedersehen-Das Wort Dank kann auch als integraler Bestandteil der Abschiedsformel angesehen werden. Die Dankesformel wird in 100 % ritualisierten und Klischee-Formeln verwendet, zum Beispiel: Komm doch herein. Nimm Platz. – Gern, danke. / Nein, danke. / Vielen Dank.

Etwas seltener treffen wir den Spruch „Danke gleichfalls“: „Guten Appetit! – Danke, gleichfalls“. Das deutsch-russische Wörterbuch der Sprachkommunikation erklärt diese Formel als die häufigste Antwort auf eine festliche Begrüßung, ebenso wie zum Beispiel den Wunsch nach einer angenehmen Zeit: „Ich wünsche ein schönes Wochenende.“ Gleichfalls Dank" ist die häufigste Form des Abschieds am Freitag.

Die fehlende Antwort auf Dankbarkeit gilt als unhöflich. Die Antwort auf die Dankbarkeit läuft auf die Zusicherung hinaus, dass der entsprechende Service mit Vergnügen durchgeführt wird. Dankbarkeit wird im deutschen Standardwort „Bitte“ (Bitte, Bitte; Aber bitte; bitte schön; Bitte; Bitte sehr; Bitte, gern) ausgedrückt. Diese Antwort ist die häufigste und stilistisch neutrale Reaktion auf Wertschätzung.

Zusätzlich zu den Worten „bitte“ und andere Ausdrücke verwendet: Gerne, Gern geschehen, Kein Problem und andere, zum Beispiel: „Vielen Dank, dass Sie mir geholfen haben. – Gern geschehen“, oder: „Entschuldigen Sie bitte! – Kein Problem“.

Die Ablehnung der Einladung ohne Angabe des Grundes für die Ablehnung als beleidigend empfunden würde. Zum Beispiel: Viele Dank, aber am Sonntag habe ich schon etwas vor. Es tut mir leid, aber am Sonntag bin ich nicht hier.

Es ist erwähnenswert, dass die Sprech-Akt der Entschuldigung (aufgrund der Anwesenheit von imperativ oft tritt der Marker Höflichkeit „bitte“, die oft verleiht mehr Ausdruck höflicher Charakter.

Erst nach einer Entschuldigung kann der Sprecher seine Beleidigung oder sein Bedauern noch einmal ausdrücken: „Entschuldigen Sie bitte die Verletzung. Kochen hat doch mehr Mühe gemacht, als wir dachten“, „Daran habe ich nicht gedacht. Das tut mir wirklich Leid“.

Außerdem gibt es im Deutschen eine Entschuldigung für Einmischung in die persönliche Autonomie des Menschen: „Entschuldigen Sie die Störung“.

Der Ausdruck „Verzeihen Sie mir bitte“ drückt eine Bitte um Vergebung aus, in der Regel für ein schwerwiegendes Fehlverhalten und nicht für eine gelegentliche Reservierung. Manchmal wird eine Entschuldigung nicht explizit ausgedrückt, und der Ausdruck von Bedauern oder die übliche Erklärung im Kontext wird als Entschuldigung verstanden. Obwohl der Ausdruck des Bedauerns (leider, bedauerlicherweise, dummerweise, tut mir Leid) wird in der deutschen Sprache viel öfter als bitte verzeihen oder entschuldigen.

Selten wird auch der Ausdruck „tut mir Leid“ als eigenständiges Sprichwort verwendet. Oft diese Aussage die Negation vorausgeht „nein“, das heißt ein Ausdruck des Bedauerns oder eine Entschuldigung mildert scharfe Negation ist, nach der es eine Erklärung für die Gründe, die zur für diese groben Ausdrücke „nein“: „Nein, tut mir Leid, wir haben nur gelbe Schuhe“.

Entschuldigungen werden oft zu Beginn des Gesprächs verwendet und dienen als Mittel zur Aufmerksamkeit (besonders auf der Straße, wenn sie nach Straße, Zeit usw. fragen) – Verzeihung, ich suche die Gemäldegalerie. – Die ist ganz in der Nähe.

Im Deutschen ist der Umgang mit Fremden im Prinzip sprachlich schwierig, da es im Gegensatz zu anderen Sprachen (Madame – Monsieur, Signora – Signore, Madame – Sir) keine neutrale Behandlung in der Sprache gibt. Das lexikalische Problem ist jedoch funktional lösbar. An diesem Beispiel „Entschuldigung! Hallo! Hallo Sie! Jungermann“ kann eine Entschuldigungsformel

für eine solche freudige Behandlung verwenden. Es muss jedoch daran erinnert werden, dass diese Sätze nicht unbedingt der Form des gleichen Klischees entsprechen, sondern sie werden in der gleichen Sprachsituation mit Hilfe der für die Muttersprache zutreffenden Redewendungen ausgedrückt.

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ZUM PROBLEM DER BILDUNG VON TOPONYMEN IN DER DEUTSCHEN SPRACHE

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In dem Artikel werden die Modelle der sprachlichen Wortbildung der meisten Toponyme in der deutschen Sprache untersucht, die für das Verständnis der Originalität solcher syntaktischen und morphologischen Formationen von Toponymen wichtig sind.

Suchbegriffe: Ableitungsmodelle, Eigennamen, Toponyme, eigentliche Zusammensetzungen, uneigentliche Zusammensetzungen, Zusammenrückungen.

К ПРОБЛЕМАТИКЕ ОБРАЗОВАНИЯ ТОПОНИМОВ В НЕМЕЦКОМ ЯЗЫКЕ

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В статье описываются модели словообразования большинства топонимов немецкого языка, что очень важно для рассмотрения своеобразия синтаксических и морфологических образований подобной категории лексики.

*Ключевые слова: модели словообразования, имена собственные, топонимы, полно-
сложные соединения, неполносложные соединения, сдвиги.*

Eine solche Kategorie von Wörtern wie Toponyme ist in der Struktur jeder Sprache enthalten, einschließlich Deutsch, das eine reiche Geschichte hat und mehr als 100 Millionen Menschen aus der ganzen Welt beheimatet ist. Toponyme entstanden vor vielen Jahren, dann wurden sie durch Hervorheben bestimmter charakteristischer Merkmale und Funktionen in Objekten bezeichnet, das heißt der Name enthielt Daten über ein Objekt, das Menschen half, es von anderen zu unterscheiden. Dies können zum Beispiel die Merkmale des Ortes, der Zweck des Objekts oder die Beziehung bei der Erwähnung. Das Studium der Toponymie ist jedoch nicht nur unter dem Gesichtspunkt des ethno historischen Ursprungs, sondern auch unter dem Gesichtspunkt der Bildung wirksam ein striktes System der sprachlichen Beschreibung der toponymischen Wortbildung. Der Zweck dieses Artikels ist es, Wortbildungsmodelle hervorzuheben, unter denen die Strukturen der Mehrheit zusammengefasst werden können.

Es ist üblich, Toponyme als Eigennamen zu nennen, die sich auf geografische Objekte beziehen. Dies können die Namen von Staaten, Städten und sogar Straßen sein. Er wurde Wissenszweig namens Toponymie gebietet. Linguist Marakuev A. M. schreibt: „Mit Toponymie meinen wir den Teil der Geographie, der sich mit der Entstehung und Entwicklung geografischer Namen (Toponyme) befasst, der ihre Form, Semantik, semantische Seite und Synonymie untersucht und die Regeln für Rechtschreibung, Rechtschreibung und Orthoepie entwickelt (richtig)

Aussprache)“ [1]. Auf dieser These basierend können wir sagen, dass die Toponymie ein spezielles Gebiet wissenschaftlicher Erkenntnisse ist, das an der Schnittstelle von Linguistik und Geographie entstanden ist. Wenn wir über Deutschland sprechen, kann es zu Recht als ein Land mit einer reichen Landschaft und vielen geografischen Merkmalen bezeichnet werden, die es zu einer Fundgrube verschiedener geografischer Namen machen. Es ist unmöglich, die Tatsache nicht zu berücksichtigen, dass die Geschichte Deutschlands reich an verschiedenen Ereignissen ist, die die Sprache und dementsprechend die Ortsnamen des Gebiets beeinflussen. Auf dieser Grundlage können wir sagen, dass deutsche Ortsnamen für das Studium sicherlich von großem Interesse sind, da sie original sind.

Gemäß dem Linguisten Stepanova M. D. können wir bestellen, dass es: „a) eigentliche Zusammensetzungen; b) uneigentliche Zusammensetzungen; c) Zusammenrückungen“ [2]. Die meisten deutschen Toponyme sind komplexe Wörter und können verschiedene Ableitungsmodelle darstellen.

Eigentliche Zusammensetzungen haben normalerweise zwei Basen. Der Hauptteil ist normalerweise ein gebräuchliches Substantiv oder ein Eigenname. Solche Toponyme können mehrere Modelle darstellen: Wir können das Adjektiv + Substantiv-Modell beispielsweise in den folgenden Fällen beobachten: Altheim (altes + Heim), Hochheim (hohes + Heim), Neustadt (neue + Stadt), Grünstad (grüne + Stadt), Lauterbach (laut + Bach), Altbach (alt + Bach), Tiefbach (leise + Bach). In diesem Zusammenhang sei Folgendes betont, dass der erste Teil des Wortes den zweiten anhand seiner Eigenschaften charakterisiert. Ein ebenso häufiges Muster ist das gemeinsame Substantiv + das gemeinsame Substantiv. Diese Toponyme umfassen „Feldberg“ (Feld + Berg) oder „Eberbach“ (Eber + Bach). Zusätzlich wird in diesen Toponymen ihre Bildung in Bezug auf die Eigenschaften des entsprechenden Gebiets verfolgt. Außerdem finden Sie häufig ein Modell: Personal- oder Nachname Eigenname + Substantiv. Sehr oft basieren die Namen von Intracity-Objekten und Straßen auf diesem Prinzip, zum Beispiel „Annastraße“, „AugustaAlle“, „Theodor-Heuss-Straße“, Fritz-Löffler-Straße. In diesem Fall handelt es sich nicht um eine Beschreibung der Merkmale eines Gebiets, sondern um seine Zugehörigkeit zu einem bestimmten Clan, einer bestimmten Familie oder Person sowie um die Verbindung zu berühmten Persönlichkeiten (zum Beispiel können einige solcher Toponyme erstellt werden aus den Namen der Gründer von Siedlungen oder anderen Gebietseinheiten). Zusätzlich zu den obigen Modellen gibt es viele andere Kombinationen, die auf sich solchen Prinzipien basieren.

Uneigentliche Zusammensetzungen bestehen aus zwei Komponenten in Form eines Adjektivs oder Substantivs im Genitiv und tragen die Funktion Definition + Substantiv (normalerweise ein Appellativ). Die häufigeren Modelle sind:

1. Nominativ eines Adjektivs + Nominativ eines gemeinsamen Substantivs, zum Beispiel: Alterstadt, Neuermarkt;

2. Dativ Adjektiv + Substantiv Nominativ: Altenmarkt, Großendorf.

Unvollständige Toponyme werden häufig mit den Beugungen -s (starke Deklination) oder -en (schwache Deklination) gebildet:

1. Appellative + – (e) s + Appellative, zum Beispiel: Landsberg, Bischofswerda;

2. Appellative + -e (n) + Appellative, zum Beispiel: Pfaffendorf;

3. Persönlicher Name (vollständig oder kurz) + – (e) s + Appellative, zum Beispiel: Albersdorf, Badersleben;

4. Persönlicher Name (vollständig oder kurz) + – (e) n + Appellative, zum Beispiel: Geisenheim;

5. Hydronym/Oronym/Oikonym + -s + Appellative, zum Beispiel: Innsbruck, Hartesburg, Hombergshausen.

Die nächste Form der Wortbildung von Toponymen sind Zusammenrückungen. Zusammenrückungen sind eine Art Übergangsphase von den Formen der Phrasen zu den Formen der komplexen Wörter. Beispiele für Modelle sind:

1. Präfix + Artikel + Appellative, zum Beispiel Andermatt;

2. Ziffer + Appellative im Dativ Plural, zum Beispiel: Drinhaus;

3. Nicht abnehmende Ziffer + Appellative, zum Beispiel: Dreieich.

Außerdem werden Verschiebungen häufig aus althochdeutschen Präfixen gebildet. Grundsätzlich können die gebräuchliche Wörter sein, zum Beispiel Berg, Tal, Werder, Bach, Brunn, Feld, Haus, Hof, Dorf, Stadt und viele andere“ [3]. Diese Beispiele bieten ein anschauliches Beispiel für einen einfachen Übergang eines Appellatives zu einem Toponym.

Daraus lassen sich folgende Schlussfolgerungen ziehen. Die Offenlegung der gemeinsamen Strukturen der Modelle deutscher Toponyme gab somit einen Eindruck von der Originalität der syntaktischen und morphologischen Formationen der deutschen Sprache, wobei die von uns identifizierten Wortbildungsmodelle für die meisten deutschen Toponyme geeignet waren, ermöglichte es, die Zusammensetzung der Toponyme der deutschen Sprache zu identifizieren. Hier repräsentieren Toponyme eine separate Vokabelebene. Ein geografisches Objekt kann mit nur einem Wort benannt werden, das die Merkmale seiner Größe und Position im Verhältnis zu anderen Objekten und der Zugehörigkeit zu Völkern oder sogar bestimmten Personen sowie andere identifizierende Informationen enthalten kann. Die Namen von geografischen Objekten unterscheiden sich von anderen komplexen Wörtern in der Sprache darin, dass ihre Komponenten nicht durch geeignete Synonyme ersetzt werden können, da die Ausgabe zu einem völlig anderen Namen führt.

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Masters' research

УДК 620.9

ALTERNATIVE ENERGY SOURCES

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This article is devoted to the study of alternative energy sources. The basic concepts and methods of energy production are considered. The main types of alternative energy sources, their advantages and disadvantages are presented.

Keywords: alternative energy sources, advantages, disadvantages.

АЛЬТЕРНАТИВНЫЕ ИСТОЧНИКИ ЭНЕРГИИ

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Данная статья посвящена исследованию вопросов альтернативных источников энергии. Рассмотрены основные понятия и способы получения энергии. Представлены основные виды альтернативных источников энергии, их достоинства и недостатки.

Ключевые слова: альтернативные источники энергии, достоинства, недостатки.

The purpose of our research is to analyze the types and methods of developing alternative energy sources. The level of this study is theoretical. The novelty of the research is to consider modern energy production technologies and the importance of their use.

Energy can be renewable (alternative) and non-renewable (traditional). Alternative energy is called natural phenomena, unlimited resources produced naturally. The traditional one is oil, natural gas, and coal. Since traditional energy sources may run out, people are trying to find a replacement. Their consumption also causes carbon dioxide emissions, the greenhouse effect and the threat of global warming. Currently, energy production is carried out by the combustion of fossil fuels and the reaction of radioactive decay. Alternative energy is a combination of energy production methods that bring the least harm to the environment. It is necessary not only for industrial purposes, but also in ordinary houses for heating, hot water, lighting, electric appliances [2].

There are the following types of alternative energy:

1. Solar energy

This is the most powerful source of energy. Most often it is obtained using solar panels. The main advantage of solar energy is its inexhaustibility. Also, this method is completely eco-friendly and does not cause negative consequences for the environment. But there are also disadvantages

such as the dependence on the weather conditions of the area, the high costs of construction and the need to use large territories [2].

2. Wind energy

Wind farms convert wind into electrical, thermal, and mechanical energy. Wind energy reserves are a hundred times greater than the hydropower reserves of all rivers on the planet. The main equipment is wind generators and windmills. Wind power has the following advantages: no harmful waste, compact size, low maintenance costs. The disadvantages of wind energy are: no possibility to control wind strength, climate impact, possible radio interference, danger to birds, noise [3].

3. River energy

This method is based on the energy of the water flow, which is converted into electrical energy in special structures. This method provides less energy than wind [1]. Hydroelectric power stations with dams and reservoirs are used to convert the water movement of into electricity. They are placed on rivers with a strong flow. Dams are built in order to create a certain pressure. The advantages of this method are: renewable resource, low cost, no environmental harm, and low carbon dioxide emissions. The disadvantages are following: possible flooding of nearby land, ecosystem restructuring, and disruption of the natural balance in the areas of construction of hydropower plants.

4. Geothermal energy

This method uses heat coming from the ground. The heat of the Earth is inexhaustible and millions of times greater than all energy resources combined. Geothermal plants use the Earth's internal energy – hot water and steam. These stations are located in volcanic areas where there is water on the surface or where it can be reached by drilling a well. The resulting water heats buildings directly or through a heat exchange unit. It is also converted to electricity when hot steam turns a turbine connected to an electric generator. The advantages of this method are: impressive reserves, cost-effective operation, and aesthetic appearance. The disadvantages are following: cost, risk of ground temperature rise, carbon dioxide and hydrogen sulfide emissions [2].

5. Biofuels

Bioenergy takes electricity and heat from first -, second -, and third-generation fuels. The first generation includes solid, liquid and gaseous biofuels. The second generation is biomass-derived fuel. The third generation is algae biofuels. The method for producing first-generation biofuels is quite simple. Residents of provincial cities set up biogas plants where the biomass ferments at the required temperature. The most popular fuel is firewood. Currently, forests of fast-growing trees, poplars or eucalyptus are planted to produce them. Biofuels have the following advantages: material availability, mobility, renewable resource. The disadvantages are regional suitability, water use, invasiveness, fertilizers [2].

Russia is an active consumer of alternative energy. Solar plants produce a capacity of 400 MW. The total capacity of wind generators is 184 MW. About two hundred river hydroelectric power plants generate up to 20 % of the total energy in the country. Due to the large number of volcanoes in certain areas, only 80 MW of energy is generated per year [2].

Thus, in our study, we looked at five ways to obtain alternative energy, analyzed their advantages and disadvantages, and the importance of using them.

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УДК 339.9

THE CURRENT STATE OF FOREIGN ECONOMIC ACTIVITY IN RUSSIA

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The article examines the main problems that arise in the implementation of transactions in foreign economic activity. A number of measures are proposed that will allow the company to feel more effectively in the foreign market. The development of foreign economic activity is one of the priorities in the foreign economic policy of the vast majority of countries of the world, including the Russian Federation, as it will allow Russian enterprises to take a competitive position on the world stage in the conditions of financial and economic crisis and become a strong tool for the sustainable socio-economic development of the country.

Keywords: foreign economic activity, currency risks, commercial risks, foreign trade, mistakes, exports, imports, deal, contract, financial crisis.

СОВРЕМЕННОЕ СОСТОЯНИЕ ВНЕШНЕЭКОНОМИЧЕСКОЙ ДЕЯТЕЛЬНОСТИ В РОССИИ

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В статье рассматриваются основные проблемы, возникающие при осуществлении сделок во внешнеэкономической деятельности. Предложен ряд мероприятий, которые позволят предприятию более эффективно чувствовать себя на внешнем рынке. Развитие внешнеэкономической деятельности является одним из приоритетных направлений во внешнеэкономической политике подавляющего числа стран мира, в том числе и Российской Федерации, потому что это позволит российским предприятиям занимать конкурентные позиции на мировой арене в условиях финансово-экономического кризиса и стать сильным инструментом для устойчивого социально-экономического развития страны.

Ключевые слова: внешнеэкономическая деятельность, валютные риски, коммерческие риски, внешняя торговля, ошибки, экспорт, импорт, сделка, контракт, финансовый кризис.

The basis of effective foreign economic activity and the key to economic security of a country in the context of movement towards an open economy is active export policy and development of export potential. Today, one of the most important areas of public policy is to stimulate competitive export-oriented and import-responsible industries, as well as to stimulate import substitution production and export of agricultural products, based on Russia's natural advantages and the growing needs of the world market for quality and environmental products.

In the current economic development environment of any state, foreign economic activity plays a huge role, it is the use of the advantages of international cooperation of production, the expansion of trade borders and as a result of obtaining additional income to the country's budget.

Thus, the economic relations of different countries, based on mutually beneficial interest, provided by the terms of a contract, which includes exports and imports, financial, investment, information and other flows across the borders of the countries participating in the foreign economic transaction, should be understood as foreign economic activity.

The analysis of mistakes made by enterprises in foreign economic activity is given quite little attention, which significantly reduces the volume of foreign economic activity.

Most of the problems and mistakes of involving Russian enterprises in world trade is not studied. Studying the problems and errors in the company's foreign economic activity in order to eliminate possible financial and temporary losses is one of the important measures to stimulate the development of foreign economic activity.

Often in practice, Russian companies, entering into negotiations with foreign partners for the conclusion of a contract, do not check neither the legal status of the counterparty, nor its financial position. This approach in some cases leads to the inability to get payment for export goods delivered. In the case of imports, it is difficult to return goods that have not been delivered in full, delivered with significant shortcomings, or even have not been delivered at all. Attempts to find a foreign partner in such cases to give him a summons to call him to arbitration and claims materials are unsuccessful.

It is important to write down in the contract the right of which state will regulate the relationship under a treaty, as the rules and regulations of each state may differ significantly.

There are contradictions between some terms of the treaty, the terms themselves are not clearly defined, this can cause controversy when interpreted. The presentation of such conditions may take into account the interests of only one party, while the other party may suffer serious financial losses. The bilingual texts of treaties stating that both texts were of the same force could not always be the same.

When reflecting force majeure in a contract, there is often no consideration for any formulation that may reduce or increase the property liability of one of the parties to the contract.

In addition to very concise contracts, which stipulate a minimum of conditions, there, on the contrary, exist very detailed contracts, which reflect a significant number of additional conditions, the consideration and approval of which takes a long time, which also negatively affects the timing of goods delivery.

Currently, the focus of Russian exports is increasingly changing from west to east, so the need to study prohibited goods to these countries is relevant.

Russia's foreign trade is heavily regulated by the authorities of other countries. Both licensing and quotas are used in exports from Russia. There is a system of examination and quarantine. All goods exported from Russia can be divided into 4 categories:

- goods prohibited for export and import;
- goods subject to mandatory licensing and quotas;
- goods with a limited amount, permissible for export and import;
- goods that can be freely imported and exported.

It should also be taken into account that when exporting from Russia there are groups of goods that are subject to preferential duties. This is regulated by Russia's accession to the WTO. In addition, when exported from Russia, some types of goods are subject to duties at special rates and are regulated by special quotas. This is applied, for example, to rice, corn, sugar, fertilizer. Moreover, there are goods subject to temporary duties, such as diesel fuel, ceramic utensils, tires, soy sauce, etc.

It is impossible to completely avoid mistakes when exporting products, but one can reduce their impact and minimize the risks of their occurrence, so it is recommended to work out the following issues:

- Build effective cooperation with business consultants to work in the market of a country.
- Invest in study of the Chinese market and alternative markets of Eastern countries, such as the Vietnamese market.

As a result, it is important to monitor modern areas of foreign economic activity in a timely manner in order to form a rational approach to the implementation of foreign economic policy and a system of regulation of foreign economic activity. Thus, it is necessary to regularly improve existing programming and forecasting systems. The main requirement for the implementation of these conditions is dynamism of a system, limiting the process of lagging estimates from rapidly changing practice of economic world relations.

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SECURITY ANALYSIS OF THE ELECTRONIC DOCUMENT MANAGEMENT SYSTEM

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This article is devoted to the analysis of security of an electronic document management system. The main stages of protection measures of information resources and stages of work on analysis of security of electronic document management system are considered. Recommendations on protection of electronic document management system are given.

Keywords: electronic document management system, security, information security, information technologies.

АНАЛИЗ ЗАЩИЩЕННОСТИ СИСТЕМЫ ЭЛЕКТРОННОГО ДОКУМЕНТООБОРОТА

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Настоящая статья посвящена к анализу защищенности системы электронного документооборота. Рассматриваются основные этапы мер защиты информационных ресурсов и этапы проведения работ по анализу защищенности системы электронного документооборота. Приведены рекомендации по защите системы электронного документооборота.

Ключевые слова: система электронного документооборота, защищенность, безопасность, информационная безопасность, информационные технологии.

To date, most organizations do not pay due attention to information security. Due to the lack of a unified information security policy in the organization, the following problems arise:

- Problems of uncontrolled use and dissemination of confidential information;
- Problems of the leakage, distortion and loss of commercial and financial information, industrial espionage and distribution of materials harmful to the reputation of companies;
- Problems of information wars, electronic intelligence for political groups, incomplete information and misinformation of heads of major institutions.

The occurrence of these information security problems is common and is caused by the accelerated growth of the information-oriented society and information technologies in the modern world. In parallel with the development of electronic document management, the number of sources of threats to information security is expanding [1].

As such, the effective approach to building a whole multi-layered system of information security could become the development of a singular intracorporate standard or a policy of information security.

Speaking about the construction of a secure system, specialists are used to dividing the requirements for systems of this kind into the following groups:

- Ensuring the legal significance of the electronic document;
- Ensuring that the electronic document is protected from standard threats.

Compliance with these requirements is possible only with the provision of an integrated approach involving the use of both software and organizational protection measures [2].

The analysis revealed the following main stages of measures to protect information resources:

1. Organizational ones;
2. Software and technical ones.

Organizational measures include a set of mandatory procedures that system participants must perform in the process of exchanging documents in order to ensure the legal significance of the transferred documents. In general, organizational measures are determined by the purpose of the system, a set of regulatory documents that define the relationship of the system participants and their mutual responsibility within the framework of the activities to support which the document management system is being created [3].

Organizational security measures allow:

- to work with staff and documents for organization of security and schedule;
- to use the technical means of security;
- to organize data-analytical activity on analyzing risks of information security;
- to manage the information security on site.

Software and technical security measures are based on the use of various electronic devices and special programs that perform protection functions. The software and hardware complex of the information security system is designed to protect valuable information processed in electronic document management systems. The complex includes: autonomous programmes that provide the safety of information and control over the degree of security; information security programmes, working in the array with information processing programmes; information security programmes, working in the array with hardware security devices [4].

As of today, one of the most unsolved problems of electronic document management systems is the task of integrating heterogeneous geographically distributed document management systems into a single process of processing electronic documents to ensure manageability of the operational flow of heterogeneous documents and their execution. Also recently it has become possible to connect mobile devices (laptops, smartphones, PDAs, etc.) to the document management systems of organizations. Therefore, one of the main tasks of implementing electronic document management models is the availability of secure communication channels [5].

To build a secure model of electronic document management, it is necessary to develop a reasonable information security policy. In this regard, the recommendations for the protection of the electronic document management system are given below [1]:

1. Encrypting files allows for supporting a more reliable security of data.
2. To ensure the legal significance of documents processed through the electronic document management system, the introduction of an electronic digital signature (EDS) is used. Using the electronic digital signature of the document allows one to solve the following problems: confirming the authorship of the document; document integrity control; protection of document content from distortion.
3. Secure access: secure access to the data inside electronic document management system must be provided by authentication and allotting user rights. The most widespread method of authentication is passwords. Secure passwords are considered those passwords that are one-time use or have technical limitations.
4. Firewall protection: One of the important components of the secure document flow model is the use of firewalls. The firewall protects the information system by filtering information, i.e. analyzing it according to a set of criteria and making a decision on its distribution to (from) the system based on the specified rules, thus distinguishing the access of subjects from one system to the objects of another.

5. Protocolling and audit of Document Automation's user's actions: the correct realization of security logs in a system allows for trace and to cut short unauthorized actions of a document control participant. All main systems of document control, operation systems and databases are fitted with security logs.

6. Safe data deletion: for preventing the recovery and repeated use of information that has been deleted from hard drives and removable storages of the computer the information being deleted is also erased. The destruction of data is achieved via writing a random sequence in place of the deleted information in the vacated disk area. The mechanism of erasing is held in the certified information security system «SecretNet», a programs array, realizing a Digital Signature «PGP» and other specialized software applications.

7. Protection from harmful software: this element of security covers for the installation of such hardware and software as: antivirus applications, intrusion detection applications, security analysis systems, etc.

8. Reserve copying: for protection from loss of precious information the files held on memory devices must be subjected to reserve copying, after which the reserve copies must be held in a safe place outside the device.

9. Limiting software installation: the security policy of an organization must regulate a catalog of software that can be installed on remote devices, connected to the corporate net.

10. Logical bordering of the net: in the availability of a remote connection to the document control system of a business it is important to consider the possibility of dividing the local and network traffic of the workplace. In this case an allocation of a separate resource is required, a resource that holds confidential information. On top of this it is required to limit the access between the system's participants for the use of its resources according to the workplaces' security policy.

11. Using confidentiality marks: if necessary, any document can have its own confidentiality mark (security classification), that allows to reflect the degree of its confidentiality which allows to foresee the necessary mechanisms and measures of providing security. The presence of such confidentiality marks implies the usage of the mandated security policy.

Conducting a safety analysis of the electronic document control system helps expose the shortcomings and gaps in organization of security of similar systems. The well-timed audit assists in discovering and alerting about the appearance of new threats to information security.

It is recommended to carry out work on the analysis of the security of the electronic document management system in several stages [3]:

1) Conducting an audit for compliance with the requirements of the international standard GOST R ISO / IEC 27001-2006 provides for checking the entire information security management system operating in the organization, as well as measures to improve it. This analysis allows you to identify vulnerabilities and determine the most probable threats to violate the established security regime.

2) Analysis of the possibility of carrying out DoS attacks (denial of service) on the server and network equipment of the electronic document management system will reveal weakly protected network fragments. When analyzing, it is advisable to check the servers and applications whose work is related to the functioning of the electronic document control system, as well as the commutative equipment responsible for organizing the network interaction of the system components.

3) Testing for the possibility of unauthorized entry to the elements of the electronic document management system. Testing should include software for e-mail systems, database management systems, backup storage, etc.

4) Establishing the compliance of the used means of cryptographic protection of information with the requirements of Russian legislation, technical specifications from the manufacturer, as well as guidelines and regulations of the FSB (FAPSI) of Russia.

5) Analysis of the possibility of exposure to malicious software. The result of the analysis is a list of document management system components, the current settings of which increase the risk of spreading malicious software.

The result of the analysis of electronic document management system can be a report containing the following information:

1. List of current threats to information security of the electronic document management system.
2. Recommendations for eliminating threats.
3. Recommendations for improving the security of the electronic document management system.
4. Recommendations for bringing the electronic document management system into compliance with the requirements of current legislation, guidelines and information security standards [1].

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DESIGNING A DEEP NEURAL NETWORK FOR CLASSIFICATION OF DOCUMENTS FROM STUDENT PORTFOLIO

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The relevance of the classification of scanned documents is considered. The means for solving this problem are analyzed. The pre-trained VGG16 network was selected and upgraded, and the data set for training the resulting neural network was selected.

Keywords: convolutional neural network, VGG16, student portfolio, classification of documents.

ПРОЕКТИРОВАНИЕ ГЛУБОКОЙ НЕЙРОННОЙ СЕТИ ДЛЯ КЛАССИФИКАЦИИ ДОКУМЕНТОВ ИЗ ПОРТФОЛИО СТУДЕНТОВ

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Рассмотрена актуальность классификации отсканированных документов. Рассмотрены средства для решения данной проблемы. Выбрана и модернизирована предобученная сеть VGG16, подобран набор данных для обучения полученной нейронной сети.

Ключевые слова: свёрточная нейронная сеть, VGG16, портфолио студента, классификация документов.

In the modern world, the use of various technologies for processing and storing information is not an innovation, but a widespread practice. Various organizations refuse to store all the necessary data on paper, preferring digital representation of information. These can be either electronic documents or scanned copies of paper documents. This option is preferable if you need to keep the signature on the document, handwritten fields, etc.

Higher education institutions are also keeping up with this trend. Almost every University has its own information system, which only employees and students of this particular University have access to. As a rule, these systems contain personal accounts for each student and employee and allow them to upload various files there. This function is especially important for the student, because this is how they create their portfolio. Usually, a number of requirements are put forward for documents that make up a portfolio, and one of them is the presence of the signature of the student and teacher on the submitted papers. Therefore, students often need to scan their work and upload it to their portfolio in this form. That is why the task of classifying scanned documents is relevant.

Given the popularity of this topic, it should come as no surprise, that experts in this field have created many neural network architectures to solve the problem described above. For example, the

ResNet neural network is a classical pre-trained network. It's often used as a basis for solving image recognition problems.

Also widely known is the convolutional neural network AlexNet, having a major impact on the development of machine learning, especially on computer vision algorithms.

However, the best results in solving problems of recognition of educational programs are the convolutional model VGG16 (Visual Geometry Group 16). In addition, it is easier to use. The model was suggested by K. Simonyan and A. Zisserman from the University of Oxford in the article "Very Deep Convolutional Networks for Large-Scale Image Recognition". The model achieves 92.7 % accuracy when tested on the ImageNet dataset for object recognition in an image. This dataset consists of more than 14 million images belonging to 1000 classes.

The model architecture is showed in Fig. 1.

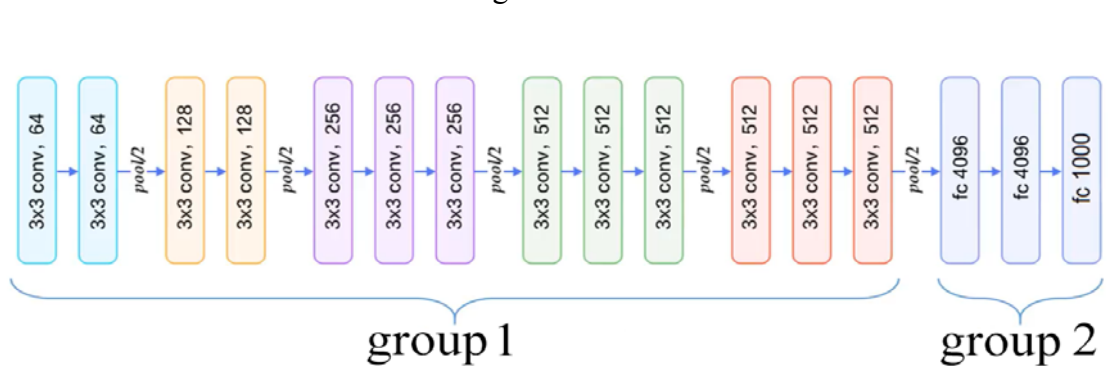


Fig. 1. The architecture of the network model VGG16.

The model layers are divided into two groups: group 1 is responsible for highlighting the characteristic features of the image, and group 2 is intended for defining an object based on data obtained from the layers of the first group. This group of layers is usually modified depending on the task. This network is suitable for solving problems of recognizing documents in students portfolios.

To train a neural network, a dataset is used – a selection of images that correspond to the topic of the problem. The best solution is to compile your own dataset, this increases the accuracy of the network after training. In this case, it is not possible to create your own data set, so the training will use the RVL-CDIP (Ryerson Vision Lab Complex Document Information Processing) dataset, which contains 400,000 black-and-white images of scanned documents divided into 16 categories.

To improve the accuracy of determining the scanned document type, the original VGG16 model underwent various modifications: the size and order of layers were changed. The best results in testing were shown by a network consisting of 23 layers: 13 convolutional, 5 pooling, 1 converting, 1 thinning, and 3 fully connected. With this set of layers, the network classifies scanned images with an accuracy of 90 %, which is quite high. The test result is shown as a histogram in Fig. 2.

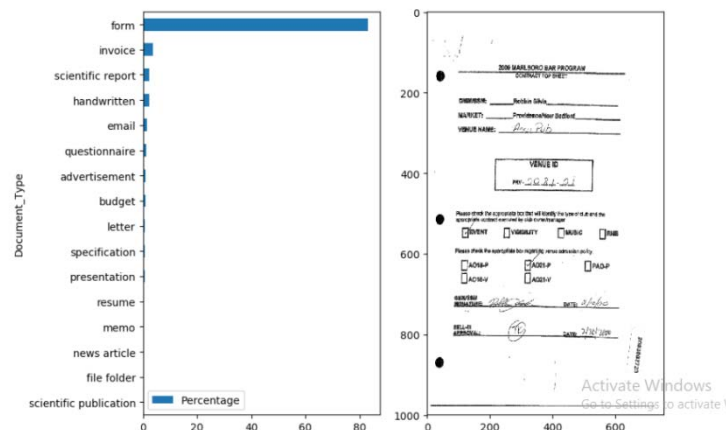


Fig. 2. The result of testing the neural network.

Thus, in practice, the problem of classifying scanned documents that students upload to their portfolio was solved.

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УДК 630.0

JUSTIFICATION OF SELECTION OF PARAMETERS OF CALCULATION TREE DURING DESIGN OF FELLING-MACHINE FOR FOREST THINNING

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The article provides the rationale for the choice of characteristics of the calculation tree for the felling machine, used while thinning. The categories and tree species common for Eastern Siberia are considered. A graph of the dependence of the heights of trees on their mass characteristics is given.

Keywords: forest thinning, tree, felling-machine.

ОБОСНОВАНИЕ ВЫБОРА ПАРАМЕТРОВ РАСЧЕТНОГО ДЕРЕВА ПРИ ПРОЕКТИРОВАНИИ ВАЛОЧНЫХ МАШИН ДЛЯ РУБОК УХОДА

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В статье приведено обоснование выбора характеристик расчетного дерева для валочной машины, которая применяется на рубках ухода. Рассмотрены распространенные для Восточной Сибири разряды и породы деревьев. Приведен график зависимости высот деревьев от их массовых характеристик.

Ключевые слова: рубки ухода, дерево, валочная машина.

When designing felling machines, there are questions about the choice of parameters of the calculation tree and some parameters of the technological equipment. To design a machine, it is necessary to determine the maximum possible mass of the calculated tree and its length. This data is a kinematic scheme while maintaining the stability of the felling machine during extreme operating conditions. [1].

Since larch, pine and spruce of II... IV categories are the most common tree species in the forests of Eastern Siberia; we consider the geometric parameters of these tree species presented in Table 1, while focusing on the maximum diameter at the height of the chest, which is 20 cm [2, 3].

Based on the data of Table 1, we determine the masses of trees based on the average value of their density by the formula:

$$m_t = V_t \cdot \rho_t, \quad (1)$$

were V_t – tree volume, m^3 ; ρ_t – tree density, kg/m^3 .

The spruce density is $550 kg/m^3$, pine – $600 kg/m^3$, larch – $700 kg/m^3$. We also determine the gravity by multiplying the mass by the acceleration of free fall. The obtained data summarized in Table 2.

Table 1

Geometric parameters of coniferous Siberia II... IV categories

Species of tree	Bonitet					
	II		III		IV	
	Height, m	Volume, m ³	Height, m	Volume, m ³	Height, m	Volume, m ³
Larch	23	0,360	20	0,320	17	0,280
Spruce	21	0,320	19	0,294	17	0,268
Pine	21	0,300	19	0,282	17	0,264

Table 2

Mass and weight of Siberian conifers II ... IV categories

Species of tree	Bonitet					
	II		III		IV	
	Mass, kg	Weight, N	Mass, kg	Weight, N	Mass, kg	Weight, N
Larch	252	2475	224	2200	196	1925
Spruce	176	1728	161,7	1588	147	1447
Pine	180	1768	169,2	1662	158	1555

For clarity, let us plot the dependence of the heights of trees on their weight (Fig. 1).

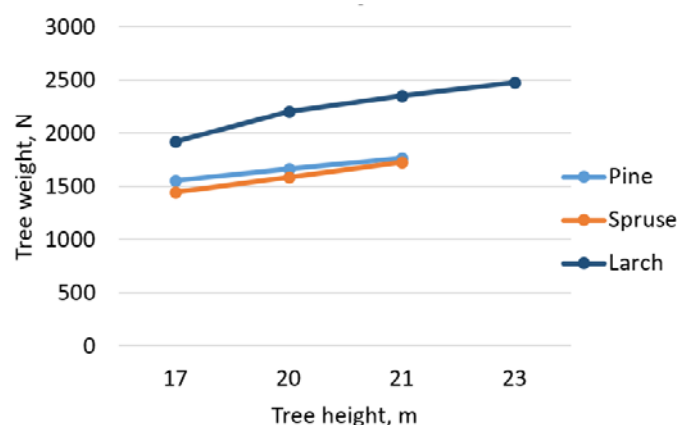


Fig. 1 – Graph of the dependence of the height of trees on their weight

Based on the results obtained, we conclude that the largest weight value, with a diameter at a chest height of 20 cm, is larch of 23 m height. It corresponds to the II category and the weight of the tree is 2475 N. According to this, to design a felling-machine, it is more expedient to take the parameters of the calculation tree corresponding to the larch of the II category with a diameter at the chest height equal to 20 cm.

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DEVELOPMENT OF A NETWORK TRAFFIC MONITORING SYSTEM BASED ON FLOW-PROTOCOLS

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A monitoring system based on Flow protocols has been developed and tested. The solution can be used to ensure the space industry networks security. The article describes the basic principles of system formation, as well as a general description of system operation.

Keywords: monitoring system, NetFlow, ELK (Elasticsearch, Logstash, Kibana) stack, visualization.

РАЗРАБОТКА СИСТЕМЫ МОНИТОРИНГА СЕТЕВОГО ТРАФИКА НА БАЗЕ FLOW-ПРОТОКОЛОВ

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Разработана и протестирована система мониторинга на базе Flow-протоколов. Решение может быть использовано для обеспечения безопасности сетей космической отрасли. В статье описываются принципы, на основании которых формировалась система, а также общее описание её работы.

Ключевые слова: система мониторинга, NetFlow, стек ELK, визуализации.

Introduction

According to a series of Cisco Information security reports [1], organizations principally focus on the border security. In inner net, the main measures are limited by safeguarding software installing. However, the attack vector of intruders is constantly changing by identifying the novel ways of breaking into the organization's framework, and bypassing a protection frame. In the space industry, the stable operation of IT networks is critically important; therefore, a tool for network traffic monitoring is extremely required to detect activity within the organization's framework in order to maintain the security threats detection within the local area networks that are missed by border protective means.

Data Source for Monitoring

As data source for monitoring, the following can be used:

- raw traffic with its further transmission to intrusion detection systems;
- event analysis from network devices;
- flow analysis [2].

In the first case, it is necessary to put sensors in network connection breakages to prevent protective means bypassing; thus, their number in the network becomes too large. Using network

devices events allows performing analysis after a recorded incident. It is possible to solve the problem of data source efficiency by analyzing traffic flows.

A General Description of Monitoring System

The physical scheme of the solution consists of a flow-enabled router which provides the concentration, and packet assembling into data flows, and further redirection to the NetFlow server, which performs the functions of network traffic concentrating and data holding, with its following analysis.

The collector and analyzer are based on the ELK stack (Fig. 1), which allows solution scaling «on fly» when adding a new network device, working with various data sources, and holding them by using a NoSQL database that is a part of the stack [3].

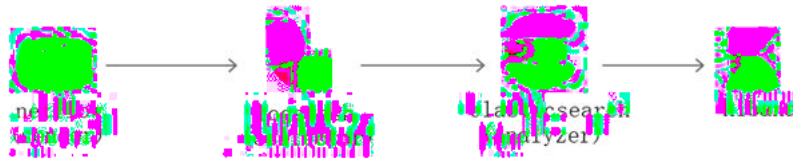


Fig. 1. Schematic representation of the solution

The collected metadata from the NetFlow protocol is processed by making changes to the configuration of the collector filtering section in order to obtain additional information that is later used as input data for analysis.

To detect security threats that have passed the perimeter, the solution functionality is supplemented with the ability to determine the reputation of source addresses and destination addresses. For this purpose, the solution was integrated with the Threat Intelligence data source. The MISP platform allows integrating third-party feeds [4], and Memcached acts as an intermediary between the data storage system and the Threat Intelligence platform. If collected data coincides with the data included in the feed blacklist, an event is recorded in the visualization by displaying the feed name and the name of client interacting with the malicious resource (Fig. 2).

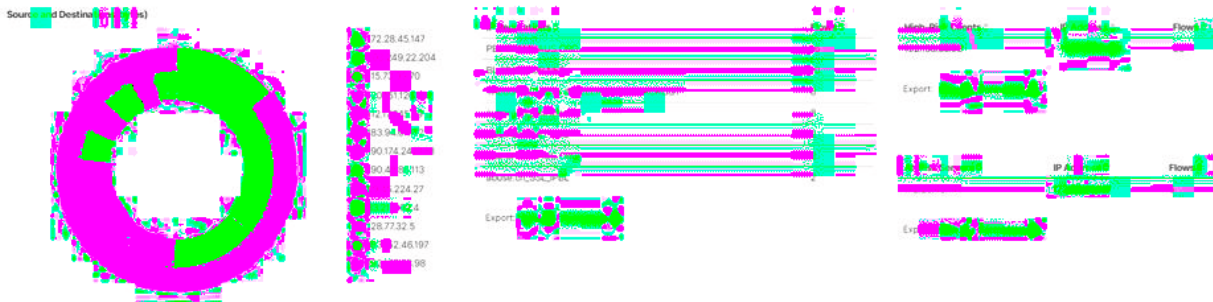


Fig. 2. Determining of source and destination addresses reputation

Additional Features of Monitoring System

Since the solution is based on the interaction of network devices, the performance of the web server and platforms within the ELK stack, it is necessary to monitor the availability of these components. Therefore, the system has been integrated with additional functionality that allows getting this kind of data, implemented through the protocols: SNMP, syslog, and the Beats platform.

Testing of Monitoring System

The system was tested by generating data using the iperf3 utility [5], followed by comparing of transmitted and received information volume within the deployed monitoring system. The results are shown in Fig. 3. Thus, we can talk about the correctness of data collection within the system.

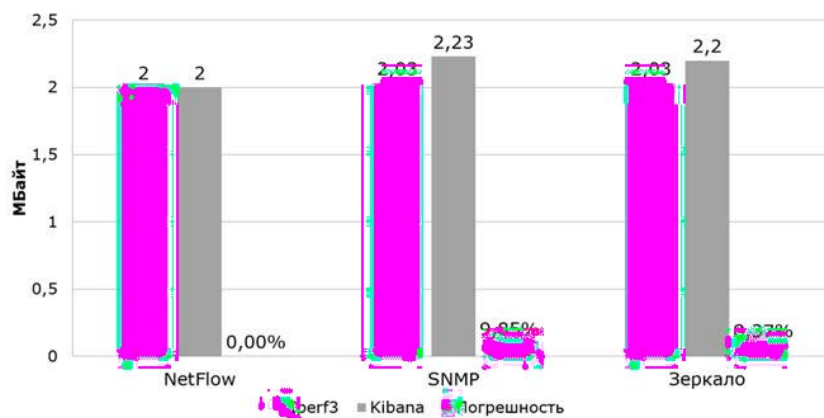


Fig. 3. Results of monitoring system testing

Conclusions

In the course of the work, a monitoring system with the ability of proactive threats tracing (when traffic from a flow-enabled network device is used as a data source) was developed and tested. This system solves the problem of detecting suspicious activity within the organization's framework.

The advantages of this device are opened program code and integration with the Threat Intelligence platform for automatic security threats searching in the collected traffic.

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FEASIBILITY ESTIMATION OF USING OF THE HURST EXPONENT FOR THE PROBLEM OF AUTOMATED EEG SIGNALS DIFFERENTIATION

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This paper reveals an automatic pathology detection method based on electroencephalogram (EEG) fractal analysis. The main idea of these method is using of topological (fractal-scaling) signs for processing algorithms for signals at low S/N ratio.

Keywords: electroencephalogram, EEG processing, fractal analysis, Hurst exponent.

ОЦЕНКА ВОЗМОЖНОСТИ ИСПОЛЬЗОВАНИЯ ПОКАЗАТЕЛЯ ХЕРСТА ДЛЯ ЗАДАЧИ АВТОМАТИЧЕСКОЙ ДИФФЕРЕНЦИАЦИИ ЭЭГ-СИГНАЛОВ

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В статье рассмотрен метод автоматического выявления патологий на основе фрактального анализа электроэнцефалограмм (ЭЭГ). Основная идея метода – использование топологических (фрактально-масштабных) признаков для использования в алгоритмах обработки сигналов с низким отношением сигнал / шум.

Ключевые слова: электроэнцефалограмма, обработка ЭЭГ, фрактальный анализ, показатель Херста.

EEG is a low-cost and non-invasive method to monitor brain activity. On the other hand, recording, processing, and analyzing EEG signals are time-consuming activities. Clinical neurologists and good knowledge are required to analyze EEG data. Automated medical diagnosis of various diseases such as cerebral hemorrhage, depression, stroke, Alzheimer's disease and epileptic seizures is currently the most explored area [1].

The improvement of technologies for recording and storing data has entailed the need to process a large amount of information, including medical information. Many statistical methods have been proposed for data analysis, such as correlation analysis, regression analysis, frequency analysis, discriminant analysis, analysis of variance, multivariate scaling, factor analysis, cluster analysis [2]. In this study, we used correlation analysis based on the fractal theory over Hurst exponent estimations. The key point of fractal approach is processing of signal exclusively in the space of fractional measure with the use of the scaling hypothesis and distributions with heavy-tailed or stable distributions (non-Gaussian) [3].

The TUH EEG Event Corpus V1.0.0 was used in the experiments in this study, contains sessions that to contain events, associated with epilepsy, including periodic lateralized epileptiform

discharge (PLED), generalized periodic epileptiform discharge (GPED), spike and slow wave discharges (SPSW), artifact, and eye movement [4]. This is a subset of the TUH EEG Corpus [5]. Table 1 shows event-based distribution of the files in the experiment subset.

Table 1

Basic descriptive statistics about the data in the experiment

Events	Number of files
Norm	325
Generalized periodic epileptiform discharge	73
Periodic lateralized epileptiform discharge	67
Spike and slow wave discharges	32

The preprocessing of the raw EEG signals contains seven stages:

Stage 1: The EEG signals from electrodes are converted to a TCP montage.

Stage 2: The signal preprocessing was performed, which included removing of last rows containing zero-values at the end of some files.

Stage 3: Each EEG record was divided into a sequence of fixed-size windows (window width ~ 8 seconds). For each window a label was set (norm or pathology).

Stage 4: For each window, the Hurst index (H) was calculated. For the estimation of the Hurst exponent, the Rescaled range analysis method was applied [6]. Calculations of Hurst exponent H showed that average Hurst index values for the pathological conditions under consideration GPED and PLED is higher than in the norm.

Stage 5: As the size of the database is too big, the new, smaller subset for the experiments was constructed.

Stage 6: The new data set were randomly split to produce a training set, 75 %, and a testing set, 25 %.

Stage 7: Once the preprocessing is done, the result are fed to a support vector machine (SVM) classifier and Logistic Regression classifier. A grid search with cross-validation method is applied to find the optimal parameters of the SVM and Logistic Regression classifiers.

Table 2 shows the confusion matrix of the system using the SVM classifier. The accuracy of SVM was 0.57.

Table 2

Confusion matrix of the SVM

	Targets			
		Normal	Abnormal	
Predictions	Normal	25	36	Precision = 0.41
	Abnormal	15	44	
		Sensitivity=0.63	Specificity=0.55	Accuracy = 0.57

Table 3 shows the confusion matrix of the system using the Logistic Regression classifier. The accuracy of the Logistic Regression classifier is 0.69.

Table 3

Confusion matrix of the Logistic Regression classifier

	Targets			
		Normal	Abnormal	
Predictions	Normal	35	23	Precision =0.60
	Abnormal	14	48	
		Sensitivity =0.71	Specificity=0.68	Accuracy = 0.69

From the Table 2 and Table 3, we find that the Logistic Regression classifier outperformed the SVM. All the performance measures were better for Logistic Regression classifier.

This work, the problem of two-class classification (norm, pathology) was solved using a publicly available set of EEG records (TUH EEG CORPUS). The EEG signals were preprocessed and their fractal characteristics based on fractal-scaling (topological) methods were estimated. Then the result was fed to the Logistic Regression classifier and SVM model. Experimental results showed that the Logistic Regression classifier outperformed the SVM for all the performance measures.

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APPLICATION OF THE DECISION ALGORITHM FOR CONSTRUCTING THE OPTIMAL ROUTE

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This article discusses the application of a decision-making algorithm for constructing an optimal route. Formally, the generalized criterion, additive convolution.

Keywords: decision-making algorithm, optimal route construction, optimization problems, formally generalized criterion, additive convolution.

ПРИМЕНЕНИЕ АЛГОРИТМА ПРИНЯТИЯ РЕШЕНИЙ ДЛЯ ПОСТРОЕНИЯ ОПТИМАЛЬНОГО МАРШРУТА

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В данной статье рассматривается применение алгоритма принятия решений для построения оптимального маршрута. Формально обобщенный критерий, аддитивная свертка.

Ключевые слова: алгоритм принятия решений, построение оптимального маршрута, задачи оптимизации, формально обобщенный критерий, аддитивная свертка.

The decision-making process can be carried out through the thinking of PLRs and experts, using mathematical methods and computers. System analysis and decision-making can be directed to various current tasks: from solving problems that arise during the operation of aviation system facilities, to calculating optimal criteria for constructing a route[1].

In systems theory, the method of constructing a generalized criterion is used to solve multi-criteria decision-making problems. Such a construction is understood as a procedure that synthesizes a set of estimates based on given criteria, called in this case private or local criteria, into a single numerical estimate that expresses the final utility of this set of estimates for the LPR. A formally generalized criterion is a function of the values of the components of the vector criterion

$$\varphi: \prod_{j=1}^m Y_j \rightarrow R,$$

where Y_j is the set of estimates for the j -th criterion

Thus, setting a generalized criterion reduces the problem of multi-criteria optimization to the problem of single-criteria optimization. The main problem is the construction of such a function, called "convolution". The solution to this problem is carried out in 4 stages:

- 1) Justification of the permissibility of convolution.
- 2) Normalization of criteria for their comparison.
- 3) Determining the relative importance of the criteria.
- 4) Construction (selection) of the convolution function [4].

Since the particular criteria have different physical nature and different dimensions, it is necessary to move on to dimensionless relative indicators of the form:

$$y_j^{норм} = \frac{y_j}{y_j^0},$$

where y_j^0 is some "ideal" value of the j -th indicator.

The choice of the normalizing divisor is subjective and should be justified in each specific case. The following approaches are possible:

- a) $y_j^0, j = \overline{1, m}$,
- б) $y_j^0 = \max_{a \in D} y_j$,
- в) $y_j^0 = y_j^{\max} = y_j^{\min}$.

Then

$$y_j^{норм} = \frac{y_j - y_j^{\min}}{y_j^{\max} - y_j^{\min}}.$$

The importance vector of the criteria is formed: $\lambda = (\lambda_1, \dots, \lambda_m)$

$$\sum_{j=1}^m \lambda_j = 1$$

The importance is determined either through formal procedures or with the involvement of experts and additive convolution is used:

$$y = \sum_{j=1}^m \lambda_j y_j,$$

where λ_j is the importance of the j -th criterion, determined at the previous stage.

Convolution principle: fair compensation of absolute values of normalized partial criteria. A fair compromise should be considered if the total level of absolute decrease in the values of one or more criteria does not exceed the total level of absolute increase in the values of other indicators. It is also formally permissible to reduce one or more values of particular criteria to zero [2].

The considered method can be applied in different subject areas. The author has developed an application that implements this method in order to choose the optimal route, taking into account the user's personal preferences. This approach can be applied to the development of a decision support system designed to help the user to develop an optimal route, which can mean not only the movement of the user from point to point [3].

Taking into account the current trends in technology development, the software was implemented as a web application using the following software tools

- PHP programming language (7.0);
- PostgreSQL DBMS (9.2);
- OSPanel web server assembly;
- graphical client for PostgreSQL pgAdmin management;
- dynamic environment for web development Brackets [5].

Thus, the theory of decision-making allows in the process of analysis to develop such algorithms and criteria that adapt to the specifics of the problem.

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COLLECTIVE METHODS FOR SOLVING CLASSIFICATION PROBLEMS

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The main methods of forming collective decision-making methods are considered, and the effectiveness of their application for the classification problem is studied. Some ways of optimizing teams are also considered.

Keywords: stacking, boosting, bagging, ensemble, brute force, genetic algorithm.

КОЛЛЕКТИВНЫЕ МЕТОДЫ ДЛЯ РЕШЕНИЯ ЗАДАЧ КЛАССИФИКАЦИИ

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Рассмотрены основные способы формирования коллективных методов принятия решений, исследована эффективность их применения для задачи классификации. Также рассмотрены некоторые способы оптимизации коллективов.

Ключевые слова: стекинг, бустинг, бэггинг, ансамбль, метод полного перебора, генетический алгоритм.

One of the main issues when working with an applied problem is the choice of a method for solving it. In most cases, it is not obvious from the analysis of the input data which method will provide the desired efficiency. Then it makes sense to build compositions of algorithms (ensembles) in which the errors of individual algorithms are mutually compensated [1].

The collective decision-making method is a method based on several basic algorithms used to improve the efficiency of problem solving.

The use of collective methods is one of the most researched areas of machine learning and data mining, as it is a relatively young area, and it is not fully studied and theoretically justified [2, 3].

The main ways of forming teams are: stacking, boosting, bagging. Let's take a closer look at each of these methods.

«Bootstrap aggregating» in English means combining the results with different input data.

Basic agents in bagging are trained in parallel. The general bagging scheme is clearly shown in Fig 1.

The basic idea of bagging is that all the basic agents of the team are trained on random samples of formed bootstrap methods [4]. The procedure for forming a team using the begging method is described in more detail in the article [5].

Boosting or improvement in translation from English is a method of consistently building a collective. The general scheme for forming a collective using the boosting method is shown in Fig. 2.

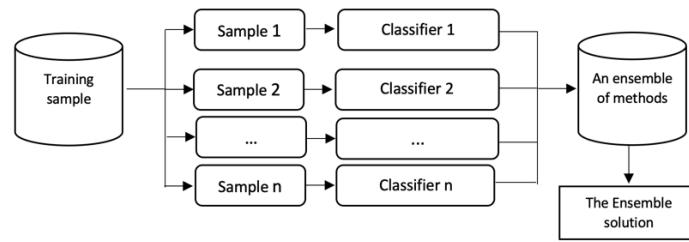


Fig.1. Bagging scheme

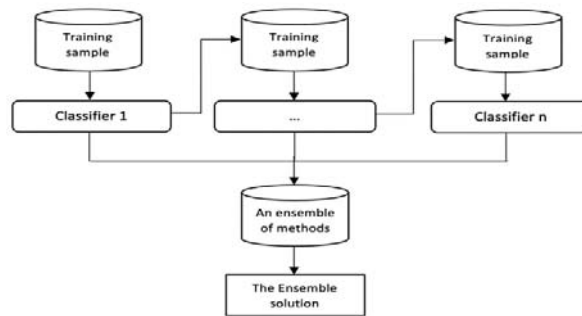


Fig. 2. Boosting scheme

The main idea of the method is that each subsequent team agent is applied to the results at the output of the previous one. That is, the agent joining the team is trained on a set of data formed from a training sample with increased weights of objects in which the previous agent made a mistake [6]. In more detail, the procedure for forming a team using the boosting method is described in the article [7].

Stacked generalization is a method of building a team, the main idea of which is to combine several weak participants and train them with a meta-learning algorithm [4]. The scheme of forming a team of stacking methods is shown in Fig 3.

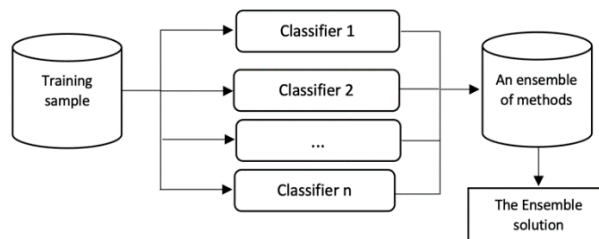


Fig. 3. Stacking scheme

For more information, the procedure for forming a team using the stacking method is described in the article [8].

In this paper, we use 2 optimization algorithms to adjust the parameters of the collectives: the genetic algorithm(GA) and the brute force method.

GA is used to optimize the composition of teams formed by stacking and bagging methods.

GA optimizes the composition of the team according to the following algorithm:

- 1) Initializes a population consisting of individuals;
- 2) The individual is fed to the input of the function in which the collective output procedure is implemented and imposes a certain mask on the composition of the ensemble. The rule for forming the composition of the ensemble is as follows: 1-the method is included in the composition, 0 – not included. Then the classification is carried out by the ensemble and its accuracy is considered;

3) The stop criterion is checked, if it is met, the best individual and team with the optimal classification accuracy is determined, solves the problem, and then the algorithm is completed. If the stop criterion is not met the transition to the next step takes place;

4) Selection, recombination, mutation procedures are carried out and a new population is created;

5) The population is evaluated [1].

The algorithm will terminate when the specified number of iterations has been completed.

To find the optimal number of agents used in the formation of the team by the boosting method in terms of classification accuracy, the brute force method was used in this work.

Team optimization is implemented using the following algorithm:

1) The results of the classification of the basic agents in the training sample in the form of lists and the number of agents used in the formation of the team $i=1$ are passed to the function that implements the brute force method;

2) A team is formed from the $i+1$ base agent;

3) The formed team solves the problem, then its classification accuracy is calculated and stored;

4) The stop condition is checked, that is, it is checked from how many agents the team is formed, if $i \geq 10$, then the iterative process ends and the optimal number of agents is selected based on the accuracy of the classification according to the test data set. If $i < 10$, then $i = i+1$ and step 2 is repeated [1].

In this paper, 6 types of boosting are implemented, consisting of: k -nearest neighbor methods, decision trees, support vector methods, linear classifiers, neural networks and a forest of random trees, collectives made decisions by majority vote, 8 types of stacking: majority voting, weighted voting, meta – algorithm nearest neighbor method, meta – algorithm decision trees, meta – algorithm support vector method, meta – algorithm linear classifier, meta – algorithm neural networks, meta-algorithm- The algorithm is a random forest of trees and 2 types of bagging: majority voting, weighted voting.

12 tasks were selected for testing the ensembles, the results of 1 of them are presented in Table.

The database "Bank Marketing Data Set" contains 20 attributes: age, type of work, marital status, whether there is a loan, whether there is a housing loan, etc. The number of instances is 4119. When solving the problem, it was necessary to determine whether the client would create a term deposit.

Table 1

Results of solving the problem

	Mean value	Max value	Min value	Ensemble	Opt_Ensemble	Cntr_Ensemble
Stacking (M_Vote)	0,895	0,909	0,171	0,907	0,916	0,909
Stacking (W_Vote)	0,895	0,909	0,171	0,911	0,917	0,909
Stacking (Knn)	0,897	0,900	0,664	0,922	0,923	0,920
Stacking (Tree)	0,895	0,906	0,820	0,913	0,916	0,910
Stacking (Svm)	0,897	0,901	0,838	0,906	0,920	0,910
Stacking (Network)	0,892	0,906	0,617	0,899	0,923	0,915
Stacking (Forest)	0,892	0,909	0,592	0,918	0,923	0,915
Bagging (M_Vote)	0,897	0,908	0,836	0,916	0,923	0,909

Bagging (W_Vote)	0,897	0,908	0,836	0,910	0,914	0,908
Bagging (Knn)	0,902	0,906	0,895	0,907	0,910	0,910
Bagging (Tree)	0,877	0,890	0,864	0,889	0,889	0,888
Bagging (Svm)	0,890	0,890	0,890	0,890	0,890	0,890
Bagging (Linear)	0,897	0,904	0,892	0,911	0,917	0,899
Bagging (Network)	0,855	0,840	0,620	0,841	0,847	0,870
Bagging (Forest)	0,900	0,909	0,894	0,903	0,904	0,911

Based on the table above, we can draw the following conclusions: all collective methods for solving this problem give results no worse than the best of the basic agents. Also, most optimized collective methods (12 out of 15) give better results than non-optimized ones.

It is important to note that among stacking collectives, the best result in solving this problem is given by stacking with the k-nearest neighbor meta-algorithm, among bagging, a collective that makes majority voting decisions, among boosting, a collective from a forest of random trees.

The best result is obtained by the collective formed by the stacking method with the k – nearest neighbor meta-algorithm. The worst of all is boosting from decision trees.

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IMPROVING THE METHODOLOGY FOR DETECTING NETWORK TRAFFIC ANOMALIES USING WAVELET TRANSFORMS

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The main focus is on testing the effectiveness of using wavelet analysis to study network traffic. Development of a technique for detecting network traffic anomalies based on the wavelet transform and its implementation in the Kibana system is considered.

Keywords: wavelet analysis, attack, network security.

СОВЕРШЕНСТВОВАНИЕ МЕТОДИКИ ВЫЯВЛЕНИЯ АНОМАЛИЙ СЕТЕВОГО ТРАФИКА ВЕЙВЛЕТ-ПРЕОБРАЗОВАНИЯМИ

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Основное внимание уделяется проверке эффективности применения вейвлет-анализа для исследования сетевого трафика. Рассматривается разработка методики выявления аномалий сетевого трафика на основе вейвлетпреобразования и его внедрение в систему Kibana.

Ключевые слова: вейвлет-анализ, атака, сетевая безопасность.

Introduction

Nowadays network security is a topical issue to everyone who processes data in computer networks. Attackers attempt to get an unauthorized access to network resources, therefore disrupting the integrity, confidentiality and accessibility of data.

According to the document of FSTEC [1] the requirement to attack detection is obligatory, and corresponding methods of invasion detection to the network must be implemented in order to disclose abnormal activity of network traffic. This article deals with the use of anomaly detection method based on Wavelet analysis, which makes it possible to check whether normal or abnormal traffic is transmitted in the network.

Wavelet analysis

Wavelet analysis is a mathematical tool for presenting signals in the form of sum of «short waves» (surge) [2]. Wavelet transform is capable of simultaneously maintaining temporary and frequent signal of information. This method exhibits high response, but has Type I errors, for compensation of which an automatic implementation was used for visual assessment. Such an approach is relevant to monitoring systems of network traffic, including Kibana as well, and requires less effort on the development in comparison with more complex systems.

The study on the effectiveness of the use of Wavelet analysis for network traffic examination

As part of the goal set, traffic graphs with no anomalies and with anomalies were designed for the network traffic (Fig. 1, Fig. 2).

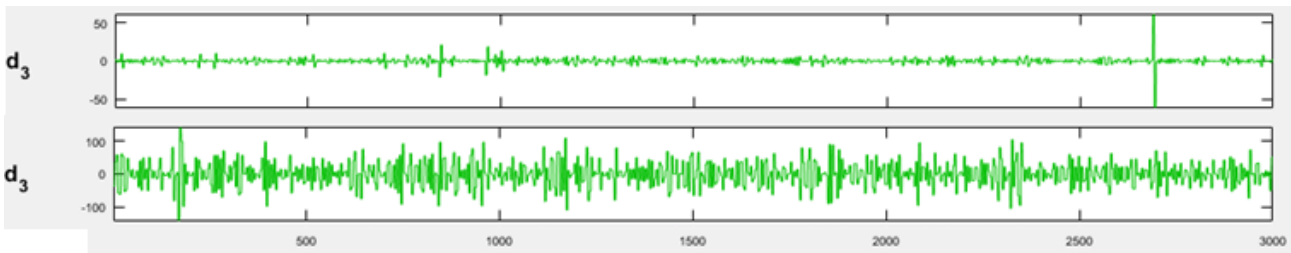


Fig. 1. Graphs of traffic without anomalies and with anomalies of Wavelet Haar

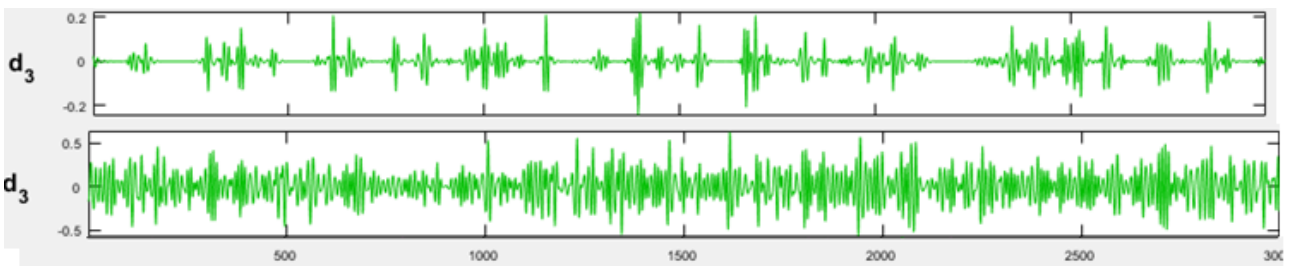


Fig. 2. Graphs of traffic without anomalies and with anomalies of Wavelet Coifman

Proceeding from the received results, a conclusion was drawn, that reviewed analyzers of traffic may be used to all existing means of anomaly detection as means of data processing, since the analysis of reviewed components of network traffic on the presence of anomaly is ongoing.

Approbation of network traffic anomaly detection method

Further, to evaluate threshold values to detect anomalies of network traffic with the help of Wavelet analysis quantitative criteria were considered. To examine network traffic on statistical criteria a software was developed for probation of Wavelet decomposition value. Based on conducted research a methodology was developed on two criteria of Fisher and Cochran Cox [3] and it was introduced to Kibana monitoring system. Also, the proposed method was tested for the percentage of Type I and Type II errors, of which Type I errors were 11-14 %, Type II errors were 11-21 %, which, as a result, has a lower percentage of errors in comparison with the use of other criteria or these criteria, but separately.

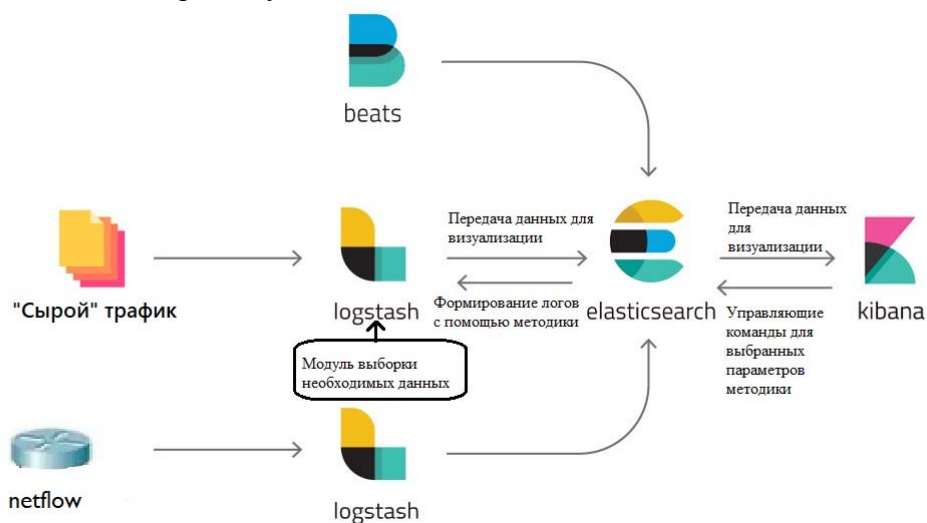


Fig. 3. Kibana methodology implementation

The developed methodology was implemented into the Kibana network monitoring system. The implementation model of the methodology is shown in Fig. 3. By separate processing in Elastic search, a separate processing log is created based on the initial data. The processed initial data through the console and visualization are displayed in the form of graphs with indication of threshold values for detecting network traffic anomalies.

Next, via the Kibana visualization tool, network traffic was analyzed with a time interval of 1 hour for TCP, ICMP, UDP traffic using statistical criteria. In Fig. 4 the distribution of statistical coefficients for detecting anomalies in TCP traffic is shown.

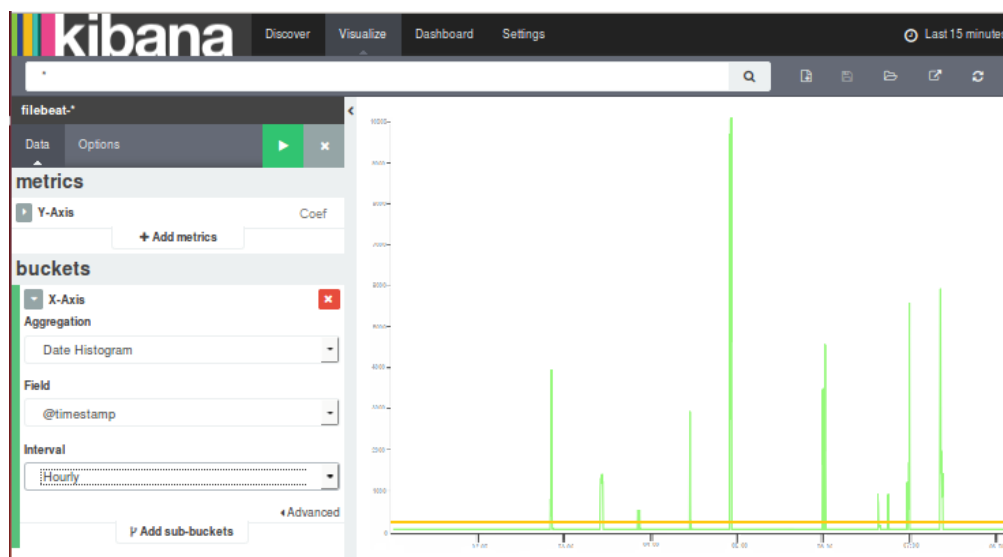


Fig. 4. TCP traffic methodology based evaluation

Conclusions

Based on the reviewed works, we conclude that the proposed method combines an automatic tool for calculating threshold values, tracked in a visual form by some parameters based on the selected best parameters of Wavelet analysis of time series with the possibility of a detailed assessment of threshold values by several statistical criteria; and successfully implemented to the Kibana monitoring system.

Therefore, the application of the Wavelet analysis method is relevant and effective for network traffic anomalies search.

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APPLICATION OF RECOMMENDATION SYSTEMS IN COMMERCIAL ACTIVITIES

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This article reviles the problem of offering products through the use of recommendation systems. The most popular types, algorithms, and frameworks for writing recommendation systems are described.

Keywords: IT, customer relationship management system, Framework, Database, MySQL, Recommendation system, Big Data.

ПРИМЕНЕНИЕ РЕКОМЕНДАТЕЛЬНЫХ СИСТЕМ В КОММЕРЧЕСКОЙ ДЕЯТЕЛЬНОСТИ

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В данной статье затрагивается проблема предложения товаров путем использования рекомендательных систем. Описываются наиболее популярные типы, алгоритмы и фреймворки для написания рекомендательных систем.

Ключевые слова: IT, система управления взаимоотношениями с клиентами, фреймворк, база данных, MySQL, рекомендательная система, Big Data.

Nowadays a lot of companies' services that were previously available only when the user visited a place, can be obtained without leaving home almost anywhere in the world. This was made possible by the growth of Internet technologies. These days a lot of people shop online, watch movies, cartoons and TV shows, watch various videos, for example on YouTube, anywhere they are. And for each user it is required to show what will be most interesting to him.

In order to increase the number of sales and views and companies' revenue, it's important to offer goods and services to each person individually. Otherwise users can leave the company's platform if they are offered something that they are not interested in. To solve this problem, there are recommendation systems that allow to offer each user something that may interest him.

Recommendation systems are a set of algorithms, programs, and services, the task of which is to predict what may interest a particular user. The work is based on the information about a person's profile and other data. If for small platforms, where the number of products and services is limited to thousands, one can use the usual sorting, where the user himself can find the product or service that interests him, then for large quantities, for example, the online store Aliexpress, each user is required to offer goods individually. The vivid example of a recommendation system is Tik-Tok.

For the first few days users see in the feed everything, but in the future, it will only be shown what the user is interested on the basis on their ratings of the video that were shown earlier [1].

There are 4 types of recommendation systems: collaborative filtering, content-based, knowledge-based, and hybrid.

1) Collaborative filtering is a system that is based on the history of ratings of both the user and the others. In the second case, we consider people' recommendations whose interests are similar to yours;

2) Content-based is a system that is based on knowledge about the users that are collected when we search for something on the Internet, write in messages, comments, visit different websites. That is, any data that can be collected is used;

3) Knowledge-based systems are based on knowledge of a particular area, such as products or users. For example, when buying a computer, you may be offered related products such as a keyboard, mouse, monitor, etc.;

4) Hybrid systems are the systems that use a combination of several algorithms within a single platform, allowing to minimize the problems of previous systems [2].

Various algorithms are used to write recommendation systems. In collaborative filtering, there are two basic methods: user orientation and product orientation. In the first case, it involves offering products that were purchased by users with similar tastes. The second one assumes the offer of products that were similar to those selected by other users.

Big Data technologies are used for processing big data. For example, we can consider two frameworks for data collection, storage and processing – Hadoop and Spark. Hadoop consists of 4 components: a distributed file system, an algorithmic approach to data processing, a system for scheduling tasks and managing cluster resources, and a set of common utilities and libraries. Spark is a framework for parallel and distributed processing and analysis of data in RAM. The main advantage of it is a high performance [3].

Thus, using a combination of recommendation systems and data processing technologies, one can get recommendations in various areas of human activity. For example, recommendations when choosing a product or service for a regular user.

The recommendations can also be useful in commercial activities. For example, when developing an information system for accounting for defects in motor vehicles.

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AUTOMATION OF HOTEL ROOM MANAGEMENT PROCESSES

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This article defines the importance of automating the business processes of hotel room management.

Keywords: automation, number of rooms, hotel, software.

АВТОМАТИЗАЦИЯ ПРОЦЕССОВ УПРАВЛЕНИЯ НОМЕРНЫМ ФОНДОМ ГОСТИНИЦЫ

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В данной статье определяется важность автоматизации бизнес-процессов управления номерным фондом гостиницы.

Ключевые слова: автоматизация, номерной фонд, гостиница, программное обеспечение.

The introduction of information technologies is actively carried out in all areas of human activity, and the development of such technologies is very dynamic [2]. Almost all organizations or institutions have special software that automates most of the work with information.

Currently, almost all people travel, and it does not matter whether it is a vacation or just a business trip, in any case, you always need to stay somewhere. That is why hotels were created so that people could easily stay and spend the night anywhere in the country or even the world. The hotel business is a rather promising and rapidly developing industry [5]. The number of new hotels is growing every year. Therefore, the development of an automated information system for the hotel business is relevant.

A modern hotel is a complex of functional links, on the coherence of which the success of the existence of the enterprise in the market actually depends. Taking into account the current trends in the field of hospitality and competition, which is increasing, the need to ensure the efficiency and accuracy of the staff work and the hotel complex as a whole increases. The solution to this problem is possible only through the introduction of hotel automation systems, that is, the introduction of Automated Control Systems (ACS) by the hotel administration [4].

The activity of the software is planned to be organized as follows: the mini-hotel will provide rooms to customers for a certain period of time. Each room is characterized by capacity, comfort and price. To accommodate a person, a hotel administrator have to collect certain information (last name, first name, patronymic, phone number for communication), as well as additional data. A

person is checked into a room only if there are available rooms. The date of arrival must be recorded, as well as the date of release of the room must be noted when leaving the hotel.

In order to implement all the plans, one needs a common database that will include all the necessary information for the full operation of the program. Such a program will be able to automate the work with big information data, as well as optimize the working time of employees. The process of accounting and data analysis of the mini-hotel will be automated.

For the developed software product, it is necessary to determine the main functions that it should provide to users in order to improve the quality of input/output, storage and processing of information, and to ensure the convenience and speed of reporting and scheduling.

The information system must have the following functionality:

- ensuring information concerning:
- employees;
- available/occupied / booked rooms;
- clients;
- the price category of rooms;
- the comfort of the rooms;
- the occupancy rate of the rooms;
- the receipt of payment from customers;
- search for information on the main positions;
- customer registration;
- sorting information by selected fields;
- filtering table entries by specific parameters;
- creating visual information in the form of reports and graphs;
- data archiving.

In addition, it is necessary to ensure the availability of:

- a detailed help system (the "Help" menu option for working with the system, contextual help, etc.);
- user-friendly and intuitive user interface;
- installation file;
- an auxiliary file must be attached to the program, which will describe in detail the procedure for launching the application and working with it.

Automated workstations are connected by a local computer network, providing comprehensive management of all departments and services of the hotel.

The core of the hotel automation system is the Room Fund Module (APM porter), the main tasks of which are the following:

- submission of a request with information about the reservation (name and coordinates of the guest, terms and parameters of the reservation, its ID);
- search for a number that meets the request, its reservation;
- arrival of a client, his/her identification and registration;
- control of regular maintenance (cleaning, press delivery, breakfast, etc.)
- information about payment for accommodation, services, deposits made (guest account balance);
- a warning about the expiration of the period of residence and the procedure for eviction and settlement, or an extension of the deadline for providing accommodation services.

The tools of a typical automated management system include information storage, multi-dimensional analytical processing tools MOLAP, and a library of standard reporting and analysis forms. In addition, such systems contain a Business Intelligence system designed to perform multidimensional analysis and strategic business planning across the entire enterprise. The use of such set of tools allows to get the necessary information in a timely manner for marketing and strategic analysis of the company's activities in order to expand the market share, increase revenue and increase the occupancy rate of the hotel.

To evaluate the performance of a hotel, the business analytics system uses key performance indicators used in the hotel industry, such as average revenue per room (RevPAR), average revenue per guest (RecPAC), and average vacation rate (ADR). In addition, the system allows to consider the performance indicators of the enterprise in various cross-sections with flexible information detailing capabilities [6].

Thus, modern integrated automated management systems that combine all the vital elements of the hotel business into a single cycle, ensure minimization of profit losses at all stages, effectively control the work of staff, and improve the quality of service.

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PECULIAR FEATURES OF THE SWIFTUI FRAMEWORK FOR DEVELOPING CROSSPLATFORM APPLICATIONS IN APPLE'S ECOSYSTEM

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The main features of developing cross-platform applications using the SwiftUI framework, which allows defining a single code base for various devices in Apple's ecosystem are described.

Keywords: SwiftUI, Swift, cross-platform, iOS, UIKit, macOS, iPadOS, tvOS.

ОСОБЕННОСТИ ИСПОЛЬЗОВАНИЯ ФРЕЙМВОРКА SWIFTUI ПРИ РАЗРАБОТКЕ КРОССПЛАТФОРМЕННЫХ ПРИЛОЖЕНИЙ В ЭКОСИСТЕМЕ APPLE

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Описаны основные особенности разработки кроссплатформенных приложений с помощью фреймворка SwiftUI, который позволяет определять единую кодовую базу для различных устройств в экосистеме Apple.

Ключевые слова: SwiftUI, Swift, cross-platform, iOS, UIKit, macOS, iPadOS, tvOS.

Nowadays, mobile application development is becoming more popular every year. The size of the mobile apps market in 2020 was approximately \$170 billion and this figure is rising steadily every year [1]. Because the market is growing developers need technologies which simplify the development of the same application for different devices.

To increase the speed of development, frameworks are being created for developing cross-platform applications that can run on various devices: laptops, smartphones, watches, and TVs.

Using cross-platform frameworks allows developers to write less code. Developers use a single codebase that can be used across multiple platforms. SwiftUI is one of the cross-platform frameworks, which provides a toolkit for creating user interfaces for macOS, iOS, iPadOS, and tvOS.

SwiftUI is a development of Apple Corporation [2]. This framework was shown at WWDC in 2019. This framework has the following characteristic features:

- previewing and live previewing for rapid UI development;
- writing less code to achieve the desired result;
- it uses declarative syntax for the user interface;
- WidgetKit requires SwiftUI for creating widgets;
- common tools and APIs are used for all Apple's devices;
- it can be integrated with UIKit using UIHostingController;

- mechanisms for reactive programming such as Combine;
- native on all Apple platforms, so applications directly access the proven technologies of each platform with a small amount of code and an interactive design canvas [2];
- automatic support for Dynamic Type, Dark Mode, and localization.

The main features of SwiftUI are preview, live preview (Fig. 1), and declarative approach to building the user interface. The preview technology allows to conduct simple experimentation with UI under development without deploying the application to the device or simulator. Under the hood, this technology renders the view to a static image, which allows to immediately update the view's state based on changed code. On the other hand, live preview runs some variant of the simulator, runs the application as a context, and injects current PreviewProvider [3]. That's why all run-time features work [3].

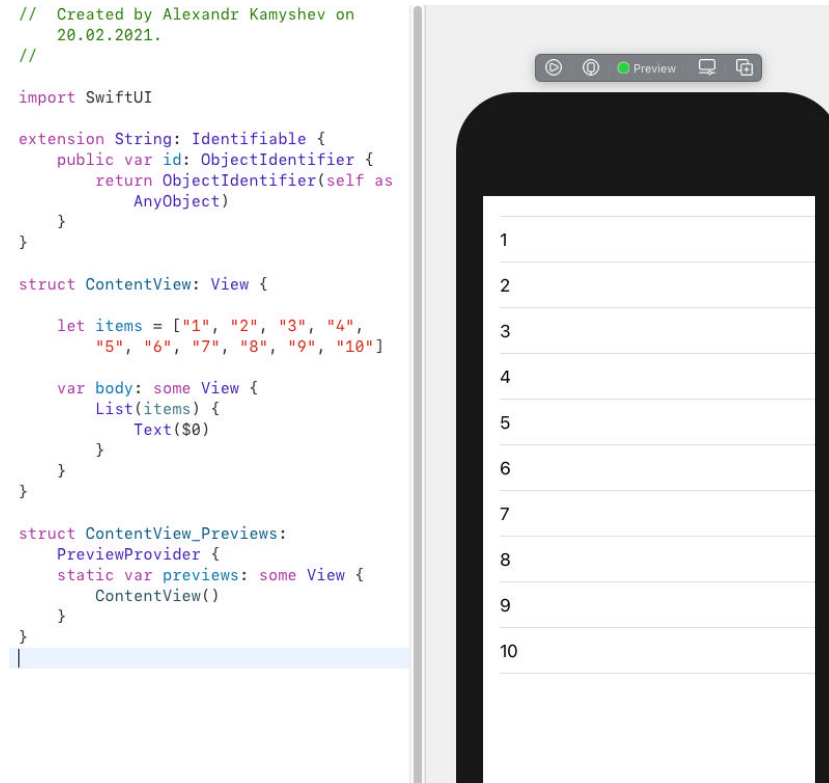


Fig. 1. Live preview

Before SwiftUI, developers used UIKit for iOS and tvOS applications, AppKit for macOS applications, and WatchKit for watchOS. All of these UI-frameworks use imperative programming [4]. This programming paradigm uses statements that change a program's state. In contrast to UIKit and Appkit, SwiftUI uses a declarative programming paradigm. This approach expresses the logic of a computation without describing its control flow [5]. This approach is being used by SwiftUI for building the user interface.

The declarative approach provides simplicity to layout and composes views on the screen (Fig. 2). A developer just defines the composition of views with animations. View in SwiftUI is a struct, so it eliminates overhead with dynamic message dispatch and reduce memory allocations.

- This cross-platform framework has the following drawbacks:
- SwiftUI can be used from the iOS 13 and up, so users on older operating systems can't use the application;
- SwiftUI was released two years ago, therefore a small number of articles and programming courses on the internet;
- best practices are not yet formed [6];
- some features are only available in UIKit.

```

struct CategoryRow: View {
    var categoryName: String
    var items: [Landmark]

    var body: some View {
        VStack(alignment: .leading) {
            Text(categoryName)
                .font(.headline)
                .padding(.leading, 15)
                .padding(.top, 5)

            ScrollView(.horizontal, showsIndicators: false) {
                HStack(alignment: .top, spacing: 0) {
                    ForEach(items) { landmark in
                        CategoryItem(landmark: landmark)
                    }
                }
            }
        }
        .frame(height: 185)
    }
}

```

Fig. 2. Example of view

SwiftUI was built on decades of experience in creating the most innovative and intuitive user interfaces in the world [2]. Apple is developing new features to SwiftUI every year on WWDC. In 2020 on WWDC Apple releases the new SwiftUI features: views which simplify the user interface, and possible to write an entire application on SwiftUI.

SwiftUI is the future of Apple's development. It's a new completely different approach to create the user interface. Many developers found this approach very attractive to side-projects also some companies are writing internal applications on this framework. So, after a couple of years, SwiftUI will be the standard for Apple's ecosystem.

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ORGANIZATION OF SECURE DATA TRANSFER IN A WEB-ORIENTED FILE SYSTEM

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This article reviles the problem of data encryption when transmitting data over a network. Various security protocols and their vulnerabilities are considered. The operation algorithm of the proprietary encrypted data transmission protocol is given.

Keywords: IT, JavaScript, PHP, data base, MySQL, data protection, internet, security protocols.

ОРГАНИЗАЦИЯ БЕЗОПАСНОЙ ПЕРЕДАЧИ ДАННЫХ В ВЕБ-ОРИЕНТИРОВАННОЙ ФАЙЛОВОЙ СИСТЕМЕ

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В данной статье затрагивается проблема шифрования данных при передаче по сети. Рассматриваются различные протоколы защиты и их уязвимости. Также приведен алгоритм работы собственно разработанного протокола передачи данных с шифрованием.

Ключевые слова: IT, JavaScript, PHP, база данных, MySQL, защита данных, интернет, протоколы защиты.

Nowadays, the task of maintaining the confidentiality of information and its secure transmission through communication channels is very actual. It can be achieved by using secure data transfer protocols. The most popular of these was SSL (Secure Socket Layer) [1], but in 2014 the US government pointed out its vulnerability (CVE-2014-3566) and it was replaced with a more secured one – TLS (Transport Layer Security) [2]. Now this protocol is widely used in applications running on the Internet (for example, web browsers). TLS protocol is based on SSL version 3.0. The latest protocol's update is documented in RFC 5246 (August 2008) and RFC6176 (March 2011).

TLS provides a protection against unauthorized eavesdropping of transmission packets. TLS (like SSL) uses asymmetric encryption to obtain the secret session key and symmetric encryption in subsequent data exchange.

For secure data transmission, the following steps are used (TLS Handshake):

- the client's request for a secured connection to the server;
- the process of sending to the server a list of supported encryption algorithms and hash functions by the client;

- the process of selection the supported and the most secure algorithms by the server;
- the process of sending the authentication certificate and public key to the client by the server;
- the client's validation of server certificate;
- the creation of a common session key for data encryption (transmitted using asymmetric encryption – RSA or Diffie-Hellman algorithms).

The exchange of keys is as follows: after establishing a connection and agreeing on all algorithms the client generates a symmetric key, signs it with the previously received public key and sends it to the server. In turn it is decrypted with the help of the private key on the server. It concludes the exchange.

A pair of keys (private and public) are used only in the TLS Handshake procedure, then the session symmetric key is used for encryption.

An important point is the authentication of the public key. If the algorithm is not implemented correctly and if a self-signed certificate is used, then the so-called "middleman attack" will be possible (or another name for it is "man in the middle", hereinafter referred to as MITM) [3]. Its essence is in the fact that an attacker gains access to the communication channels and secretly relays packets, replacing them with his own. To counter this, mutual authentication is used. TLS can use authentication with a mutually trusted Certification Center for this (it is not used with self-signed certificates).

This type of the attack starts with listening to communication channels and extracting useful information that can be used to modify packets later. An example of such an attack is shown below.

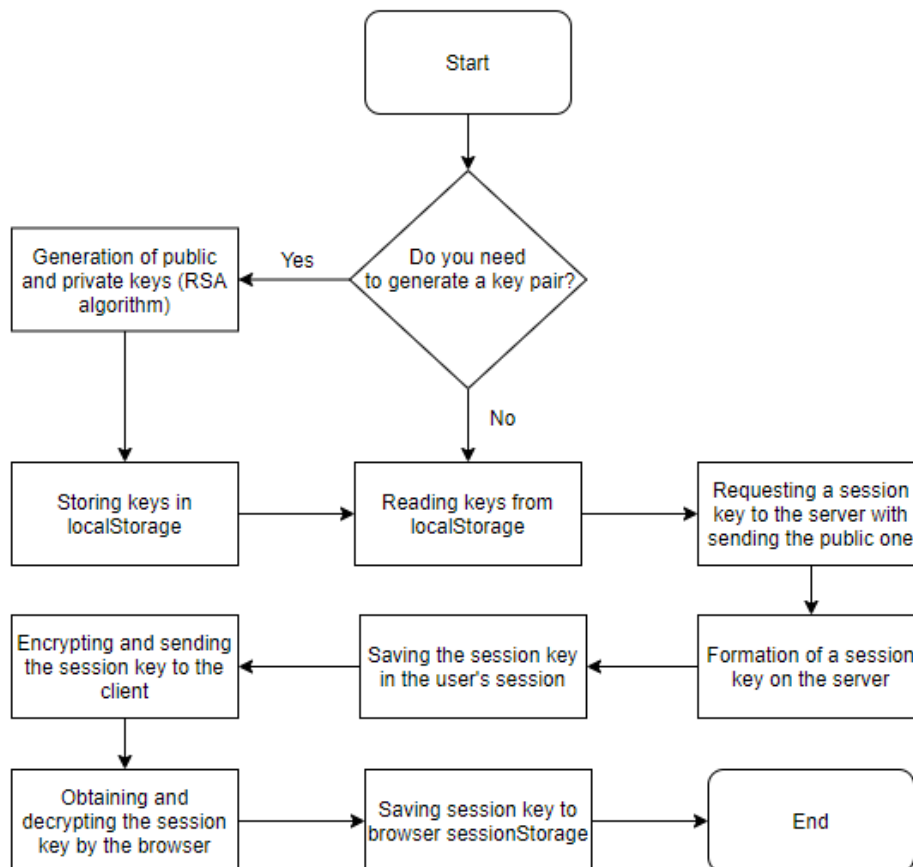


Fig. 1. Internal algorithm for secure data transmission.

The client tries to communicate with the server, but instead of this connects to MITM, which presents itself as a client and generates its own key pair (private and public) and sends its public key to the server. Next, MITM establishes a connection with the server and presents itself as a client,

having received a public key from it. If the client and server do not have the ability to validate the keys, then MITM will be able to redirect information from the client to the server (and vice versa), distorting it. This is possible if the server, for example, uses a self-signed key.

In Russia the hardware and software products of the InfoSec's ViP Net company, certified by the FSB and FSTEC, are very popular and are used to transfer personal data.

Currently, not all sites use valid certificates and secure connections. To ensure secure data transfer, the "File System for Web-Based OS" project uses its own additional encrypted data transfer protocol. SSL / TLS can be used on the top of it (which is desirable).

The description of the developed algorithm of the internal protocol for secure data transmission:

- initially, the browser (client) runs the handshake function. After the first launch this function, using the RSA algorithm (using the jsencrypt [4] library), generates a pair of client keys (private and public) and stores them in the browser storage (window. Local Storage). Next, the "handshake" sends a request to the server to obtain a session symmetric secret key with the sending of the public key;

- the server generates a random symmetric key, which is saved in the created session (in PHP) and send it to the browser in encrypted form using the public key;

- the browser decrypts the received session key using the private key and stores it in the browser session (window. Session Storage), this completes the "handshake";

- then the exchange of the data in both directions is carried out using symmetric key encryption (it is created for the duration of the current session, when creating a new session, a new key is generated for the client).

The described project uses AES-256-CBC as a symmetric encryption algorithm (on the client side, the crypto-js library [5] is used, on the server side – the PHP OpenSSL module).

This protocol allows to protect data additionally (especially important when a secure communication channel is not used). Data encryption and decryption work automatically. So the so-called proprietary AJAX server is used for this process (classes written in PHP).

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TRANSACTION MECHANISMS OF DBMS

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The paper discusses the mechanism of transaction and properties of transactions. The four isolation levels of ANSI/ISO standard SQL 92 are presented. We give the conclusion on the operation of transactions based on the difference in implementing transactions in DBMS: PostgreSQL 10, MS SQL Server 2019, MySQL 8.0.

Keywords: database, transaction, ANSI/ISO standard SQL 92, save point, DBMS, PostgreSQL 10, MS SQL Server 2019, MySQL 8.0.

МЕХАНИЗМЫ ТРАНЗАКЦИЙ СУБД

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В данной статье рассматривается механизм работы транзакций, свойства транзакций. Представлены четыре уровня изолированности в стандарте ANSI/ISO SQL 92. Рассмотрены отличия реализации транзакций в СУБД: PostgreSQL 10, MS SQL Server 2019, MySQL 8.0. Приведен вывод по работе транзакций рассматриваемых СУБД.

Ключевые слова: база данных, транзакция, SQL, ANSI/ISO стандарт SQL 92, точка сохранения, СУБД, PostgreSQL 10, MS SQL Server 2019, MySQL 8.0.

Databases (DB) are an important part of an information system. When operating a multi-user database, it is necessary to provide simultaneous access to data for many users. During simultaneous work of users (parallel work), the results of calculations may depend on the temporal relationships between users' actions, at what time and in what sequence they were performed. The transaction mechanism solves the problem of parallel operation in DB. A transaction is a set comprising one or more atomically performed database operations. There are two options for processing a transaction: either all set operations occur, or none of them occurs. Database Management System (DBMS) usually allow the user to set less stringent restrictions to overlap the operations of two or more transactions. Basic SQL interface considers each SQL command as a separate transaction. Transactions have the following four properties:

The atomicity property of a transaction requires that all operations of a transaction be completed, if not, the transaction is aborted. In other words, a transaction is treated as single, individual logical unit of work.

Database consistency is the property that every transaction sees a consistent database instance. In other words, execution of a transaction must leave a database in either its prior stable state or a new stable state that reflects the new modifications (updates) made by the transaction.

Isolation property of a transaction means that the data used during the execution of a transaction cannot be used by a second transaction until the first one is completed.

The durability property of transaction indicates the performance of the database's consistent state. It states that the changes made by a transaction are permanent [1].

The possibility of parallel execution of concurrent transactions at various isolation levels allows application developers to increase the number of concurrent transactions, storing them correctly. Four isolation levels are defined in the ANSI/ISO standard SQL 92.

READ UNCOMMITTED – transactions running at this level do not issue shared locks to prevent other transactions from modifying data read by the current transaction. Also, transactions are not blocked by exclusive locks at the time of data modification, thus allowing other transactions to read the modified data which is not yet committed.

READ COMMITTED – transactions issue exclusive locks at the time of data modification, thus not allowing other transactions to read the modified data that is not yet committed. The Read Committed isolation level prevents the Dirty Read issue. However, data can be changed by other transactions between individual statements within the current transaction, resulting in a Non-repeatable Read or a Phantom Row.

REPEATABLE READ – statements cannot read data that has been modified but not yet committed by other transactions. No other transaction can modify data that has been read by the current transaction until the current transaction completes.

SERIALIZABLE – statements cannot read data that has been modified but not yet committed by other transactions. No other transactions can modify data that has been read by the current transaction until the current transaction completes. Other transactions cannot insert new rows with key values that would fall in the range of keys read by any statements in the current transaction until the current transaction completes.

Modern database management systems have the functionality of the basis SQL standard, but in addition they include their own mechanisms for dealing with transactions. We will analyze the capabilities of the transaction mechanism of the following DBMS: PostgreSQL 10, MS SQL Server 2019, MySQL 8.0

PostgreSQL uses a specific approach to transaction processing in databases. The data is not written to disk immediately, but only reflected in the “current” status information which is stored in the database. Committing a transaction permanently fixes the consequences of the command in the current state of the database. PostgreSQL uses the Multi-Version Concurrency Control (MVCC) mechanism to execute SQL commands in deferred transactional blocks.

A transaction in PostgreSQL comprises a set of SQL commands surrounded by BEGIN and COMMIT commands. PostgreSQL actually processes each SQL statement as a transaction. Since version 8.0, save points (SAVEPOINT) have become available in the DBMS, which allow selectively undo some parts of a transaction and commit all the rest [2].

PostgreSQL implements the ANSI/ISO SQL 92 isolation levels, but it has stricter requirements for READUNCOMMITTED than the standard. Reading dirty data is prohibited at this level. PostgreSQL uses the READCOMMITTED isolation level by default.

MS SQL Server offers many tools to control transaction behavior. The transaction is defined at the level of the database connection and is automatically closed when the connection is closed. MS SQL Server supports three types of transaction definition: explicit, automatic and implicit.

By default, MS SQL Server works in automatic transaction start mode, when each command is considered as a separate transaction. When a user needs to create a transaction that includes several commands, he must explicitly specify the transaction. Explicit transactions require the user to specify the start and end of the transaction.

MS SQL Server supports the save point mechanism. DBMS saves the state of the transaction at the current point and assigns the saved state the name of the save point.

Besides the four ANSI/ISO SQL 92 levels, MS SQL Server has an additional SNAPSHOT level. This level implies that the transaction sees the state of the data that was recorded before launching and the changes it made to itself. It behaves as if it received a snapshot of the database data at startup and works with it. Unlike SERIALIZED, SNAPSHOT does not use locks, but as a result, committing may not be possible if a concurrent transaction has changed the same data earlier. In this

case, the second transaction, when attempting to COMMIT, will generate an error message and will be canceled. MS SQL Server uses READ UNCOMMITTED isolation level by default [3].

In MySQL, transactions are only supported by InnoDB tables. MyISAM tables do not support transactions. By default, MySQL runs in transaction autocomplete mode. Given the atomicity of the transaction, each request in this case is considered as a separate transaction and therefore it is immediately confirmed upon completion. In the first case, it includes each subsequent request in an implicit transaction, in the second, the instruction marks the start of a new transaction.

MySQL supports SAVEPOINT. If the current transaction already has SAVEPOINT with the same name, then the previous SAVEPOINT is removed and it installs a new one. All SAVEPOINTS of current transactions are deleted if COMMIT or ROLLBACK is executed [4].

MySQL supports all ANSI/ISO SQL 92 isolation levels for InnoDB tables. The REPEATABLE READ isolation level is the default in MySQL.

Unlike other DBMSs, MySQL gives users the choice of working with slower tables that support transactions, or faster tables that don't use transactions.

The comparison of transaction mechanisms of DBMS are presented in Table 1.

Table 1

Comparison of transaction mechanisms

Criteria	PostgreSQL 10	MS SQL Server 2019	MySQL 8.0
Support of the transaction mechanism	Full	Full	InnoDB tables only
SAVEPOINT support	Supported	Supported	Supported
Support of ANSI/ISO SQL 92 isolation levels	Supported four isolation levels of ANSI/ISO standard SQL 92, but with some differences	Supported four isolation levels of ANSI/ISO standard SQL 92, as well as an additional 5-th LEVEL SNAPSHOT	Supported four isolation levels of ANSI/ISO standard SQL 92
Types of transaction definition	Explicit, Auto Commit, Autonomous	Explicit, Auto Commit and Implicit	Explicit, Auto Commit
Data access technologies	MVCC	ACID, MVCC	MVCC (InnoDB tables only)

Based on a review of transaction mechanisms implemented in the database engine, it can be said that in the database PostgreSQL and MS SQL Server support the most complete transactional mechanisms. MySQL DBMS provides the user with a choice to use tables with a transaction mechanism or not, since transactions are unnecessary in all areas of use of DBMS.

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METHODS OF DIRECT THERMAL TO ELECTRIC ENERGY CONVERSION

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This article is devoted to the study of ways to convert thermal energy. Basic concepts and methods have been studied. The types of alternative sources, their advantages and disadvantages are considered.

Keywords: conversion, energy, thermal, electrical.

СПОСОБЫ ПРЯМОГО ПРЕОБРАЗОВАНИЯ ТЕПЛОВОЙ ЭНЕРГИИ В ЭЛЕКТРИЧЕСКУЮ

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Эта статья посвящена изучению способов преобразования тепловой энергии. Изучены основные понятия и методы. Рассмотрены виды альтернативных источников, их достоинства и недостатки.

Ключевые слова: преобразование, энергия, тепловая, электрическая.

The purpose of our research is to analyze the design features and methods of heat energy conversion. The level of this research is theoretical. The novelty of the research lies in the use of modern methods and technologies, modern equipment, and analysis of the features of the transformation process.

The development of science and technology has led to the formation of new areas of application of thermal power sources that meet such requirements as high efficiency and high power density, high reliability and long service life, safety and ease of use, etc.

Direct conversion of various energies implies that various types of energy (thermal, light, chemical, etc.) are directly converted into the electrical energy, bypassing the mechanical energy stage, and thereby simplifying the design and expanding the thermoelectric functionality of the installation. This is the importance of our subject.

1. Radioisotope thermoelectric generators are used in space solar technologies, where the use of solar panels is inefficient or impossible. The radioisotope thermoelectric generator is a radioisotope thermal source of electricity. It uses thermal energy that is released during the natural decay of radioactive isotopes and converts it into electricity using a thermoelectric generator. The radioisotope thermoelectric generators are the main source of energy in spaceships [1].

2. Thermogenerators are a special device for increasing the efficiency of using the heat of exhaust gases. In diesel ship engines, about 40 % of the heat is carried away by hot exhaust gases.

One of the solutions for efficient utilization of exhaust gases is the use of thermal generators based on the exhaust gases heat energy. The system uses thermogenerator modules. Their work is based on semiconductor elements. The thermoelements surface temperature increases due to convection heat transfer. The thermojunction temperature is lowered due to fresh water. These actions lead to a temperature difference between the cold and hot thermoelements junctions, where an electromotive force occurs, due to the thermoelectric effect. The efficiency of the thermal converter is 8-12 % [2; 86].

3. There are also devices that are used in aircraft. They power electrical equipment. According to this method, electrical energy is generated by the exhaust gas in the turbine, and the temperature is lowered by a cool fluid medium, such as cold air. . The efficiency of this method varies from eight to fifteen percent, power up to 7000 W, voltage up to 300 V [3; 8].

In conclusion, we have made a theoretical analysis of the direct conversion of thermal energy into electrical energy. We found that the energy efficiency of converting thermal energy into electrical energy can be 8-47 % W with a power of 0.1 million W – 7000 W. We have studied the main research directions in this scientific field and methods of converting thermal energy into electrical energy for the space industry on the basis of semiconductor materials (samaric sulphide, bismuth, antimony, indium).

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PROBLEMS OF CYBERSECURITY IN THE REGULATORY FRAMEWORK OF THE RUSSIAN FEDERATION

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Recently Russia has formed and continues to improve the regulatory framework for ensuring information security, has adopted laws regulating public relations in this area, and has developed mechanisms for their implementation. These processes are accompanied by an increase in scientific publications on these themes. However, there are quite a lot of problems and all of them require coverage and solutions. The article considers a range of cybersecurity issues that need to be reflected in the regulatory framework of the Russian Federation.

Keywords: cybersecurity, regulatory framework, artificial intelligence, problems.

ПРОБЛЕМЫ КИБЕРБЕЗОПАСНОСТИ В НОРМАТИВНО-ПРАВОВОЙ БАЗЕ РФ

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На сегодняшний день в России сформирована и продолжает совершенствоваться нормативно-правовая основа обеспечения информационной безопасности, приняты законы, регламентирующие общественные отношения в этой сфере, разрабатываются механизмы их реализации. Эти процессы сопровождаются ростом научных публикаций на эту тему. Однако, проблем достаточно много и все они требуют освещения и решения. В статье рассмотрен круг проблем кибербезопасности, которые требуют отражения в нормативно-правовой базе РФ.

Ключевые слова: кибербезопасность, нормативно-правовая основа, искусственный интеллект, проблемы.

Theory and practice of ensuring homeland security is becoming quite relevant in connection with the widening of the range of sorts of security. To this date, Russia has formed and continues to improve the regulatory framework for ensuring cybersecurity, laws have been adopted that regulate public relations in this area, and mechanisms for their implementation are being developed. Work on formation and development of national cyber and telecommunication security continues nationwide. These processes are accompanied by the growth of the number of studies on this subject. However, there are a lot of problems and all of them require background research and solutions.

Experts are looking into the development of the legal framework in the field of cybersecurity [1]. The authors have considered issues that are subjected to debate. These include issues of legal

and organizational problems of introducing artificial intelligence technologies into legal circulation. There are problems of the formation of cybersecurity in the practical application of artificial intelligence [1].

There are other problems, which A.V. Zhogal describes [2]. The author examines a list of relevant problems that obstruct the effective provision of cybersecurity in the Russian Federation. These are:

- risks associated with the possibility of using information to achieve geopolitical goals that are contrary to international law to the detriment of international security;
- an increase in the number of cases of impact on the information infrastructure for military purposes;
- strengthening of information and psychological impact on Russian society.

It should be noted that international legal norms regulating international relations in the infosphere have not yet been developed, which complicates the formation of a system of legal regulation of cybersecurity in the Russian Federation. Experts note that cybersecurity plays an important role in the life of not only the entire state, but also that of citizens [3].

The essence of cyberattacks lies in the ability to read, modify or simply destroy classified information. Experts say that “The problems of cybersecurity in our country are especially acute, particularly because there is no thoroughly developed legal basis. Practically, there is currently no systematic approach to internal Russian cybersecurity. For example, the issues of a timely and adequate response to essentially criminal actions in computer networks, the use of the Internet for criminal purposes are not spelled out in detail and are not supported by specific laws” [3].

D.N. Shchedrin [4] looking into the legal aspects of cybersecurity in the Russian Federation, notes that “to this date an essential condition for the development of the information society is cybersecurity, which can include an almost endless list of security problems and their solutions, ranging from technical to legislative ones”.

The development and adoption of the Cybersecurity Strategy is the basis of the solution of legal issues of cybersecurity, this is stated at the highest level: Russia needs a proven strategy to fight against cybercrime. Today only the Concept of the Cybersecurity Strategy of the Russian Federation is available for study in open sources. Other states have made significant progress in this direction. For example, the UK adopted the Cybersecurity Strategy back in 2016. It is worth noting that the UK Cybersecurity Strategy contains not only general concepts, goals and objectives, but also programs to curb cybercrime, a list of persons who can conduct cyberattacks is indicated. Furthermore, some of the theses that are written in this strategy are supported by real examples from world practice.

To conclude, there is a long-felt need to develop a legal framework for cybersecurity. This should be a multi-level system (personal security, state security, world community security). The legal framework of the Russian Federation should be based on interaction in this matter with world standards, that is, a comprehensive approach to the problem should be taken. Experts note that “in modern conditions, cybersecurity issues go from the level of information protection at a separate computer facility to the level of creating a single cybersecurity system as an integral part of the information and national security of each state” [4]. Attention should be paid to the formation of a culture of cybersecurity in relation to the regulatory framework, which indicates a multidisciplinary approach to solving problems.

The Russian Federation currently has a rather extensive structure for ensuring national security, however, the digitalization processes of all industries dictate further improvement. This is the goal for the next two years.

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REFRIGERATED SALMON STORAGE ROOM

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This article is devoted to the design of a cold storage room for salmon. The necessary calculations are presented to achieve this goal. The importance of the refrigeration industry for the country's security is shown.

Keywords: cold storage room, heat gain, storage

ХОЛОДИЛЬНОЕ ПОМЕЩЕНИЕ ДЛЯ ХРАНЕНИЯ ЛОСОСЯ

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Данная статья посвящена проектированию холодильного помещения для хранения лосося. Представлены необходимые расчеты, чтобы достичь поставленной цели. Показана важность холодильной промышленности для безопасности страны.

Ключевые слова: холодильное помещение, теплоприток, хранение

The purpose of our research is to design a cold storage room for storing food, namely salmon. It is necessary to solve several problems – to carry out the following calculations:

1. thermal insulation thickness;
2. heat leakage;
3. external wall heat gains;
4. floor heat gains;
5. heat gains as a result of air exchange;
6. lighting heat load;
7. heat gain from persons;
8. heat gain from equipment;
9. product load;
10. heat gain from the container;
11. safety factor;
12. refrigeration cycle.

The level of our research is theoretical and practical. The relevance of the research lies in the fact that each product requires certain storage conditions and proper refrigeration equipment.

The novelty of the study lies in the use of modern refrigeration technologies, modern refrigeration equipment and analysis of the distinctive features of the food cooling process.

The Russian union of refrigeration industry enterprises is the main association of enterprises and organizations in the refrigeration, cryogenic and climate industry, which includes large

engineering companies, manufacturers of refrigeration and cryogenic machines and equipment, ventilation systems, research organizations, educational institutions and specialized departments with which the union has agreements on cooperation [1, 237].

This branch of mechanical engineering in Russia is an important link in the country's national security, because its products are used in almost all sectors of the economy: agriculture, defense, rocket and space complex, oil and gas, chemical sector, medicine, trade, etc [2, 116].

As a test task, a cold storage room for 200 tons of salmon was designed in the city of Kurilsk.

Fresh fish is stored in special chambers in wooden boxes. The loading rate is $450\text{kg} / \text{m}^3$.

Storage conditions are: the relative humidity in the chambers is 95 %, the air circulation is artificial air cooling. For fish storage, the recommended storage temperature is -2°C . Containers are wooden boxes.

As a result of solving the test problem, a storage room for refrigerated salmon was designed. This is a three-chamber refrigerator with a temperature in the chambers of -2°C . The total floor area is 312m^2 . The refrigerant is R404a.

The compressor was selected using the Bitzer equipment selection program.

A 4GE-23Y-40P semi-hermetic reciprocating compressor with a cooling capacity of 75.2 kW and a power consumption of 19.78 kW was chosen.

The evaporator was selected using the Guntner equipment selection program. Two 20 kW GACVRX 40 1JF / 4A-70A and GACVRX 40 1FF / 2A-70A evaporators were chosen.

The capacitor was selected using the Guntner equipment selection program. The 95 kW GCHCRD 080.2/13-59-0183083M capacitor was chosen.

Thus, we would like to note that we have found a constructive solution for the cold storage of salmon with the use of modern equipment. This solution ensures stable storage conditions and product quality.

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MODERN AIR CONDITIONING SYSTEMS FOR INDUSTRIAL BUILDINGS

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This paper considers and analyzes the current state of air conditioning systems for industrial buildings. Key features of these systems are presented. An example of the industrial air conditioning system of the assembly shop is described.

Keywords: air conditioning system, industrial building, technological air conditioning, air parameters.

СОВРЕМЕННЫЕ СИСТЕМЫ КОНДИЦИОНИРОВАНИЯ ВОЗДУХА ДЛЯ ПРОМЫШЛЕННЫХ ЗДАНИЙ

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Данное исследование рассматривает и анализирует современное состояние систем кондиционирования воздуха для промышленных зданий. Рассматриваются ключевые особенности данных систем. Приводится пример описания системы промышленного кондиционирования цеха сборки.

Ключевые слова: система кондиционирования, промышленное здание, технологическое кондиционирование, параметры воздуха.

A modern industrial building, in addition to enclosing structures, includes a complex of various supporting systems (power supply, water supply, drainage, etc.). These systems are designed to increase production efficiency and create safe working conditions. One of these systems is the air conditioning system.

The purpose of this scientific research is to study the current state of air conditioning systems for industrial buildings. The paper considers and analyzes the issues of applied air conditioning technologies, design features of industrial air conditioners, development of the market of industrial air conditioning systems.

Industrial air conditioning systems are designed for rooms with an area of 300 m² and more and provide excess heat removal with a capacity of 25 kW. Industrial buildings use process air-conditioning systems. The purpose of such systems is to maintain the air parameters required for optimal support of technological processes (equipment assembly, milling, welding, soldering, electrical installation, etc.) [1]. Temperature, pressure, humidity, velocity are the main controlled parameters for air.

Industrial air conditioning systems are different from domestic ones. Industrial air conditioning systems have special requirements. The main requirement is to ensure a high level of reliability. The industrial production cycle depends on the reliability of the air conditioning system. Another special requirement is the ability to maintain a constant set temperature level in the production room with a minimum deviation [2].

As an example of an industrial air conditioning system, we can consider an air conditioning system in the assembly shop of various machines and units. It is important to maintain a constant ambient temperature level during assembly. Changing the air temperature will change the size of the parts (solids expand when heated), as the result the assembly will be inaccurate [3]. To ensure high assembly accuracy, it is necessary to use an air conditioning system that will ensure a constant air temperature.

The most commonly used industrial air conditioning technologies are: central air conditioning, chiller-fan coil systems, precision air conditioners. Daikin, Mitsubishi Electric and Fujitsu brands are currently represented on the market of industrial air conditioning systems in Russia. Such systems are designed for each specific case, taking into account the individual characteristics of an industrial building.

Thus, the current state of air conditioning systems for industrial buildings was considered in our research. The purpose of such systems is to maintain the air parameters required for optimal support of technological processes. This direction is currently relevant and promising in modern industry.

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AN OVERVIEW OF METHODS FOR THE ANALYSIS OF NATURAL LANGUAGE BASED ON MACHINE LEARNING MODELS

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The aim of this paper is to provide an introduction to methods for the analysis of natural language based on machine learning models. The research has been done on two natural language processing methods for disaster tweet data.

Keywords: bag-of-words, vector, model.

ОБЗОР МЕТОДОВ АНАЛИЗА ЕСТЕСТВЕННОГО ЯЗЫКА НА ОСНОВЕ МОДЕЛЕЙ МАШИННОГО ОБУЧЕНИЯ

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В данной работе рассматривается обзор методов анализа естественного языка на основе моделей машинного обучения. Проведены исследования двух методов обработки естественного языка для данных твитов о бедствиях.

Ключевые слова: мешок слов, вектор, модель.

Introduction

Natural Language Processing (NLP) is one of the most important areas of research in artificial intelligence. The origin of this direction is associated with the appearance of the first computers and with the idea that it would be good to use machines to solve useful problems related to the natural language in which people speak and write. Unstructured text data, such as the content of a book or tweet, are one of the most interesting sources of traits and one of the most difficult ones to process [1].

Description of the text vectorization methods

A bag-of-words. One of the most common methods for converting text to features is using the bag-of-words model. These models output a feature for each unique word in the text data, with each feature containing the number of occurrences in the observations. In practice, the bag-of-words model is mainly used for the formation of features. Based on the bag-of-words, various measures can be calculated that characterize the source text. Most often, the frequency of words is found from the bag-of-words, that is, the number of occurrences of each word in the entire text [2].

TF-IDF. Most mathematical models work in high-dimensional vector spaces, so you need to display text in vector space. The main approach is bag-of-words: a vector of the dictionary dimension is formed for the document, its own dimension is allocated for each word, the attribute of

how often the word occurs in it is recorded for the document, and we get a vector. The most common method for calculating a feature is TF-IDF (TF – term frequency, IDF – inverse document frequency). TF is calculated, for example, by the word occurrence counter. IDF is usually calculated as the logarithm of the number of documents in a corpus divided by the number of documents where this word is represented. Thus, if a word occurs in all documents in the corpus, then such a word will not be added anywhere. The advantage of the bag-of-words is the simple implementation; however, this method loses some information, for example, the word order [2].

Practical results

We applied two natural language processing techniques to disaster tweet data, such as bag-of-words and TF-IDF. Before applying the methods, we cleaned up the text. We applied concatenation and lemmatization, removed stop words and highlighted word stems. After applying the methods, we conducted training on classification models and determined the accuracy on each model. Accuracy is shown in table 1.

Table 1

Accuracy of natural language processing techniques

Model	Bag-of-words / <i>f-1 measure</i>	TF-IDF / <i>f-1 measure</i>
Random forest	0.78	0.74
AdaBoost	0.76	0.73
Logistic regression	0.80	0.77
KNN	0.72	0.65
Support vector machine	0.79	0.76
Bayes model	0.78	0.76
Bernoulli Bayes	0.79	0.74

Conclusion

The application of two natural language processing techniques to disaster tweet data, such as the bag-of-words and TF-IDF for encoding textual data into a numeric attribute, revealed the disadvantages and advantages of these methods. The disadvantage of these methods is the creation of unique features of words in the data, consequently our resulting matrices can have high dimensions. Dimension reduction techniques can be used to solve this problem. The advantage of these methods is good convergence in classification accuracy for logistic regression. For the bag-of-words, the *f-1* score of the measure is 0.80, and for the TF-IDF it is 0.77. When comparing the two methods, the bag-of-words is the best choice for disaster tweet data because the learning rate of the model is faster and the classification accuracy is 0.3 % higher.

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APPLICATION AND BENEFITS OF DIGITAL TWINS

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The article shows the relevance of using the "digital twin." The advantages of application of digital twins in various areas of human activity are described. The exemplary operation of the digital twin is also presented in stages and the design of the digital twin is considered.

Keywords: digital twins, benefits of digital twins, application of digital twins, creation of digital twins.

ПРИМЕНЕНИЕ И ПРЕИМУЩЕСТВА ЦИФРОВЫХ ДВОЙНИКОВ

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В статье показана актуальность использования «цифрового двойника». Статья описывает преимущества применения цифровых двойников в различных сферах деятельности человека. Так же поэтапно описана примерная работа цифрового двойника и рассмотрен его дизайн.

Ключевые слова: цифровые двойники, преимущества цифровых двойников, применение цифровых двойников, создание цифровых двойников.

The life of a digital twin begins when experts in applied mathematics or data science research the physics and operational data of a physical object or a system in order to develop a mathematical model that simulates the original.

A digital twin is a software analogue of a physical device that simulates internal processes, technical characteristics and behavior of a real object under conditions of impact and the environment [1].

An important feature of the digital twin is the fact that information from the sensors of a real device operating in parallel is used to set input influences on it.

The digital twin works in three stages: see, think, and do. As an example, the behavior cycle of a twin of one technological unit is considered.

The “see” stage means obtaining data about the situation. This information is of two kinds: operational data (for example, boiling point and any other internal factors) and data from the environment (external factors).

The next stage is "think", where the digital twin analyzes the information received and makes a decision that corresponds to the given technical and economic parameters, statistical data and conditions for the safe operation of the facility. In some cases, several options are worked out and the final choice is up to the person.

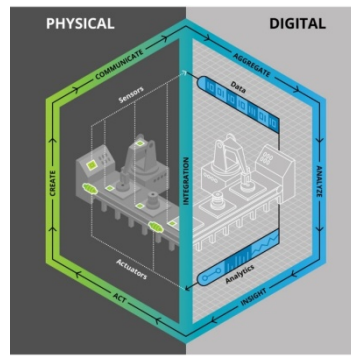


Fig. 1. Application of a digital twin [2]

The third stage is "do", and it supposes, that the digital twin is responsible for the further course of the object's working cycle, as while managing the work, the digital twin controls the state of each node and the system as a whole. Digital twin technology can detect the problem in real time using computer visualization. Receiving information about a disruption in production, artificial intelligence (AI) within the digital twin makes an appropriate decision to independently neutralize the malfunction or the need for human intervention. Information for the employee is displayed using a simple API.

A digital twin allows users to investigate solutions for product lifecycle extension, manufacturing and process improvements, and product development and prototype testing. In such cases, a digital twin can virtually represent a problem so that a solution can be devised and tested in the program rather than in the real world.

A digital twin design is made by gathering data and creating computational models to test it. This can include an interface between the digital model and an actual physical object to send and receive feedback and data in real time [3].

A digital twin requires data about an object or a process in order for a virtual model to be created that can represent the behaviours or states of the real world item or procedure. These data may relate to the lifecycle of a product and include design specifications, production processes or engineering information. It can also include production information about equipment, materials, parts, methods and quality control. Data can also be related to operation, such as real-time feedback, historical analysis and maintenance records. Other data used in digital twin design can include business data or end-of-life procedures.

Once the data has been gathered it can be used to create computational analytical models to show operating effects, predict states such as fatigue, and determine behaviours. These models can prescribe actions based on engineering simulations, physics, chemistry, statistics, machine learning, artificial intelligence, business logic or objectives. These models can be displayed via 3D representations and augmented reality modelling in order to help the person understand the findings.

The findings from digital twins can be linked to create an overview in such a way as by taking the findings of equipment twins and putting them into a production line twin, which can then inform a factory digital twin. By using linked digital twins in this way it is possible to enable smart industrial applications for real world operational developments and improvements.

Digital twins are used in a wide variety of industries for different applications and purposes. Some notable examples include:

1. Manufacture (production optimization).
2. Automotive (gather and analyse operational data from a vehicle in order to assess its status in real time and inform product improvements).
3. Retail (model and improve the customer service, both at the level of a shopping centre and for individual stores).
4. Healthcare (organ donation, surgery training and de-risking of procedures. Systems have also modelled the flow of people through hospitals and track where infections may exist and who may be in danger through contact).

5. Smart cities (a digital twin can also be used to help cities become more economically, environmentally and socially sustainable. Virtual models can guide planning decisions and offer solutions to many complex challenges faced by modern cities. For example, real time responses to problems can be based on real time information from digital twins, which allows assets such as hospitals to react to a crisis).

Thus, digital twins are used to solve various types of problems, such as: static and dynamic diagnostics, as well as optimization and forecasting problems.

Digitalization of the world is improving greatly and covers more and more areas of activity. According to forecasts, the global market for digital twin technologies will reach \$16 billion by 2023. The zones of the most intensive growth in the use of digital twins are resource-intensive industries such as industrial production, oil and gas industry, aerospace and automotive industries.

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ANALYSIS OF DIFFERENT QUERY LANGUAGE FOR SPATIAL DATA

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This paper analyzes implementation of different query languages for spatial characteristics using some example. Some of the strengths and weaknesses of query languages are discussed.

Keywords: SQL, CQL, ECQL, GeoSparkQL, spatial data.

АНАЛИЗ РАЗНЫХ ЯЗЫКОВ ЗАПРОСОВ ДЛЯ ПРОСТРАНСТВЕННЫХ ДАННЫХ

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В данной работе анализируются примеры реализации различных языков запросов для пространственных характеристик. Обсуждаются некоторые слабые и сильные стороны языков запросов.

Ключевые слова: SQL, CQL, ECQL, GeoSparkQL, Пространственные данные.

Most Search query languages fall into two groups: powerful, expressive languages, not very easy to read and not very convenient for building queries. And non-specialists, or simple and intuitive languages, are not enough powerful for expressing complex concepts (like CCL and Google). Some languages of search query that contain the search functionality on records databases containing spatial characteristics are discussed below.

CQL (Contextual Query Language)- Contextual Query Language is a formal language for representing queries to information retrieval systems(web indexes, bibliographic catalogs, digital libraries and repositories, etc.). It focuses t on readability and intuitiveness while maintaining the expressiveness of more complex query languages.

ECQL (Easy Common Query Language) – A query language created by OGC for directory services. It is a human readable query language and its syntax is very similar to that of SQL, but with extremely limited functions

A significant difference between ECQL from CQL is the use of not abstract indexes or search attributes in queries, but the names of proper fields of database tables containing spatial information. The developers of the ECQL languages demonstrate their similarity with SQL. Geoserver uses ESQL for building CQL-filters for queries.

GeoSparQL- The development of Semantic Web technologies and Open Linked Data (LOD) storages could not leave aside the possibility of using the SparQL query language to search for information related to the spatial characteristics of objects. The OGC document has been developed, which regulates SparQL extensions for working with spatial data.

SQL. Structured Query Language (SQL) is the standard query language for relational database management systems. It is quite natural that extensions were included in this language that allow you to operate with spatial data. Formally, these extensions are based on the OGC specifications [1] and are formatted as ISO documents [2]. However, the implementations of these extensions are different for different DBMSs.

MSSQL Server extension includes two spatial types: Geometry and Geography. Extension for Oracle is ST_Geometry and SDO_Geometry. PostgreSQL extension for spatial data are ST_Geometry, PostGIS geometry, and PostGIS geography.

A complete description of each language, and consideration of all possibilities and weaknesses, is beyond this report. However, the basic properties can be illustrated with simple examples. Therefore, for each language, one simple example is given – to formulate a query to find all records related to the area limited by the search term.

Example. Find all records related to the area bounded by the specified term:

For CQL

```
geo.bounds within/partial/geo.nwse "56.02 92.3 58.8 84.0"
```

For ECQL

```
INTERSECTS (the_geom, 56.02, 92.3, 58.8, 84.0)
```

For GeoSparQL

```
SELECT ?f
WHERE { ?f my:hasPointGeometry ?fGeom .
?fGeom geo:asWKT ?fWKT .
FILTER (geof:sfWithin(?fWKT,
"<http://www.opengis.net/def/crs/OGC/1.3/CRS84>
Polygon ((56.02 92.3, 56.02 93.0,
58.8 84.0, 58.8 83.3,
56.02 92.3)))"^^geo:wktLiteral))
```

For MySQL

```
select * from my_table where MBROverlaps(the_geom,
ST_GeomFromText('LINESTRING (56.02 92.3, 58.8 84.0)');
select * from my_table where ST_Overlaps(the_geom,
LINESTRING (56.02 92.3, 58.8 84.0))
```

For MSSQL

```
select * my_table where
the_geom.STIntersection(geometry::STGeomFromText(
'LINESTRING (56.02 92.3, 58.8 94.0)', 0));
```

For PostgreSQL

```
select * from my_table
where the_field && box '((56.02,98.3),(58.8,94.0));
```

Conclusion. It should be noted that different query languages target different information systems. Some of them require information about the data structure (names of elements, tables, fields), others are focused on working with abstract objects (search attributes, named indexes) that are defined globally in the corresponding profiles identified by URI or OID. The functionality of the first group of languages is higher, but the scope is narrower. For the second group, the opposite is true. For distributed heterogeneous information systems, only the languages of the second group can be used.

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THE REVIEW OF INFORMATION SECURITY INCIDENT INVESTIGATION PRACTICES

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The paper analyzes the practice of investigating information security incidents in order to study approaches to the search, collection and processing of information about them and the use of these approaches in the investigation of cybercrimes.

Keywords: IS incident, digital evidence, investigation, collection.

О РАЗБОРЕ ПРАКТИК РАССЛЕДОВАНИЯ ИНЦИДЕНТОВ ИНФОРМАЦИОННОЙ БЕЗОПАСНОСТИ

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В работе произведен разбор практик расследования инцидентов ИБ с целью изучения подходов к поиску, сбору и обработке информации о них и использования этих подходов при расследовании киберпреступлений.

Ключевые слова: инцидент ИБ, цифровые свидетельства, расследование, сбор.

Classical crime investigation actions rarely can be used to search for digital evidence. Detectives are not sufficiently trained for searching for «digital traces of crimes» [1]. In this case they seek advice from specialists in the field of information security (IS), whose activities are similar to the research activities. It turns out that if the IS expert skills and the experience of internal affairs agency officers to search for criminals are combined, this cooperation can have some blueprint as a result, as well as the methodology which can help with evidence collection for doing an expertise of crimes in the field of computer information investigation can be worked out.

It goes without saying that not all information security incidents are similar, but there are some rules and formulas to work with them, which are applicable in most cases, so-called practice of IS incidents investigation. So, it's necessary to study some of these practices to use appropriate approaches during the cybercrimes investigation.

Information Technology Infrastructure Library (ITIL) contains a set of the best world practices used in work of structural units, companies and departments, involved in the providing of IT services, including IS incident management. In the *ITIL* incident management process contains the following stages: acceptance and recording; classification and initial support; service request corresponding the start of the procedure; matching; investigation and diagnosis; resolution and recovery; closure; progress monitoring and tracking [2]. According to *ITIL* the standard service requests are referred to incidents.

This research is aimed to solution search, which can be used for methodology compilation, so the stages where evidence search is performed are examined: acceptance and recording; classification and initial support; matching; investigation and diagnosis.

In the most cases incidents are recorded by Service Desk from different sources. Recording of all incidents must be performed as soon as a message comes in order to prevent loss or distortion of information and to facilitate further work [2].

The place of detection of an incident is determined by an attribute where the message about it came from: a user, a system, a Service Desk employee, an IT department employee [2]. It is necessary to define the areas of the IT infrastructure that are affected by the incident.

Classification of incidents is aimed at definition of their category to facilitate monitoring and reports compilation, and from investigation point of view, the following are important: incident category, priority, impact and routing. An incident can be prioritized using a priority matrix (impact and urgency). Business impact refers to the degree of damage that a problem will cause to a user or an organization. The urgency of the incident indicates the time frame within which the incident must be resolved. The basis for routing incidents is often category information. To resolve the incident, it is forwarded to the appropriate technician with the necessary knowledge and skills.

After classification, it is checked for the correspondence of the incident signs to an open problem or a known error, as a result of which a link can be established [2].

Incident management is a horizontal process. Service Desk (1st level support team) routes incidents that do not have a solution or are beyond the competence of the employee working with it to a level 2 support team with better experience and knowledge, which either resolves the incident or transfer it to the next level support team [2]. This process is called escalation.

In addition to the ITIL, there are also recommendations in the field of standardization of the Bank of Russia. The document “Ensuring IS of organizations in the RF BS. IS Incident Management” contains the following stages of detecting and responding to IS incidents:

- the stage of detection, notification and assessment;
- the stage of collecting and fixation information;
- the stage of closing an IS incident, including its localization and restoration of the regular execution of banking technological processes of the RF BS organization;
- the stage of analyzing the collected information and making management decisions based on the results of responding to an information security incident [3].

It is recommended to use the following sources of information about IS events in the RF BS:

- logs of management systems, control and monitoring of information security;
- system logs of operating systems and database management systems;
- application software logs, active network equipment logs;
- logs of information protection tools used, logs of specialized software and hardware tools for detecting intrusions and network attacks, software for checking the integrity of files;
- information from specialized physical access control devices [3].

The characteristic feature lies in a two-level check of an IS event to determine whether it is an IS incident, or whether it is a change in the state of an object or an IS monitoring area. The stages of working with an incident are partially similar to ITIL. The following features of the algorithm are different and relevant to the investigation:

- if an IS incident can initiate legal proceedings against a person or organization, as well as for the conduct of disciplinary procedures, all information related to it must be collected, stored and presented for further analysis and possible acceptance by the court as evidence;
- upon detection of an IS incident, an employee performs its primary documentation and notifies the operator-dispatcher of the ISIRT in accordance with the established regulations [3].

The scope of the standard ISO/IEC 27043-2015 «Information technology. Security techniques. Incident investigation principles and progresses» is concerned with the following process: identifying, collecting, obtaining and storage potential digital evidence [4].

At the identification phase digital data storage devices and processing devices that may contain potential digital evidence are defined. There is a prioritization action for collecting evidence based on its variability in order to minimize damage and obtain the best evidence [4]. It also aimed at identifying hidden potential evidence, for example, adding a virtual component.

After identification a decision must be made whether to collect or receive evidence. Collection is one of the processing processes when devices are moved from their operating environment to a laboratory or other controlled environment for subsequent collection and analysis of evidence [4]. Devices can be in one of two states: system power is on or it is off [4]. The process of obtaining evidences includes making a digital copy of them, and both the original and the copy must be verified using a validated verification function acceptable to the person who will use it [4].

There may be circumstances when the verification process cannot be performed. In such cases, the following options are possible:

- to use the best available method, justify, defend and document the choice of method;
- to verify the parts of the source that can be reliably read [4].

If a copy of the evidence is not possible or unacceptable, a logical acquisition of the evidence is performed, targeting only certain types of data, directories or addresses [4].

The saving process includes protecting potential digital evidence and digital devices that may contain evidence from falsification or damage [4]. It must be initiated and maintained throughout all phases of evidence handling, i.e. there must be no damage to the data itself or any associated metadata. If confidentiality of evidence is a legal or business requirement, then potential evidence must be stored in a manner that provides confidence in the privacy of it [4].

The standard requires handlers of evidence to be competent in identifying and managing risks and the consequences of possible courses of action when handling evidence.

To ensure that the integrity and reliability of potential evidence is maintained, the following basic principles should be followed:

- minimizing handling of the original digital device or potential digital evidence;
- accounting for any changes and documenting the actions taken;
- compliance with local regulations regarding evidences;
- employees should not take actions beyond their competence [4].

Studying the practices of investigating IS incidents allows us to highlight the following main points that should be followed when working out a methodology. The general approach to the investigation of crimes should be taken from ITIL, which determines the place of the incident based on where the message came from, which makes it possible to use some basic classification. To make the collected evidence legally valid, use the approach suggested by BS RF and ISO/IEC 27043-2015. Also, from ISO/IEC 27043-2015, recommendations for working with data based on their variability and volatility should be taken, as well as recommendations for ensuring the safety.

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SYSTEM OF ENZYMATIC PROCESSING OF MINERALIZED HUMAN METABOLITES SOLUTIONS

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This work considers one of the most important problems in the creation of BTSLW when, along with the main biological method, an ecologically safe additional physicochemical method of processing organic waste is used.

Keywords: life support system, fermenter, space, human metabolites.

СИСТЕМА ФЕРМЕНТАТИВНОЙ ПЕРЕРАБОТКИ РАСТВОРОВ МИНЕРАЛИЗОВАННЫХ МЕТАБОЛИТОВ ЧЕЛОВЕКА

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Данная работа рассматривает, одну из наиболее важных проблем в создании БТСЖО когда, наряду с основным биологическим методом, используется экологически безопасный дополнительный физико-химического метода переработки органических отходов.

Ключевые слова: система жизнеобеспечения, ферментер, космос, метаболиты человека.

The main factor to realize space missions with humans on board is a life support system (LSS) that provides regeneration of the human habitat and makes its existence in extraterrestrial conditions possible. At present one of the most important problems in creation of such LLS is development of ecologically safe physical-chemical method of organic wastes processing, which can quickly enough and without big energetic expenditures transform the spent organic material into a form acceptable for further entering the higher plants. One of the successful variants is the "wet" incineration method developed in the laboratory of photosynthesis control of phototrophs of the Institute of Biophysics SB RAS [1]. The essence of this method is the oxidation of organic waste in a hydrogen peroxide solution under the influence of an alternating electric field. As a result of such processing a mineralized solution is formed, in which urea is preserved. It must be decomposed to avoid the overgrowth of urobacteria in the WLS.

Therefore, one of the processing steps is the decomposition of urea in a solution of mineralized human metabolites using an enzyme. Further, this solution can be used to feed plants and microalgae [2,3].

The principal structure of the enzyme fermenter is shown in Fig. 1. The urea is decomposed by the enzyme urease, which can be isolated from soybeans in the SJO. This enzyme has two

temperature optimums (37 and 60 C°) and one pH optimum (pH=7), which are maintained in the fermenter. Optimal conditions for the operation of the enzyme are maintained by a thermoregulation system (heater and temperature sensor) and a pH control system (pH meter and acid pump). The fermenter is able to fully automate the hydrolysis of urea to the end based on the pH-meter readings.

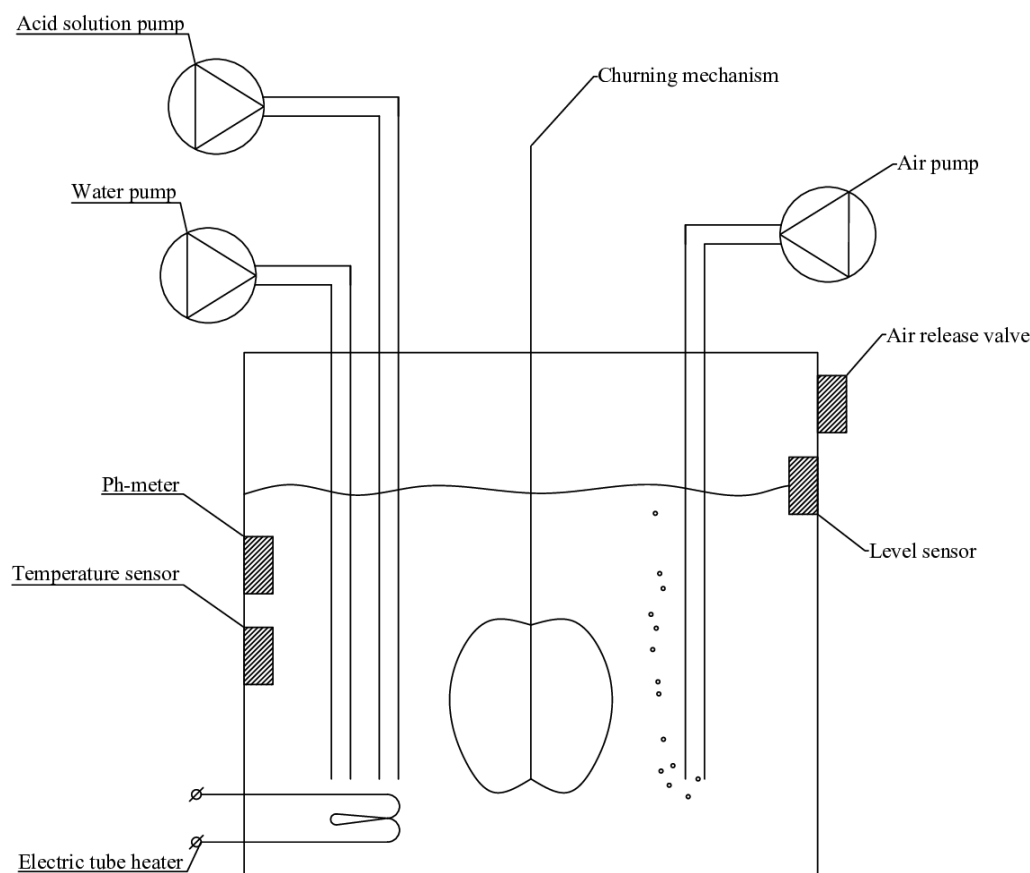


Fig. 1 – Principal structure of the enzyme fermenter

This development allows to carry out one of the technological stages of physical-chemical processing of human metabolites in an automatic mode. Thus, the fermenter makes it possible to close the substance cycle in the SLC without additional man-hours, which is critical in the issue of organizing the mass-exchange cycle of the life-support system.

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THE THREAT OF SOCIAL ENGINEERING TO THE SAFETY OF DISTANCE LEARNING SYSTEMS

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The article analyses threats of social engineering attacks on educational institutions. The statistics of changes in cyberattack activities related to pre- and post-pandemic time are considered. The paper also proposes key methods of counteracting social engineering.

Keywords: social engineering, distance learning, pandemic, cybercrime.

УГРОЗА СОЦИАЛЬНОЙ ИНЖЕНЕРИИ БЕЗОПАСНОСТИ СИСТЕМ ДИСТАНЦИОННОГО ОБУЧЕНИЯ

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Проведен анализ угроз атак социальной инженерии на образовательные учреждения. Рассмотрена статистика изменения активности кибератак до и после пандемии. Предложены основные методы противодействия социальной инженерии

Ключевые слова: социальная инженерия, дистанционное обучение, пандемия, киберпреступления.

Social engineering is a method (of attacking) of unauthorized access to information or information storage systems without usage of technical means. The method is based on exploiting human weaknesses and is considered to be extremely effective. An attacker receives information in many ways, for example, by collecting information about employees of the attack target, by using a regular phone call or by entering the organization under the guise of its employee. An attacker can call a company employee (under the guise of technical support service) and find out a password referring to a slight problem in the computer system. Such tricks work very often out. The most powerful weapon in this case is a pleasant voice and acting abilities of the attacker. Names of employees can be found out after a series of calls and studying the names of managers on the company's website and other sources of open information (reports, advertising, etc.) [1].

COVID-19 and quarantine measures made people all over the world drastically change their lifestyle and switch to distance work. Teachers and lecturers are not an exception. In addition to problems in organizing of the learning process, educators and academic institutions faced a large number of cyberattacks.

Intensity of cyberattacks on educational institutions increased during the pandemic and equaled attacks on financial institutions. According to Rostelecom, the number of cyberattacks on

educational services and electronic diaries in Russia has increased by 5.5 times. As it is reported by Kaspersky Lab, 350.000 users were attacked through websites containing electronic textbooks and ready-made reports.

Are cyberattacks really dangerous for educational organizations and online resources? Why is it important to follow the basic rules of cybersecurity in order not to be "hacked" or "infected" with a computer virus?

It is obvious that cyberattacks are a serious problem for commercial companies as they bear huge costs and reputational risks. Nevertheless, ordinary Internet users are also subject to cyber threats.

Educational institutions and digital services should definitely be prepared for hacker attacks, as they experience them every day. Students themselves could also be the initiators of such attacks. Creating an excessive load on the network channel or the whole system, it is possible to disable any online educational resource completely as well as partially. Students grasp any opportunity to get an unscheduled day off which could be also explained by widespread availability of tools for organizing a cyberattack [2].

In addition to technical attacks and collapses of educational institutions' websites, there are attacks on personal data of teachers, lecturers, students and schoolchildren that are supposed to be the most dangerous ones. Most importantly, there is a huge number of pensioners and children at any educational institution, and exactly this category of people is the most vulnerable during the pandemic and quarantine. Usual environment, behavior strategy and planning system are changing. Human psyche is stressed out, memory and attention worsen for an uncertain period of time [3].

People are immersing deeper into the digital reality. This fact allows cybercriminals to automatize attacks making them massive, which brings efficiency (profit) even in case of poor effectiveness (for example, phishing which is defined as sending electronic messages containing information that makes the user visit a false website that offers to enter sensitive data or to download malicious software). On the other hand, the effect of a so-called remote war is to mention: when a soldier does not see the enemy's face, it is easier to kill, respectively, to commit a crime, for instance, to steal money from a pensioner.

Almost 20 % of lecturers in Russia's universities are over the age of 65 [4]. For historical reasons, older people have a high level of confidence in government. Swindlers often take advantage of it understanding that seniors willingly provide sensitive information to everyone they meet. Pensioners are one of the most vulnerable categories of citizens since they cannot practically make up for financial losses [5]. As lecturers and teachers have to use electronic resources during distance education period, the probability of being deceived increases significantly.

Electronic educational resources appear to be no less dangerous for children, pupils and students. Parents are trying now in every possible way to "haul" a modern child out of social networks and computer games in order to protect it from negative and destructive content. Distance learning, in this case, is a breeding ground for social engineering attacks. Such attacks are connected not only with swindle but also with harassment, blackmails and phishing, which is destructive for schoolchildren and students. Using phishing technologies cybercriminals make their victims do what they need. They influence victim's psyche and emotions trying to cause fear, excitement, impatience or pity. Russia is among top countries with the highest cyberbullying rates. According to Microsoft, almost half of Russian children and adolescents between the ages of 8 and 17 confirmed the fact of being a victim of harassment on the Internet. Russia took the 5th place among 25 states for this indicator [6].

Unlike swindlers ("hackers"), most people are not ready for a secure life in digital world. In everyday life children are taught the basics of security (for instance, do not talk to strangers, do not open the door to strangers, etc.), however, in the digital sphere, even adults do not always know or understand what a danger is.

In order to protect minors from cybercrimes, parents, teachers and heads of educational institutions are to follow common rules of digital hygiene, for example: follow of requirements for a secure connection to online sources, availability of updated antivirus software both in educational

institution and at home. Cyberthreats should also be controlled by schools, district departments of education and ministries of education.

It is also essential to improve pupils' knowledge of information security. Children should understand that entering personal data and account information on third-party resources is unwarranted. Besides, it is important to check website addresses carefully in order to avoid following links to phishing resources and not to click on a link without checking its security, even in case of getting a message from close acquaintances [7].

The number of attacks based on social engineering is steadily on the rise and increased by 147 % in 2020. Distance education, quarantine and the pandemic enhance growth of such attacks. The controversy surrounding COVID-19 predictions or possible emergence of more dangerous viral diseases in a few years appears for good reason. Preparation of teaching staff for a distance work is not entirely without foundation. In contrary to benefits, harms and prospects of distance learning which are seen as a matter of argument, the necessity of secure educational process for both students and lecturers is not arguable. Many enterprises and institutions are coming to launch a course on how to counteract social engineering; educational institutions should also consider to teach such a programme which could be essential either for academic and non-academic staff or for students.

Experts recommend the following measures aimed at personal and proprietary data protection:

Be suspicious of any email or text message that requests sensitive data or financial transactions.

Hover a cursor over and view every hyperlink before clicking in order to make sure of them to be linked to legitimate sources.

Use multi-factor authentication to gain a secure access to vital systems and databases.

Become convinced that all the latest security updates are installed on browsers, mobile devices and computers.

Never use the same password for multiple accounts and devices. The uniqueness and complexity of a password are of paramount importance to protect against additional risk [8].

Do not automatically save the password to log in to servers when being at the workplace and always log out of the profile or account when leaving the workplace.

Despite the fact that examples of deceptions managed by social engineering methods are now common knowledge, the number of such crimes continues to increase. Unfortunately, it is much easier to deceive a person than to hack a system or a device – this is the reason why this type of attack enjoys huge popularity. However, it is possible and necessary to fight against such crimes! The only way to counteract social engineering is to raise awareness of employees, pupils and students as well as to develop practical skills to repulse cyberattacks.

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APPLYING A NEURAL NETWORK FOR DETECTION OUTLIERS BEFORE USING DATA IN DSS

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This article deals with the problem of data preprocessing, in particular the outliers' detection before using the data sets in decision support systems (DSS). The datasets analysis and preprocessing is performed to improve the efficiency of DSS application. It allows to identify objects and their parameters with abnormal values that can distort calculation results. As a solution of the problem, it is proposed to use a neural network at the preparing data stage for their direct application in DSS.

Keywords: neural network, data outliers, Decision Support Systems, multi-criteria calculations.

ИСПОЛЬЗОВАНИЕ НЕЙРОННОЙ СЕТИ ДЛЯ ОБНАРУЖЕНИЯ ВЫБРОСОВ В ДАННЫХ ПЕРЕД ИХ ПРИМЕНЕНИЕМ В СППР

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В данной статье затрагивается проблема предварительной обработки данных, в частности выявление выбросов, перед использованием наборов данных в системах поддержки принятия решений (СППР). Для повышения эффективности применения СППР производится анализ и предварительная обработка набора данных. Это позволяет определить объекты и их параметры, обладающие аномальными значениями, которые могут исказить результаты вычислений. В качестве решения проблемы предлагается применение нейронной сети на этапе подготовки данных для их непосредственного использования в СППР.

Ключевые слова: нейронная сеть, выбросы в данных, системы поддержки принятия решений, мультикритериальные вычисления.

Information is an integral part of life. Everyday people use, transmit and receive a huge amount of data. Information consists of this data application. Today, information systems have complex structure, so data analyzing and making any decisions becomes more difficult.

Therefore, as a result of combining management information systems and database management systems, specialists developed Decision Support Systems. These systems allow users to choose the best solution from possible variants and provide it ranking. DSS are designed to support multi-criteria decisions in a complex information environment [1].

There are many such systems, but using of these systems is inefficient, if they are applied to a large set of real data. Therefore, data preparation is necessary to improve the accuracy of the analysis and assumptions development in the DSS. So, the data set should be preprocessed before using DSS, because it may contain empty values and outliers. These outliers can cause systems to either miss significant findings or distort real results. Missing values is the most common problem with real data. There are several ways to solve it [2]:

1. deleting a row if the data set is large enough and the percentage of missing values in a row is high;
2. filling in the missing variables with zeros;
3. filling in the missing values with the average or the most frequent value in the column;
4. filling in the missing values with any value that is immediately in the same column.

It is enough to analyze the data and fill in the gaps. But it may take longer to detect data outliers. In statistics, outliers are data points that do not belong to any particular group or class. It is an abnormal observation that is far from other values. Detection of outliers is an important step in many data analysis applications. One needs to pay special attention to the used estimation data and their reliability in the presence of outliers. Basically, clustering, distance measurement and spatial methods are used to detect outliers in data sets. Finding outliers depends on specialist's knowledge of the subject area and understanding of the data collection process [3].

Some graphical methods can be used to identify outliers. The graph can be a scatterplot, a histogram or a boxplot. The last of these graphs display dots or other symbols on the graph to indicate obviously when a data set contains outliers. These graphs use the interquartile method with fences to find outliers. Boxplots can be used to detect outliers if the data set has groups. The third data set contains some outliers, and their presence is marked with an asterisk (Fig. 1).

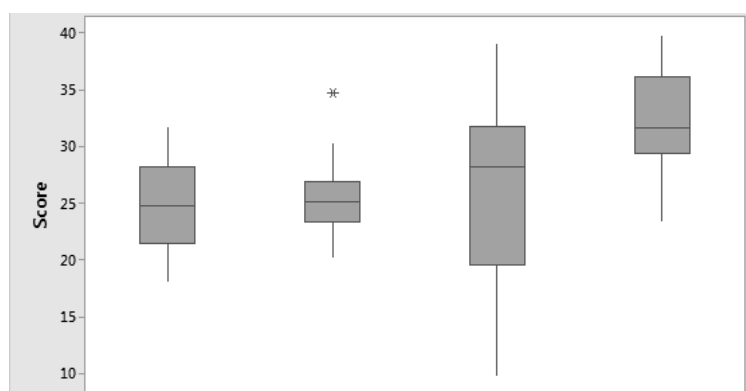


Fig. 1 – Boxplot of Score

But using neural networks is more effective. The graph can be uninformative if the data set contains many parameters and values. Therefore, DBScan algorithm can be used for detecting outliers. It is density Based Spatial Clustering of Applications with Noise [4].

Clustering algorithms are to divide a set of objects into subsets (clusters). So, objects from one cluster have similar properties and differ from objects of others clusters by some criterion. Clustering is an unsupervised learning because the specific properties of each subset are unknown at the training stage.

To apply any clustering algorithm experts, some parameters are to be used: Eps and MinPts of each data cluster and at least one point from the respective cluster. But DBScan uses global values for Eps and MinPts (the same values for all clusters).

MinPts is the minimum number of base points which form the cluster. Eps is the neighborhood of a point. A naive approach could require for each point in a cluster that there are at least MinPts of points in an Eps-neighborhood of that point. In general case, an Eps-neighborhood of a border point contains significantly less points than an Eps-neighborhood of a core point. Therefore, one would have to set the minimum number of points to a relatively low value in order

to include all points belonging to the same cluster. But this value will not be characteristic for the respective cluster – particularly in the presence of noise. This algorithm marks outliers with -1. The disadvantage of method is that the larger the dataset, the less accurate it becomes [5].

Random Cut Forest and Isolation Forest algorithms also can detect outliers. Their difference is anomalies highlighting instead of profiling and constructing normal points and areas by assigning a value (score) to each data point.

Outliers are minority data points in Isolation Forest algorithm. They have attribute values that are very different from those used in normal cases. Random Cut Forest algorithm outputs a list of values. Low values mean that the data point is normal, and high values indicate the presence of outliers in the data.

These models will detect the main part of outliers if they are trained on a large data set. Also, k-means algorithms and hierarchical clustering can be used to detect outliers, but their efficiency is lower. The preprocessing data algorithm with applying neural network is shown in Fig. 2.

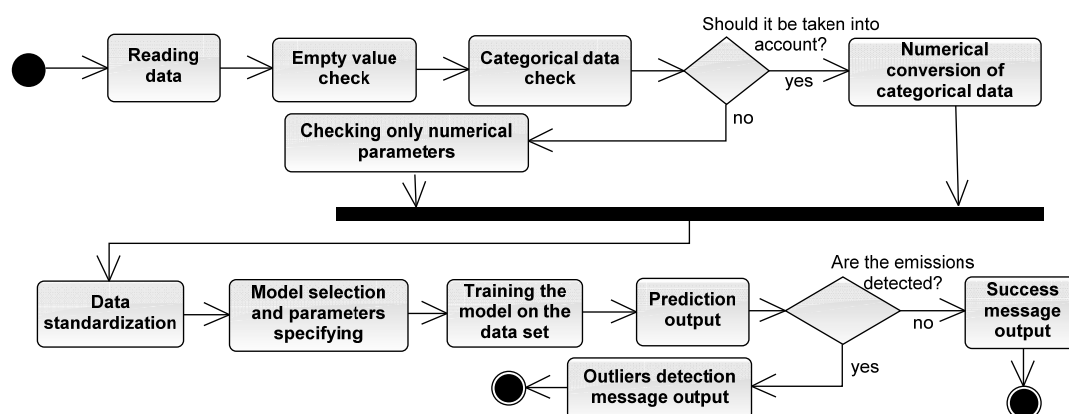


Fig. 2 – The preprocessing data algorithm with applying neural network

Data preprocessing is the main stage before using DSS. The empty values are less dangerous than data outliers, because the process of outliers' elimination is difficult and it has several ways to detect and neutralize them. Only experienced specialist can choose the right method based on subject-area knowledge. The neural network can make the outliers detect process easy. The specialist has to load the dataset and start the process. Once the process is complete the specialist can decide what to do with the results. Outliers may be neutralized or not included in DSS calculations.

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TEXT SEGMENTATION IN IMAGES USING MACHINE LEARNING

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The article contains various details, one of which is a hand-written signature. A person who signs the document confirms its validity. The detection of a document details makes the verification task easier, as it makes it possible to identify the signature on any part of the document without human intervention. Methods for the detection details of a document are discussed.

Keywords: classification, identification, intelligent systems, neural networks, text segmentation.

СЕГМЕНТАЦИЯ ТЕКСТОВЫХ ДОКУМЕНТОВ С ИСПОЛЬЗОВАНИЕМ МЕТОДОВ МАШИННОГО ОБУЧЕНИЯ

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Документ содержит разные реквизиты, одним из которых является рукописная подпись. Человек, расписавшись на документе подтверждает его действительность. Обнаружение реквизитов документа делает задачу верификации проще, так как дает возможность идентифицировать подпись на любом участке документа без участия человека. Рассматриваются методы решения задачи сегментации реквизитов на изображении.

Ключевые слова: классификация, идентификация, интеллектуальные системы, нейронные сети, сегментация текста.

Any image contains various objects. Detecting these objects is one of the leading challenges in machine learning. Nowadays, object detection methods are used in video surveillance systems to track position of objects in the video stream. The detection of document details is a different area of research. The hand-written signature is an important part of the documents. It gives the document a legal effect with other attributes. However, the document has a risk of falsification that can lead to fraudulent activities. The solution to this problem will allow an intelligent system to detect the signature, among other details, and to perform a subsequent verification process. For this need, the following tasks must be considered:

- 1) Highlighting objects in the image using bounding boxes.
- 2) Assigning labels to the highlighted objects from the category of known classes.

Note that a number of objects in the image is unknown until detection. It's the fundamental difference between this task and other tasks in machine learning [1].

A classifier is a mathematical model that describes the process of predicting the class of given data points. Classification is the task of approximating a function by mapping input variables –

object attributes, into discrete output data – object class label. Many classification algorithms are available, but it is not possible to make a conclusion which one is the best since having different advantages and depending on its area of use and the nature of the dataset. There are binary and multi-class classifiers depending on the number of classes. Multi-class classifiers are used in detection, since objects classifying into one of three or more classes.

The first idea for solving the detection problem is the template matching method. This method uses a bounding box that changes its location with each iteration. A classifier identifies the object and reads all data within the frame. This method is ineffective because it does not consider the scale and aspect ratio of the image and is computationally expensive [2].

The next method is based on R-CNN (Region-based convolutional neural network). This method has two stages:

- The first stage identifies regions of interest which with a high probability contain objects of interest.

- In the second stage, the classifier determines the selected objects.

Search regions of interest performed a selective search algorithm based on image segmentation (Fig. 1).

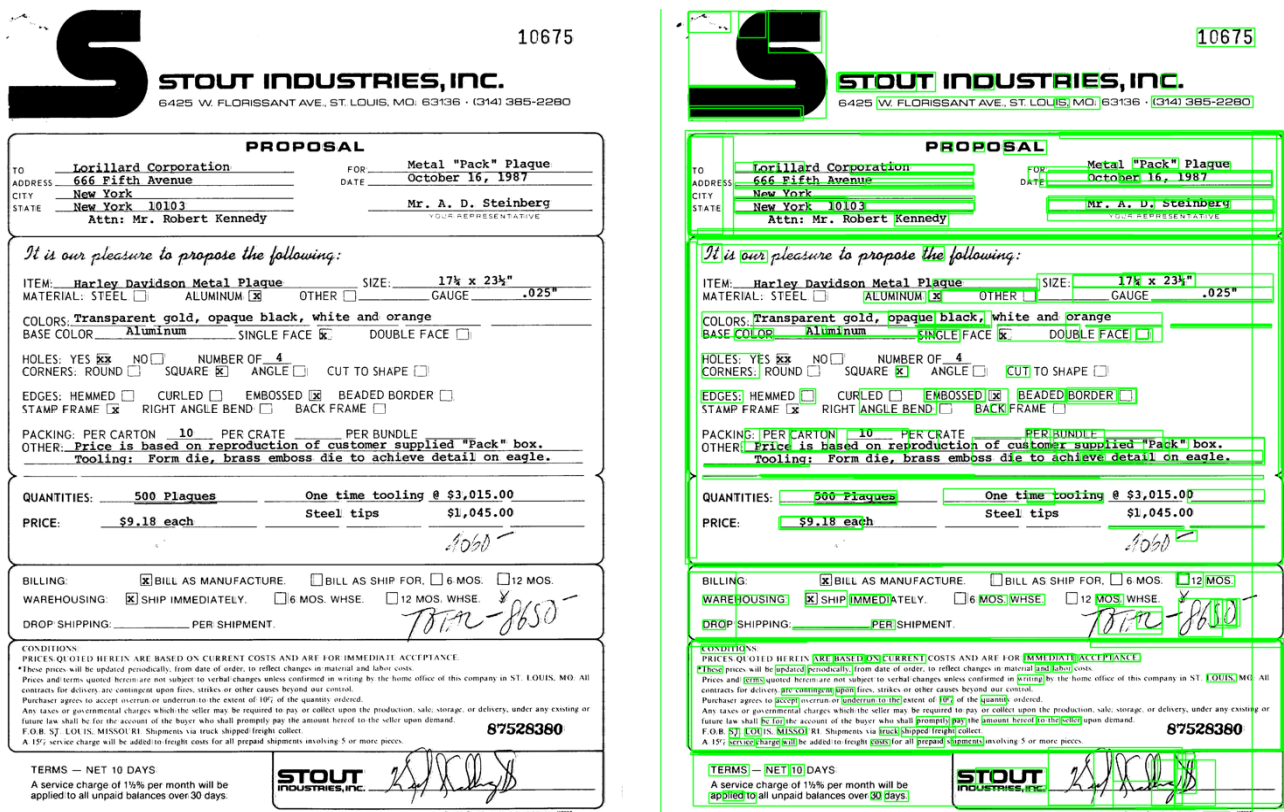


Fig. 1 – Example of selective search operation

The visual object located in the region of interest is normalized using affine transformations for input data to a convolutional neural network that creates a feature vector for classification. Fig. 2 shows the architecture of convolutional neural network "CaffeNet" [3].

The method is used as an SVM (support vector machine) classifier. This is a supervised learning algorithm belonging to linear classifiers. SVM maps data points of the feature vector in space to maximize the width of the gap between the two or more categories of classes. New feature vectors are mapped into space and predicted object to belong class based on which side of the gap they fall. The accuracy of SVM depends on the number of feature vectors in space. SVM can be used for the various problem:

1. SVM is used in text and hypertext categorization.

2. Classification of image.
3. Classification of satellite data.
4. Hand-written characters recognized.
- 5.

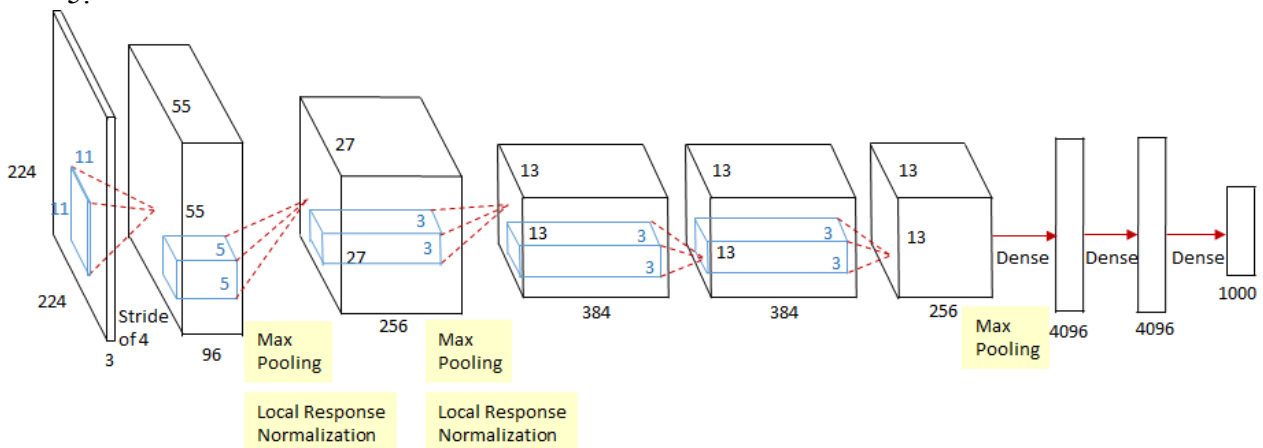


Fig. 2 – Architecture of the convolutional neural network "CaffeNet"

The model will show a good result if it is training with a large dataset. The dataset is a test and training set of document images with various attributes. The well-trained model can determine the signature on the among details of the document. The disadvantage of the method is the selective search algorithm because it generates many regions of interest that can affect the training time of the classifier [4].

This method has many modifications which improve the performance of the algorithm. At present, the current version is Mask R-CNN, in which regions are predicted based on the features of the original image using a separate module – convolutional neural network. A rectangular matrix is used instead of regions of interest to identify the object. Mask R-CNN is the best solution for the problem of object detection. Its integration into the hand-written signature verification system makes it possible to automatically detect the necessary detail in the image and check them.

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EXPERIMENTAL COMPARISON OF TEXT DOCUMENT VECTORIZATION METHODS

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This article is devoted to an experimental comparison of popular text vectorization methods, which are compared on the basis of the results of the applied classification tasks. Three databases are involved in the experiment. Statistical verification of the results is performed and promising areas of development are identified.

Keywords: vectorization, word embedding, text classification, bag of words, TF-IDF, sentiment analysis.

ЭКСПЕРИМЕНТАЛЬНОЕ СРАВНЕНИЕ МЕТОДОВ ВЕКТОРИЗАЦИИ ТЕКСТОВЫХ ДОКУМЕНТОВ

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Данная статья посвящена экспериментальному сравнению популярных методов векторизации текста. Методы векторизации сравнивались на основе результатов прикладных задач классификации. В эксперименте участвовали три базы данных. Произведена статистическая проверка результатов и определены перспективные направления развития.

Ключевые слова: векторизация, эмбединг, классификация текста, мешок слов, TF-IDF, анализ настроений.

Data analysis models are getting tendency to work with numeric features, so before applying existing models to text data it is necessary to convert text representation to a numeric one. Such a representation is called a vector representation or vector model, and the transformation process is called vectorization. Due to the appearance of many developed methods of text vectorization in recent years, there is a need for a comparative analysis of vectorization approaches in order to determine promising areas of development.

The simplest method of vectorization is to represent documents in the form of *bag of words*. The method is to fill in the document a vector with zeros and ones, depending on whether the word is used in the document or not [1]. *Term frequency* is an extension of the method which means counting the number of words in a document [2]. The *TF-IDF* vectorization is considered more effective. The vector representation consists of two parts: the frequency of the word in the document; the inverse frequency of the word in the entire text of the documents [3].

Word embeddings is relatively new representation form, the essence of the methods is to use the weight matrix from the neural network that is trained to predict the word by context (*CBOW*), or vice versa (*Skip-gram*) [4]. Such methods require large computational resources but this is partially compensated by the presence of pre-trained models [5].

For the experimental research, the following data sets were used:

1. *Movie Review Dataset (MRD)* [6]. The set contains user reviews of movies and it is a task of binary sentiment classification;
2. *20 Newsgroups (20N)* [7]. The data contains news documents for 20 different classes. The data is often used in research related with text classification and clustering;
3. *Coronavirus tweets NLP (CTN)* [8]. The database is formed from tweets describing the concern of the users to the situation with COVID-19. The table 1 shows the main characteristics of the data sets:

Table 1.

Characteristics of data sets

Database	Total messages	Number of classes	Average message length	Number of words	Number of unique words
<i>MRD</i>	50000	2	238.2	11912875	99413
<i>20N</i>	18691	20	200.5	42309	6484
<i>CTN</i>	28862	2	32.3	932197	27384

Methods based on the idea of bag of words have the output of a vector of documents in the word space from the entire corpus. Methods based on neural networks define vectors for each word separately. The task of translating word vectors into document vectors is reduced to aggregating vectors in various ways. This article uses the “*word averaging*” approach, in which the document vector is obtained by averaging the vectors of all the words included in it. The word averaging approach is a simple solution to the problem of word aggregation, but leads to a significant loss of information.

The following approaches were used in the comparison:

1. *Bag of words*;
2. *Term frequency*;
3. *TF-IDF*;
4. *CBOW*;
5. *Skip-gram*;
6. *Skip-gram* (Pre-trained GoogleNews-vectors-negative300) [5];

The experiment consists of four stages:

1. At the first stage, the input text is preprocessed, which includes tokenization and text cleaning;
2. At the second stage, all vector models are trained;
3. At the third stage, statistics on the results of the models are collected;
4. At the fourth stage, the collected statistics are used for statistical comparison by the Mann-Whitney U-test [9].

The cross-validation method consisting of 10 blocks was used to validate the models. Logistic regression was used as a classifier. The quality of the classification was measured by the F1-score [10]. The table 2 shows the results of running a logistic regression with 6 types of vectorization for three tasks.

For statistical verification, the results of 30 runs of all models were collected and a significance level of 0.05 was selected. The null hypothesis is formulated as follows: there is no relationship between the observations. According to the results of statistical verification, the difference was statistically insignificant only for models with Term frequency vectorization and

Skip-gram for the Movie Review Dataset (P-value = 0.206). For all the other cases, the P-value was less than 0.05.

Table 2

Experimental comparison results

Vectorization method	Average F1-score MRD	Standard deviation MRD	Average F1-score 20N	Standard deviation 20N	Average F1-score CTN	Standard deviation CTN
<i>Bag of words</i>	0.878521	0.000669	0.601750	0.001496	0.861233	0.000754
<i>Term frequency</i>	0.881452	0.000478	0.606235	0.001742	0.864629	0.000912
<i>TF-IDF</i>	0.886286	0.000321	0.655469	0.000833	0.851458	0.000704
<i>CBOW</i>	0.881938	0.000206	0.670248	0.001542	0.756858	0.000589
<i>Skip-gram</i>	0.881559	0.000215	0.705755	0.001118	0.758492	0.000486
<i>Skip-gram</i> (Pre-trained GoogleNews)	0.831366	0.000166	0.506535	0.000911	0.777816	0.000318

In this paper, various methods of vectorization of text documents were considered and experimentally investigated. Conclusions were made according to the results of solving classification tasks. The results of the experiment showed that using a model pre-trained on a large volume of texts is an ineffective solution, and also that the standard bag of words approaches show high accuracy on practical tasks. Word embeddings methods with Word averaging aggregation lose out to standard methods in two out of three practical tasks. Promising areas are the research of ways to aggregate word vectors into documents and the development of new aggregation approaches.

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METHODS OF IMAGE RESTORATION USING CONTEXT-BASED APPROACH

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This article touches on the problem of image restoration using context-based approach, non-learning and deep learning. Some approaches are briefly reviewed, and two are described in more detail.

Keywords: image restoration, image inpainting, context-based approach, deep learning

МЕТОДЫ ВОССТАНОВЛЕНИЯ ИЗОБРАЖЕНИЙ С ИСПОЛЬЗОВАНИЕМ КОНТЕКСТНОГО ПОДХОДА

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Данная работа затрагивает проблему восстановления изображений с помощью контекстного подхода, без обучения и с обучением. Приводится краткий обзор некоторых подходов и более подробно описаны два из них.

Ключевые слова: восстановление изображений, зарисовка изображений, контекстный подход, глубокое обучение

Image restoration is the task of rebuilding missing or damaged patches of an image and it can be used in various fields. For example, after removing unwanted objects from images it is necessary to fill the holes with suitable pixels, such as background color. In addition, typical applications, which use image restoration, are old photos or paintings restoration as well as photos editing, such as Photoshop.

There are two groups of context-based approaches of image restoration. The first one consists of non-learning methods, which are based on getting information, such as color or texture, from neighboring pixels to target region. Then, the algorithm tries to expand and merge them [1]. However, these methods can only handle narrow holes, where the color and texture variance is small. Big holes may result in over-smoothing or artifacts. It is also impossible to restore an object, «hidden» under the hole, for example, a nose on a person's face. But non-learning methods work great with watermarks.

On the other hand, there are deep learning based methods generally initialize the missing pixels with some constant values, for example, the mean pixel value of the mean pixel value of images from ImageNet database [4], which is then passed through a convolutional network. After that, post-processing is often necessary to make the results of the initialization better, and different authors have offered a large variety of ways to do it. Content Encoders first embed the 128×128

image with 64×64 center hole into low dimensional feature space and then decode the object to a 64×64 image. C. Yang, X. Lu, Z. Lin et al. in their work suggest to use the result of Content Encoders as input and then to spread the texture information from non-hole regions to fill the holes [7]. Song et al. uses a refinement network in which a blurry initial hole-filling result is used as the input, then iteratively replaced with patches from the closest non-hole regions in the feature space [5]. Li et al. and Iizuka et al. extended Content Encoders by defining both global and local discriminators; then Iizuka et al. apply Poisson blending as a post-process [2, 3]. Following, Yu et al. replaced the post-processing with a refinement network powered by the contextual attention layers [9].

Amongst the deep learning approaches, several also ignore the mask placeholder values. Yeh et al. searched for the closest encoding to the corrupted image in a latent space, which is then used to condition the output of a hole-filling generator [8]. Ulyanov et al. further found that the network needs no external dataset training and can rely on the structure of the generative network itself to complete the corrupted image. However, this approach can require a different set of hyper parameters for every image, and applies several iterations to achieve good results. Moreover, their design is not able to use skip links, which are known to produce detailed output. With standard convolutional layers, the raw features of noise or wrong hole initialization values in the encoder stage will propagate to the decoder stage [6].

L. Guilin, A. Fitsum et al., based on the above, suggested their own way to solve the task of image inpainting. They decided to use stacked partial convolution operations and mask updating steps to perform image inpainting.

At first they define the partial convolutional layer, which consists of stacked partial convolution operation and mask update function. Then they design a UNet-like architecture, replacing all convolutional layers with partial convolutional layers and using nearest neighbor upsampling in the decoding stage. So, they use the partial convolution with appropriate masking at image boundaries instead of typical filling the holes. The loss functions target both per-pixel reconstruction accuracy as well as composition, i.e. how smoothly the predicted hole values transition into their surrounding context. Authors first perform an autocorrelation (Gram matrix) on each feature map for better results.

C. Burlin, L. Duperier and Y.L. Calonnec decided to try adversarial networks. The idea is to reproduce the judgment of the human eye: if the missing part is a car window, predicting a car window even if it does not perfectly fit the car is better than predicting a blurry red patch with a black indistinct shape in the middle. The authors decided to use generative adversarial networks, the main idea of which is to train in parallel a discriminator network (D) that will learn to assess how real an image looks. The goal of the discriminator is to distinguish between the real patches and the generated ones. It is trained on a «dataset» composed of real and generated sections with corresponding labels (1 is a real image, 0 is an artificial one) [1].

The discriminator will improve by training on those more sophisticated examples. The loss will not necessarily improve because the authors' generator might make larger mistakes than before. However, images will look more real, and that is what matters in the end.

The new loss function can be described by the formula:

$$L = \alpha L_{rec} + (1 - \alpha) L_{disc}$$

where L_{rec} is the loss and L_{disc} is a sigmoid cross entropy on the probabilities outputted by the discriminator about the generated images. It can be calculated as:

$$L_{disc} = \sum_i \log(p_i) = \sum_i \log(D(\mathcal{P}^{(0)})) [1],$$

where p_i is the probability mass function of the pixel i .

To sum up, contest-based methods can be very effective way to solve the task of image restoration. Non-learning methods work better for small holes and watermarks. Deep learning is

suitable for photo recovery, and scientists from all over the world are developing different approaches to recover damaged images as best as possible.

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DEVELOPMENT OF AN ARTIFICIAL NEURAL NETWORK FOR CLASSIFICATION OF TEXT BY CATEGORY

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A project approach is assumed to solve the problems of text classification into categories. The urgency of this problem and the advantages of Russian universities with graduates are considered. A design approach to the creation of an artificial neural network is considered.

Keywords: neural network, deep learning, classification problem.

РАЗРАБОТКА ИСКУССТВЕННОЙ НЕЙРОННОЙ СЕТИ ДЛЯ КЛАССИФИКАЦИИ ТЕКСТА ПО КАТЕГОРИЯМ

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Предполагается проектный подход для решения задач классификации текста по категориям. Рассматривается актуальность данной проблемы и преимущества работы российских вузов с выпускниками. Рассматривается проектный подход к созданию искусственной нейронной сети.

Ключевые слова: Нейронная сеть, глубокое обучение, задача классификации.

Artificial neural networks (ANNs) are mathematical models, as well as their software or hardware implementations, built on the principle of the organization and functioning of biological neural networks – networks of nerve cells of a living organism.

After the development of learning algorithms, the resulting models began to be used for practical purposes: in forecasting problems, for pattern recognition, in control problems, etc.

ANNs are a system of interconnected and interacting simple processors (artificial neurons). Such processors are usually quite simple, especially when compared to processors used in personal computers.

Neural networks are not programmed in the usual sense of the word, they are trained. Learning is one of the main advantages of neural networks over traditional algorithms. Technically, training consists in finding the coefficients of connections between neurons. In the process of training, the neural network is able to identify complex dependencies between input and output data, as well as perform generalization. This means that in case of successful training, the network

will be able to return the correct result based on data that was absent in the training sample, as well as incomplete and / or “noisy”, partially distorted data.

The relevance of research in this direction is confirmed by the mass of different applications of neural networks. This is the automation of pattern recognition processes, adaptive control, approximation of functionals, forecasting, creation of expert systems, organization of associative memory, and many other applications. With the help of neural networks, it is possible, for example, to predict the performance of the stock market, perform recognition of optical or sound signals, create self-learning systems that can control a car when parking or synthesize speech from text.

Today, leading Russian universities are actively working with university graduates. Famous, successful graduates are invited by universities to meet with students so that they motivate the next generation. Many successful graduates go to graduate school after graduation and pursue a teaching career at universities. But the potential for cooperation with alumni is much wider.

Active interaction with alumni has long been a common practice in many foreign universities. Their experience shows that the image of an educational institution directly depends on the feedback of graduates and is an effective tool for attracting applicants.

In the modern world, the IT sphere is constantly evolving, it does not stand still. New programming languages, frameworks, equipment appear every day. Having come to an employer, graduates are faced with new requirements and knowledge necessary for a good and well-paid job. The problem is that the skills acquired by graduates differ from the modern requirements of the employer.

The topic under study is relevant because the organization of feedback is very useful in both directions: for graduates – a way to organize and use their professional and social connections, find the people they need and develop contacts, for a university – attracting more applicants, up-to-date information on the requirements of employers in the market labor.

The information received is very large. Working with a large amount of information is a laborious process; to simplify it, it was proposed to classify the information received from graduates.

The challenge is to develop a neural network that allows you to classify text.

Python was chosen as the programming language for implementation, and the Google Colab online service was chosen as the development environment.

The training data set (dataset) is selected based on the subject area in which the projected deep network will be used.

The projected network has a multilayer perceptron (MLP) structure, which is called simple feedforward neural networks, and sometimes just neural networks.

Multilayer perceptrons are successfully used to solve classification problems and have the following three distinctive features:

1. Each neuron in the network has a non-linear activation function.
2. One or more hidden layers.
3. High connectivity.

The neural network consists of:

- Input layer – 1000 neurons (number of words).
- One hidden layer, consisting of 512 neurons.
- Output layer – 5 neurons (5 classes).

In the process of writing the program, a comparison was made to obtain the optimal training result by the number of neurons on the hidden layer.

Learning takes place using the backpropagation method. Backpropagation is a very computationally efficient approach to calculating the derivatives of a complex cost function.

The neural network was launched, the training and prediction accuracy was tested, this network was implemented using graphical output of learning success data for each output class of the classifier; class prediction accuracy varies around 93 %. During testing, the performance of the program was assessed positively.

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DEVELOPMENT OF AN AUTOMATIC SYSTEM FOR MONITORING THE WORK OF A PROTOTYPE OF A MICRO- SEAWEED CULTIVATOR

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The structure and principle of operation of an automated micro-seaweed cultivator are considered. The value of the cultivation of micro-seaweed in the modern and reasoned need to use this life support system is described.

Keywords: micro-seaweed cultivator, biotechnical life support systems.

РАЗРАБОТКА АВТОМАТИЧЕСКОЙ СИСТЕМЫ КОНТРОЛЯ РАБОТЫ ПРОТОТИПА МИКРОВОДОРОСЛЕВОГО КУЛЬТИВАТОРА

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Рассмотрено строение и принцип работы автоматизированного микроводорослевого культиватора. Описана ценность культивирования микроводорослей в современном мире и аргументирована необходимость использования данной установки в биотехнических системах жизнеобеспечения.

Ключевые слова: микроводорослевый культиватор, биотехническая система жизнеобеспечения.

At present, the problem of intensive cultivation of micro-seaweed is widely studied not only in the countries of the former CIS, but also in the USA, Japan, France, Italy, Czechoslovakia, Bulgaria, Russia and other countries. This is due to the wide range of applicability of micro-seaweed: the use of the grown crop of micro-seaweed, the use of biomass as a raw material for obtaining any valuable substances, as well as the use of the assimilatory properties of micro-seaweed for reclamation of the aquatic environment. The effectiveness of the development of these areas is determined by the optimization of the processes of controlled cultivation of algal cells and, accordingly, ensuring their potentially high production properties.

The topic of micro-seaweed cultivation is still relevant because, despite numerous works on the study of various ways of medium regeneration by dark methods in closed LSS, there is not a single really operating LSS based on the use of only biological methods of medium regeneration. It is known that such systems have a long payback times (more than a year), occupy large spaces, and it is technically difficult to use them in microgravity conditions [4]. And at the present time, not a single long-term space mission has been completed on the surface of any planet. All manned flights take place only in near-earth orbit. In addition, the biological components of the system are more

difficult to control, mutation processes and various physiological deviations are possible under the conditions of space flight: weightlessness, radiation, high temperature, etc.

Nevertheless, great hopes are pinned on the future biological links of biotechnical life support systems (BTLSS). For example, for many years, experiments have been carried out in which the possibility of performing the function of oxygen regeneration in closed BTLSS by unicellular seaweed such as chlorella [2]. One of the main advantages of cultivating micro-seaweed is have rather high rates of biomass accumulation in comparison with higher plants, which is of great importance in case of an emergency. So, for example, in the event of an accident, a link of higher plants will be able to restore the CO₂ / O₂ balance in the system within ~ 25 days, however, using micro-seaweed, it is possible to restore the gas balance in 3 – 4 days [3]. Taking into account the fact that in a closed BTLSS the CO₂ concentration can fluctuate within 1 – 2 %, chlorella should quite successfully return the CO₂ content to normal or at least slow down the growth of its concentration in the event of an emergency [1].

Also, directly using the micro-seaweed culture of chlorella, it is possible to utilize human liquid waste. In China, experiments were carried out to grow chlorella in human urine, while it photosynthesized and purified urine, absorbing, for example, nitrogen and phosphorus by almost 100 %.

The cultivator for micro-seaweed belongs to cultivation devices, namely cultivators for photoautotrophic microorganisms, and can be used in microbiological, food, medical, industry, agriculture, as well as in BTLSS. By default, the cultivator contains a body made of translucent material, a drive shaft with a stirrer, devices for supplying and removing gas, liquid and nutrient solution, a light source, a heating element, and a thermometer. But since the purpose of the work is to create an automatic micro-seaweed cultivator, it was decided to add the following sensors: pressure sensor, crop density sensor, temperature sensor, sensors for minimum and maximum liquid levels, and an air valve. A diagram of the device of an automatic micro-seaweed cultivator can be seen at Fig. 1.

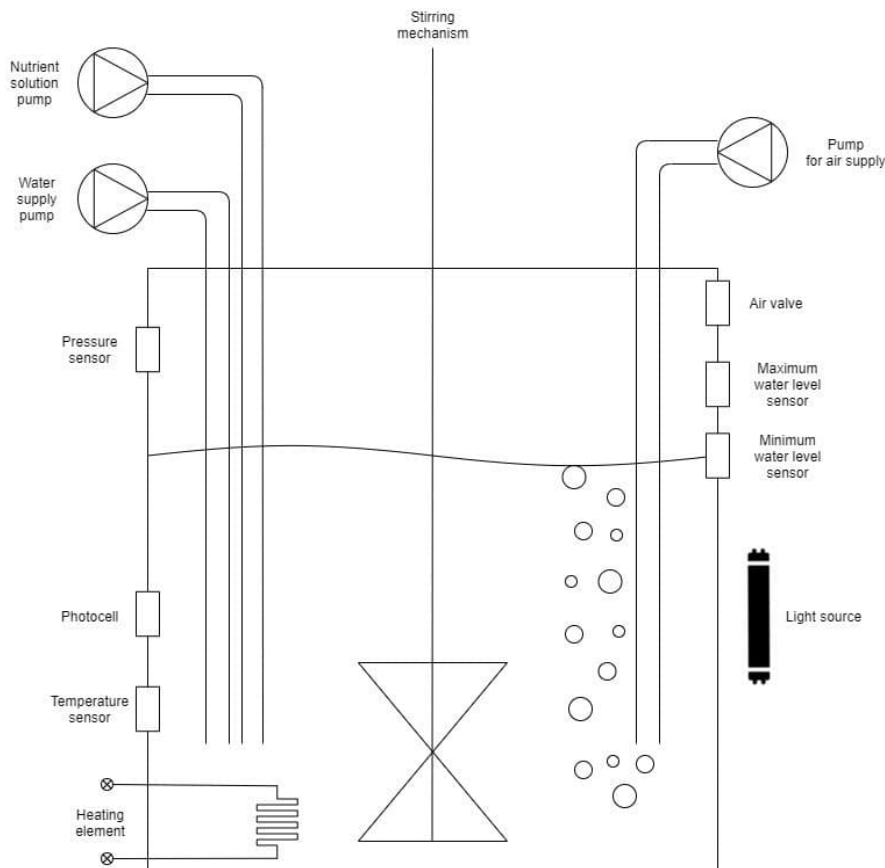


Fig. 1 – Diagram of an automatic micro-seaweed cultivator

The cultivator works as follows: a suspension of micro-seaweed in a translucent casing circulates under the action of a mixer; maintaining the required temperature is carried out using a temperature sensor and turning on / off the tubular electric heater of the (heating element); optimal gas balance is controlled by an air pump, pressure sensor and air valve; the density of the suspension with seaweed is controlled by an LED and a photodetector (density sensor); optimal fluid balance is maintained using water level sensors and a pump; the concentration of the nutrient medium is also maintained by means of a pump supplying the nutrient solution every preset period of time.

The proposed device of the cultivator should provide the possibility of conducting experiments with micro-seaweed in a wide range of conditions, which is interesting for research carried out within the framework of the problem of creating BTLSS. Due to the fact that the cultivator is made in a sealed translucent body, in comparison with an opaque body, the size of the light-receiving surface is more than doubled, the unproductive dark volume is reduced and the conditions for gas exchange are improved. When combining the heat exchanger with a horizontal partition, the required cultivation temperature is maintained and the dimensions of the cultivator are reduced.

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DESIGN OF A COLD-STORAGE CHAMBER FOR 2000 TONS OF APPLES

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This paper is devoted to the study of the design of a cold-storage chamber for 2000 tons of apples. The structure of the refrigerating chamber is considered, its main components and their purpose are listed. The main parameters of the cold-storage chamber for storing apples are calculated.

Keywords: cold-storage chamber, design, refrigeration unit

ПРОЕКТИРОВАНИЕ ХОЛОДИЛЬНОЙ КАМЕРЫ ДЛЯ ХРАНЕНИЯ 2000 ТОНН ЯБЛОК

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Данная статья посвящена исследованию вопросов проектирования холодильной камеры для хранения 2000 тонн яблок. Рассмотрено строение холодильной камеры, перечислены ее основные компоненты и их предназначение. Рассчитаны основные параметры камеры для хранения яблок.

Ключевые слова: холодильная камера, проект, холодильная установка

The purpose of our research is to design a cold-storage chamber for 2000 tons of apples.

The tasks are:

- 1) to calculate heat flows,
- 2) to select equipment,
- 3) to determine the size of the chambers.

The level of our study is theoretical and practical.

A refrigeration unit is a set of equipment used to obtain and maintain temperatures below the ambient temperature in cooled rooms, bodies or substances. It includes one or more refrigerators and also the necessary service equipment.

Units with vapor compression refrigeration machines are located indoors in a building where a cold consumer is located, or in a separate building – a refrigeration station.

Refrigeration chamber is located at a vegetable plant. The chamber is one-storey, with a built-up roof. Each chamber has 3 evaporators. Apples are stored in boxes. These boxes are installed on europallets.

The walls of the chamber are made of brick. The ceiling and floor are reinforced concrete slabs. The thermal insulation used is polyurethane foam.

The design (operating) mode of the refrigeration unit is characterized by boiling, condensation, suction (steam at the compressor inlet) and supercooling of the liquid refrigerant in front of the control valve [1; 267].

The tasks of thermal calculation of a refrigerating machine are: determination of the required volume capacity of the compressor, selection of the compressor, determination of power consumption, determination of the heat load on the condenser.

A refrigeration compressor is a compressor designed for compressing and moving refrigerant vapors in refrigeration units.

This is a heat exchanger in which the evaporation of the refrigerant occurs due to heat removal from the environment when it is cooled.

A condenser is a heat exchanger designed to remove overheating and condensation of refrigerant vapors pumped by a compressor.

Receivers are sealed cylindrical vessels that serve as a container for liquid refrigerant.

The filter-dryer is an element of the refrigeration unit circuit, protects refrigeration units from moisture, acid and solid particles [2; 328].

In refrigeration units, a check valve serves to prevent the movement of refrigerant in the system in the reverse direction.

The design of the valve is such that it passes the refrigerant only in one direction — from the compressor to the condenser.

Liquid separators are designed to separate the refrigerant vapor from the liquid on the compressor suction line, to protect it from possible wet compression and water hammer.

Applications are commercial and industrial refrigeration.

Compressor oil cooler is special equipment designed for oil cooling [3; 118].

A dual-pressure cutout allows you to control both low and high pressure simultaneously.

We calculated the main parameters of a refrigeration unit for storing 2000 tons of Spartan apples in Krasnoyarsk. The refrigerator has 4 chambers for storing apples. Each chamber has an area of 967.25 m². The total construction area of the cold storage facility is 3868 m². Storage temperature, according to the state standard is 0°C. Working fluid for the refrigeration unit is R134a.

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MODELING OF THE COMBUSTION CHAMBER OF A LIQUID ROCKET ENGINE

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A program in the C# has been developed for automatic (parametric) modeling of the contour of the combustion chamber and the nozzle part of a liquid-propellant rocket engine. The program provides the construction of the contour of the chamber of a liquid-propellant rocket engine (LPRE) based on the calculated data obtained as a result of thermodynamic calculation LPRE. The geometric model is the basis for calculation the cooling of the LPRE chamber.

Keyword: C#, geometric model, liquid-propellant rocket engine chamber.

МОДЕЛИРОВАНИЕ КОНТУРА КАМЕРЫ СГОРАНИЯ ЖИДКОСТНОГО РАКЕТНОГО ДВИГАТЕЛЯ

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Разработана программа на языке программирования C# для автоматического (параметрического) моделирования контура камеры жидкостного ракетного двигателя. Программа обеспечивает построение контура камеры жидкостного ракетного двигателя (ЖРД) на основе расчетных данных, полученных в результате термодинамического расчета камеры ЖРД. Геометрическая модель является базовой для расчета охлаждения камеры ЖРД.

Ключевые слова: язык программирования C#, геометрическая модель, камера жидкостного ракетного двигателя.

The article discusses the possibility of automated creation of a model for its further application in the educational process. Designing aircraft and rocket engines in the course of the discipline "Theory and calculation of rocket engines" begins with a thermodynamic calculation, as a result of which the geometric dimensions of the engine combustion chamber and nozzle part, the composition and properties of combustion products, etc. are determined [1, 2]. Calculation of the cooling of the combustion chamber is an obligatory part of the course and diploma projects.

Creation of a geometric model of a camera is a rather laborious process that requires students to have the skills of three-dimensional solid modeling in modern computer-aided design (CAD) systems. The constructed geometric model is further used to calculate the cooling of the engine chamber, during which the heat-transfer coefficient, heat flow, the temperature distribution of the coolant and the fire wall of the chamber, and other parameters are determined. If this calculation does not satisfy the impulse specific, then it is required to make changes in the thermodynamic calculation, after which the iteration is repeated to create a geometric model of the LPRE chamber contour. Then the calculation of cooling is repeated, etc. until the scheme for supplying the coolant to the duct is chosen, all the necessary overall geometric parameters of the engine chamber and the

cooling path have been obtained, which make it possible to proceed directly to the design of the liquid-propellant engine.

Thus, in order not to start anew after each iteration, the creation of the geometric model of the liquid-propellant engine chamber, a program in the C# using the SolidWorks application programming interface (API) [3] is proposed. SolidWorks API contains a set of functions that allow you to perform certain operations in CAD from outside. This allows automatic construction of the rocket engine chamber contour. The construction of the combustion chamber and the nozzle part of the liquid-propellant engine is carried out according to strictly defined geometric expressions determined from the entered data.

After starting the program, a dialog box appears, in which the user must enter the values of the parameters: diameter of the combustion chamber, diameter of the critical section, diameter of the nozzle exit, the angle of the nozzle in the critical section, the average angle of the nozzle, the average angle of the nozzle on the nozzle exit, the length of the cylindrical part of the chamber, obtained as a result of thermodynamic calculations (Fig. 1). After input datas in all the textboxes, you need to start the calculation, and then execute the command "Построить".

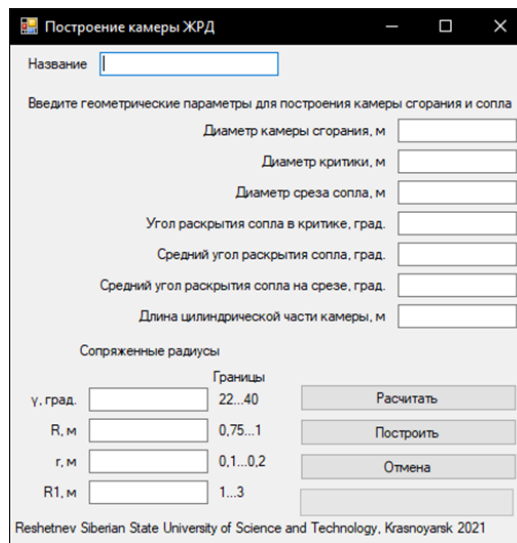


Fig. 1. – Program dialog box

As a result of the program, a file of a three-dimensional geometric model of the camera with the SOLIDWORKS Part extension (part file [4]) is created, which can be opened for viewing and editing in the SolidWorks CAD system (Fig. 3).

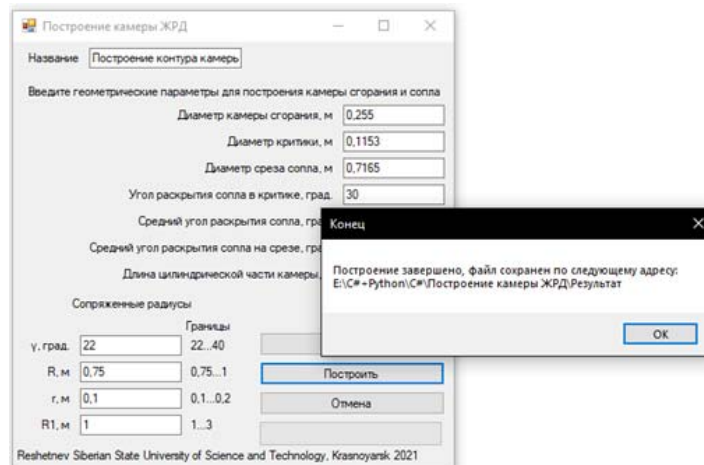


Fig. 2. – Program dialog box and program termination message

The geometric model of the camera is automatically divided into 11 cross-section ($i = 10$ zones). The number of sections determines the accuracy of the final calculation results. One of the sections coincides with the critical section of the engine chamber. If there is a too sharp change in the parameters of combustion products (velocity and temperature) in the section or unsatisfactory results of the final calculation are obtained, the design scheme should be changed in such a way as to avoid sudden pressure surges.

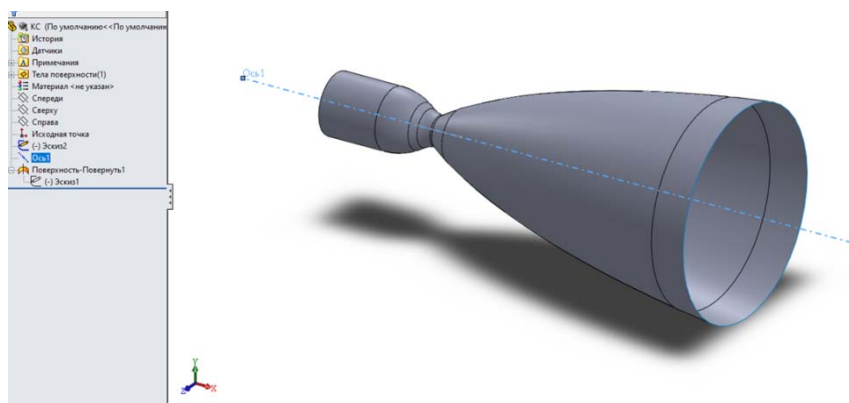


Fig. 3. – The result of the program is the geometric model of the rocket engine chamber

The program is designed for the operating system Windows XP and higher versions, the size of the program is 40 KB. The peculiarity of the presented program is its versatility, the speed of formation of the geometric model file and ease of use.

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THE MAIN PROBLEMS IN THE INFORMATIZATION OF THE AEROSPACE INDUSTRY

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This paper examines the development trend of the rocket and space industry in China. In the work, the main reasons for the lagging of China's rocket and space industry from the world level are in progress. The problems of informatization of this area are presented.

Keywords: aerospace industry, informatization, China's aerospace industry

ОСНОВНЫЕ ПРОБЛЕМЫ ИНФОРМАТИЗАЦИИ АЭРОКОСМИЧЕСКОЙ ОТРАСЛИ

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В данной работе рассматриваются основные тенденции развития ракетно-космической отрасли Китая. В работе приведены основные причины отставания ракетно-космической области Китая от мирового уровня. Представлены проблемы информатизации данной области.

Ключевые слова: аэрокосмическая промышленность, информатизация, аэрокосмическая отрасль Китая.

An important project in the aerospace industry is a large and complex system project involving multi-disciplinary integration, multi-subsystem integration and multi-unit cross-regional collaboration. As a software supplier, we should help it achieve effective resource integration through modern technology. Collaborative research and development, production and management.

PTC has entered China for nearly 20 years and has witnessed the remarkable results achieved by the informatization construction of China's aerospace companies. The informatization construction of aerospace companies has been widely used in product design, manufacturing, and management. Various aspects such as CAD. CAPP The application of CAM. PDM and ERP and other individual technologies and systems are more popular, and the product development cycle is significantly shortened. The quality of design and manufacturing is significantly improved.

In the future, aerospace companies will use PLM to realize the integration of multiple systems in digital manufacturing management, to achieve the integration of information, process integration, and resource sharing.

In contact with aerospace companies, PTC believes that aerospace companies' bottlenecks in the application of informatization are manifested in the following six aspects:

1. The software environment is not uniform, and multiple platforms coexist. In the process of informatization, China's aerospace industry has introduced and developed various CAD/CAPP/CAM/ERP software systems.

2. Separation of design and manufacturing. China's aerospace design and manufacturing are self-contained, using different databases, making it difficult to guarantee the uniqueness of the data source.

3. The amount of data is huge. Aerospace companies have produced large amounts of data in the course of decades of development, and with the continuous increase of new models and the massive use of computers, the amount of data will increase exponentially.

4. Low degree of standardization and generalization.

5. Little investment in informatization construction. Lack of medium and long-term strategic planning for informatization construction.

6. There is a lack of professional talents. The implementation of PLM is by no means an overnight success. Effective strategies must be formulated and implemented in stages and plans. At this stage, it is still very difficult to implement the whole life management from demand analysis to scrapping. The PLM that can realize the design process, process, manufacturing and assembly process is already a leap.

There are several aspects as to how to solve:

1. Strengthen enterprise standardization construction.

2. Establish product design. Manufacturing collaboration platform.

3. Establish a manufacturing process management platform.

4. Use electronic approval procedures.

5. Enterprises should list informatization construction In the agenda of enterprise development, we must first clarify the overall goal and the phased implementation plan and the source of funds.

6. Enterprise information issuance is the transformation of people.

It is necessary to strengthen the training and training of information talents. It is necessary to cultivate middle-level cadres who can adapt and master new scientific and technological means as the basis and key breakthrough for the implementation of enterprise informatization.

Since the founding of New China, China's aerospace industry has continued to develop with the support of the government. At present, China's aerospace industry already occupies a certain important position on the international stage. The successful launch of the launch E-2 lunar exploration satellite, China's current level of the world's most advanced intercontinental missile, and the high success rate of satellite launches all show that China has made world-renowned achievements. However, success cannot conceal existing problems. Experts estimate that the gap between China's aerospace level and the world's advanced level is 10 to 15 years, while China's civil aircraft development is still blank in terms of military aviation technology. China has been stuck on the improved Yun-8 level military transport aircraft, the bomber is still on the improved H-6 level, the fighter jets are only at the third generation level (the fourth generation fighter jets of the United States are already in service), China and the world are advanced The gap in level is 20 to 30 years. So, I think China still needs to follow up in the aerospace field to find and solve problems to narrow the gap with military powers.

The integration of complex multi-systems mainly solves the coordination operation management mechanism of complex systems in the network environment, the conflict and consistency problems between multiple systems, and improves the integration of the system. Explore the integration mechanism and integration methods of complex multi-systems, and finally form a An integrated environment for coordinated operation. Finally, the integration of design and manufacturing resource management system and design and manufacturing information platform of aerospace enterprises is realized, that is, the integration of management information and engineering information is realized.

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APPLYING INTELLIGENT SYSTEMS FOR FACE RECOGNITION ON IMAGES

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One of the main problems in the field of machine learning is the problem of face recognition, especially where it is necessary to use the position of a person on information obtained in real time. Another task is face detection in an image or sketch. The article discusses methods which are suitable for solving this problem.

Keywords: intelligent systems, neural networks, detection, face image, face sketch.

ПРИМЕНЕНИЕ ИНТЕЛЛЕКТУАЛЬНЫХ СИСТЕМ ЛЯ РАСПОЗНОВАНИЯ ЛИЦ НА ИЗОБРАЖЕНИЯХ

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Одной из основных проблем в области машинного обучения является задача распознавания лица, в особенности, где необходимо отслеживать положение человека, основываясь на информацию, полученную в реальном времени. Другой, не менее важной, является задача обнаружение лица на изображении или эскизе. В работе рассматриваются методы, подходящие для решения данной проблемы.

Ключевые слова: интеллектуальные системы, нейронные сети, обнаружение лица, эскиз лица.

There are many problems in the field of computer vision, one of which is the problem of detecting objects in an image. This technology allows to analyze information in images and video files. For example, read text or find the location of certain objects. Also, this task can be used in another area – face recognition in images or sketches. This task can be applied in a variety of areas, including entertainment, such as the Snapchat app, or biometric security systems.

The task of finding a face in an image or sketch for further processing is one of the areas of application of face detection technology. For example, to build a realistic image of a face found on a sketch. The solution of this problem will allow the intelligent system to detect a human face in a sketch in order to subsequently transform it into a realistic image. [1].

The point of the object detection problem is as follows. The intelligent system needs to select the desired objects in the image using bounding boxes, and then assign labels of known classes for the selected objects. The main difference from the classification problem is that the number of possible objects present in the image is not known in advance [2].

The first known approach is the local binary template method. This algorithm is a description of the neighborhood of an image pixel in binary representation. As a result of the operation of the algorithm, an eight-bit binary code is constructed that describes the neighborhood of the central pixel. Applying the method of local binary templates to each pixel of the image, a histogram is built, in which a separate column corresponds to each uniform code.

Face images are viewed as a collection of all sorts of local features that are well described using local binary patterns. However, the histogram which built for the entire image as a whole encodes only the presence of certain local features, but does not contain any information about their location in the image. To count this kind of information, the image is divided into sub-areas, in each of which its own histogram is calculated. By concatenating these histograms, a general histogram can be obtained that count both local and global features of the image. [3].

It should be noted that the quality of the system operation essentially depends on the preprocessing of the input images. Also, in the absence of a filtering step, the likelihood of correct identification and verification decreases.

The second approach to solving this problem is the Haar cascades. The trained Haar cascade, taking an image as input, determines the presence of the desired object, that is, it performs the classification task, dividing the input data into two classes:

1. The desired object exists.
2. The desired object does not exist.

This method is a set of masks, which is a set of rectangular masks adjacent to each other. Each mask is an image with a kind of black and white pattern. The number of such masks is unlimited, as is the complexity of their patterns (Fig. 1). Applying a mask to a certain part of the frame gives a numerical value – the result of the mask convolution with the frame: the program adds up the brightness of all the pixels of the image that fell into the white part of the mask, as well as the brightness of all the pixels that fell into the black part of the mask, and then calculates the difference between the obtained values. The convolution result is compared to the threshold [4].

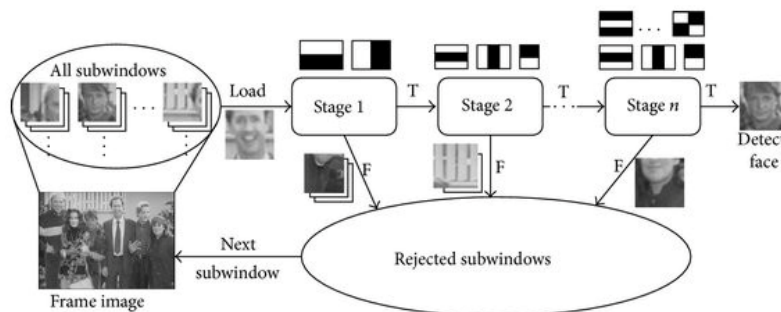


Fig. 1 – Haar Cascade Classifier Architecture

The popularity of this approach is due to the following advantage: convolution is calculated very quickly and easily, since it is enough to perform only three operations for each rectangular mask element.

And the last, the most accurate approach to object recognition is the use of deep neural networks. Any object can act as recognizable patterns, including images, sketches, handwritten or printed text. When training these networks, it refers to the data as the input data with a label of which type this image belongs to. As a sample of the vector of feature values, and the set of features in these conditions must uniquely determine which class the neural network is dealing with.

An important point when training a network is that for high accuracy of work, it is necessary to determine not only a sufficient number and values of features, but also not to retrain it, since the network can adapt to the training set and subsequently show low accuracy on test data.

When training, it is important to consider the fact that the initial data must be unambiguous and consistent. Since it is necessary to prevent the occurrence of a situation in which the neural network will produce high probabilities of belonging of one object to several classes.

The principle of operation of neural networks is as follows:

1. At the first stage, the image is processed by an algorithm that determines a rectangular fragment with a face;
2. This fragment is normalized in order to simplify processing by the neural network;
3. The normalized image is proceeding to the input of the neural network, which builds a unique feature vector.

At the end, if necessary, the obtained feature vector can be transferred to the database for further comparison with the vectors already available there (Fig. 2). This comparison makes it possible to identify a specific person [5].

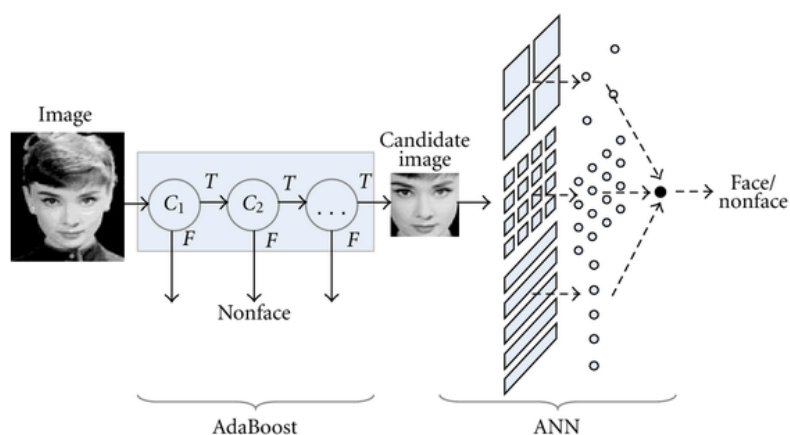


Fig. 2 – Face recognition process

To recognize objects in images and video sequences, different technologies and algorithms are used, which impose different requirements on the input data. The use of deep neural networks in the task of object detection is an effective tool for detecting objects both in a photo and in a video sequence, including the task of detecting faces in images or sketches.

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ACCELERATION OF CURING OF WOOD-CEMENT COMPOSITES IN CARBON DIOXIDE MEDIUM

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In the manufacture of products from light concrete based on wood and cement, the binding properties of cement are not used enough. The article discusses the method of acceleration of curing of wood-cement composites in carbon dioxide medium.

Keywords: wood-cement composites, arbolite, sawdust, curing, carbon dioxide.

УСКОРЕНИЕ ТВЕРДЕНИЯ ДРЕВЕСНО-ЦЕМЕНТНЫХ КОМПОЗИТОВ В СРЕДЕ УГЛЕКИСЛОГО ГАЗА

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При изготовлении изделий из легких бетонов на основе дерева и цемента вяжущие свойства цемента используются недостаточно. В статье рассматривается способ ускорения твердения древесно-цементных композитов в среде углекислого газа.

Ключевые слова: древесно-цементные композиты, арболит, опилкобетон, твердение, углекислый газ.

The main reason that slows down the setting and hardening processes of arbolite, sawdust concrete, fibrolite and other light concretes prepared on cement and wood aggregate are water-soluble extractive substances of wood. The composition of water-soluble extractives of wood includes carbohydrates that bind calcium oxide (CaO), forming calcium saccharates. Calcium saccharates and extractive substances, surrounding non-hydrated grains and neoplasms, interfere with the normal course of the process of hydrolysis and hydration of cement [1], [2].

The aim of the study is to accelerate the setting of wood-cement composites with the help of carbon dioxide. To achieve this goal, the following tasks should be performed:

- to identify the causes of slowing down the hardening of wood-cement composites;
- to investigate the effect of carbon dioxide on the acceleration of WCC hardening.

Carbohydrates such as sucrose, xylose, fructose and arabinose are peptizers and in a small amount can dramatically slow down the setting and hardening of cement dough. Organic surfactants of the hydrophilic type, adsorbed on the surface of the particles, enhance their mobility. The surface of the particles is covered with a hydrate shell, which is characterized by a colloidal structure [3].

As a result, the particles covered with such a protective shell lose their ability to adhere to each other under the influence of molecular forces or to coagulate. The coagulation adhesion of the

particles is possible only in close contact, which is prevented by the adsorption shell. The formation of this shell slows down the hydrolysis and hydration of cement, resulting in a stable colloidal system, which causes the development of destructive processes, does not give a hardening structure and therefore adversely affects the strength of the binders [4].

All these negative effects of water-soluble extractives of wood on cement affect not only the slowing down of the setting and hardening processes of arbolite products, but also their final strength, since the weakest link in the wood-cement system is the contact zone of wood and cement, where the toxic effect of extractives is particularly noticeable. In the presence of wood extractives, the ratio of Al:Ca in the solution increases. In this case, saccharates are formed, and it can be assumed that there is a probability of the formation of aluminum silicate (due to the significant excess of (Al) aluminum compared to (Ca) calcium).

This negative effect of water-soluble wood extractives can be eliminated by exposing the sample to carbon dioxide during the hardening process. This is due to the fact that, firstly, in the system of cement-water-extractive substances, calcium saccharates in the presence of (CO₂) carbon dioxide are not formed, therefore, the amount of Ca in the solution should increase, and secondly, the ratio of Al:Ca will become close to normal and there will be no conditions for the formation of aluminosilicagel. In a normally hardening sample, the Al ratio is:Ca is 0.28 [5].

Processing of products made of arbolite or sawdust concrete is most economically carried out with waste flue gases. The use of waste gases, even lime kilns ones, is difficult, since the concentration of CO₂ in the gases is often reduced to 10-20 % instead of 25 %. By controlling the change in the CO₂ concentration in the waste gas, it is possible to adjust the processing time by changing the gas flow rate, which will allow almost any waste gas with different CO₂ concentrations to be used.

To identify the dependence of the time of processing of arbolite with carbon dioxide on the speed of its supply, the installation shown in Figure 1 is used.

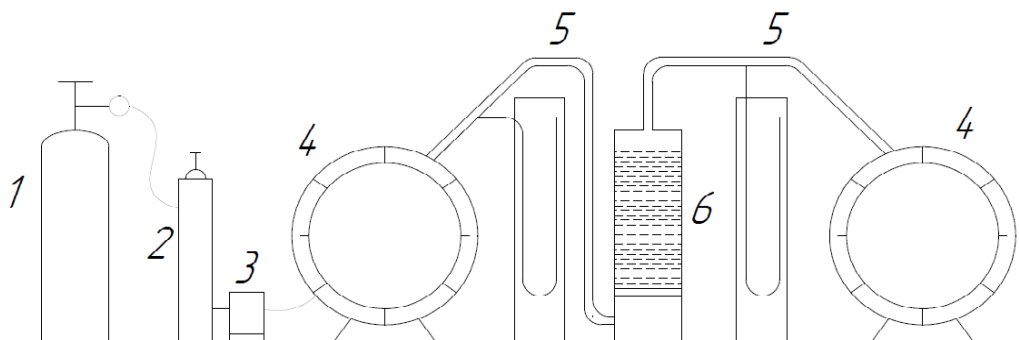


Fig. 1 – experimental setup

Balloon carbon dioxide (1) is fed through the gas cleaner (2) and the speed controller (3) to the sample cartridge (6). The gas clock (5) and pressure gauges (4) take into account the amount of gas supplied to the sample and passed through the sample, and therefore the amount of CO₂ absorbed by the sample. The supplied gas, as well as the gas absorbed and passed through the sample, is taken into account every 5-10 minutes during the entire experiment.

When treating arbolite or sawdust concrete with carbon dioxide, a heterogeneous reaction takes place. In this case, the total speed of the process is determined both by the speed of the chemical reaction and by the conditions of gas supply to the reaction surface, that is, by hydrodynamics. The experimental data are in good agreement with the dependence proposed by B. V. Kantorovich [6]:

$$C = \frac{G}{1 + \left(e^{N \frac{M}{V}} - 1 \right) e^{C_0 N A \left(\frac{M}{V} - 1 \right)}} \quad (1)$$

where:

- C is the average concentration of CO_2 in the flow in a given sample cross section;
- x is sample length;
- u is gas supply speed;
- β is the absorption coefficient determined from experience;
- a is initial reaction surface per unit volume;
- k' is apparent rate constant of a heterogeneous process;
- t is processing time.

Thus, the study shows that in a carbon dioxide environment, the amount of Ca in the solution increases at all times of hardening, despite the presence of extractive substances, the processing time of the product depends on the thickness of the product, the rate of heterogeneous reaction and the amount of gas absorbed during the reaction. The amount of gas absorbed during the reaction depends on the cement consumption per m^3 of the product and ranges from 14-16 % of the cement weight.

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Post-Graduate Students' Research (Economic & Humanitarian Fields)

УДК 33.338

MODEL OF THE STRATEGIC PLANNING SYSTEM OF SCIENTIFIC AND TECHNOLOGICAL DEVELOPMENT OF THE PRC UNDER THE CONDITIONS OF TRANSITION TO A NEW WORLD ECONOMY: LESSONS FOR RUSSIA

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The article examines the most important institutional transformations of the strategic planning system for the scientific and technological development of China (hereinafter – STD) in the conditions of the formation of a new world economic order. In the course of the research, the team of authors set and solved the following tasks: 1) built a model of the strategic planning system of the PRC scientific and technological revolution in the context of the formation of a new world economic order; 2) identifies the distinctive features of the strategic planning system for the scientific and technological development of the PRC, which are of practical interest in the state management of the scientific and technological development of the Russian Federation. Particular attention is paid to the study of mechanisms for the implementation of scientific and technological developments, contributing to an increase in the efficiency of the economy in the public interest.

Keywords: world economic order; scientific and technological development; strategic planning; strategic planning system for scientific and technological development; market mechanisms of regulation; government plans and programs

МОДЕЛЬ СИСТЕМЫ СТРАТЕГИЧЕСКОГО ПЛАНИРОВАНИЕ НАУЧНО - ТЕХНОЛОГИЧЕСКОГО РАЗВИТИЯ КНР В УСЛОВИЯХ ПЕРЕХОДА К НОВОМУ МИРОХОЗЯЙСТВЕННОМУ УКЛАДА: УРОКИ ДЛЯ РОССИИ

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В статье рассматриваются важнейшие институциональные трансформации системы стратегического планирования научно-технологического развития Китая (далее – НТП) в условиях становления нового мирохозяйственного уклада. В ходе исследования авторским коллективом были поставлены и решены следующие задачи: 1) построена модель системы

стратегического планирования НТР КНР в условиях формирования нового мирохозяйственного уклада; 2) выявлены отличительные особенности системы стратегического планирования научно – технологического развития КНР, представляющие практический интерес в государственном управлении научно – технологическим развитием РФ. Особое внимание уделено исследованию механизмов реализации направлений НТР, способствующих повышению эффективности экономики в общенародных интересах.

Ключевые слова: мирохозяйственный уклад; научно – технологическое развитие; стратегическое планирование; система стратегического планирования научно – технологического развития; рыночные механизмы регулирования; государственные планы и программы

A fundamental feature of the current period of time is the restructuring of the world economy, due to the imposition of the processes of changing technological and world economic structures [1]. Today, developed countries are systematically making the transition from the V technological order (originated in the 1970s – 1980s. On the basis of the creation of microprocessor technology, computers, the Internet, mobile communications, etc.) to the embryonic phase VI of TU, based on a complex, nano-bioengineering technologies, robotics, 3D printers, new technologies in energy, etc.

With the transition to the VI technological order, the world economy will move to a new "integral" world economic order, the characteristic features of which are [2]: (a) a hybrid model of functioning, synthesizing state regulation and market self-organization; (b) humanization of economic relations, a shift in emphasis from purely economic goals to socio-economic ones, movement towards improving the quality of life and well-being of the population; (c) introduction of new forms in management and maintenance of interaction of economic agents based on advanced scientific and technological achievements in key areas of society development (monetary and financial, production, institutional, co-evolution of society and nature).

An important feature of the new integral world economic order is the replacement of the American center of capital accumulation by the Asian systemic cycle of capital accumulation (SCC) [3]. In fact, today there is a rapid formation of a new MHU by such Asian countries as China, Iran, India, Japan, South Korea, Vietnam. The geographic center of the new MHU can formally be considered China, where the integral order is already fully manifesting itself and is based on combining the advantages of a market economy with planning and regulating principles of economic management. The transformation of the PRC's strategic planning system is based on market socialism and the systematic improvement of the public administration system through the selection of institutions that contribute to improving the quality of life and well-being of the population. The technological and organizational basis of China for the transition to the new MHU is provided by the systematic reform of the strategic planning system for scientific and technological development. This undoubtedly determines the need for an in-depth study of China's experience in organizing scientific and technological development and assessing the possibility of using the best practices in the state management of scientific and technological development of our country. Scientific interest in studying the experience of building an effective strategic planning system for scientific and technological development in the PRC in a new world economic order is due to the objective reason for the need to avoid mistakes and improve the efficiency of managing scientific and technological development in the Russian Federation.

The model of the strategic planning system of the PRC scientific and technological development, which is being formed in the context of the transition to a new MHU, is shown in Figure 1. It can be used as a tool for structural and institutional analysis, assessment of the planning system for scientific and technological development of Russia (but, of course, taking into account national specifics).

According to the model, the structural basis of the strategic planning system of the PRC scientific and technological revolution is implemented in 4 projections – this is the "System of priorities for scientific and technological development of China", "The system of mechanisms for

implementing the priorities of scientific and technological revolution", "Strategic planning documents aimed at implementing the mechanisms of scientific and technological revolution" and "Improving the overall welfare of society". According to the first and second projections, the main institutional groups are identified according to the key institutional criterion. The system of priorities for scientific and technological development in China is differentiated into thematic and functional ones.

Thematic priorities include key areas and those areas of research and development, investments in which can bring significant socio – economic effects in the long and medium term and have an upward impact on the level of welfare of society. The functional priorities of the PRC scientific and technological revolution include tasks solved in order to improve the functioning of scientific and technological development.

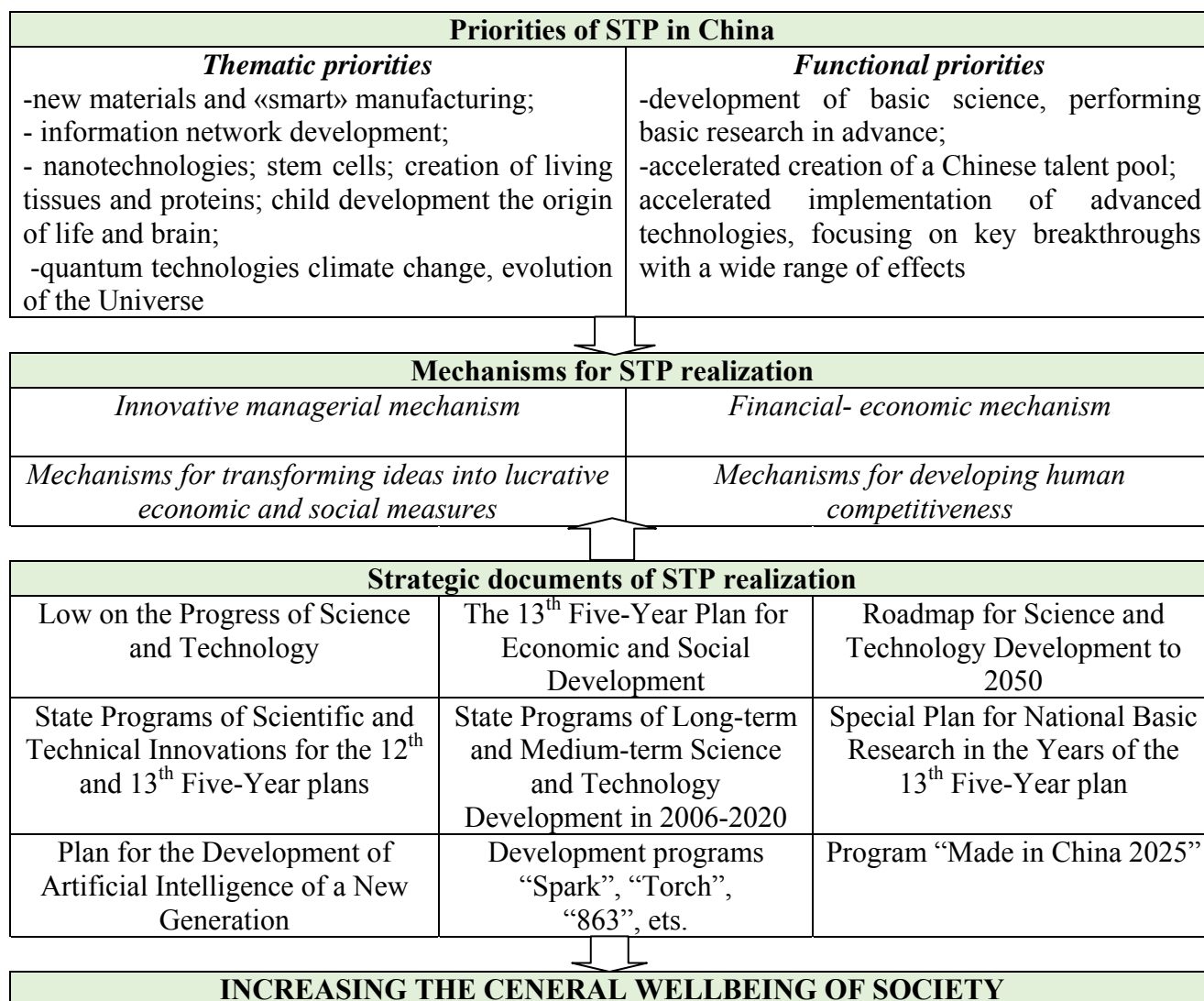


Fig. 1. Model of Strategic Planning for STP in China during the Transition to a New Global Economic Mode. Source: Compiled by the authors based on sources [4];[5]; [6]; [7]; [8]; [9]; [10]; [11]

The implementation of the main thematic and functional areas of the PRC scientific and technological revolution is carried out through mechanisms enshrined in the official strategic documents of the PRC scientific and technological revolution, which can be conditionally divided into the following groups: 1) *Financial and economic mechanism, providing for both direct forms of support for scientific and technological development* (provision by the Development Bank of China of "soft loans" to high-tech companies; direct government investment in fundamental research in the field of advanced technologies), *and indirect economic support* (tax incentives for

small and medium-sized businesses in the form of a reduction in the tax base by deducting up to 150 % of R&D costs from gross profit; introduction of mechanisms for accelerated depreciation of research equipment worth up to 300 thousand yuan, as well as accelerated implementation Consumer VAT). 2) *The mechanism of scientific and technological support for the transformation of knowledge and ideas into economic and social benefits*. Includes as determinants: a) the introduction of a new system of integrated management of science and technology in the military and civilian spheres; b) formation of a system of technical standards at the national and international level; c) improvement of the intellectual property system based on information technology; d) creation of high-tech laboratories, modern scientific parks; e) creation of a system of national centers for the training of talents, etc. 3) *Mechanisms of infrastructural support for the formation of competitive human change*, including a system of multilevel training of talents; orientation towards the educational system, which instills in students the attitude towards learning throughout life; attracting world-renowned scientists and teams to the PRC under the Thousand Talents Plan; creation of a system of "revolving doors" between research institutes and enterprises, so that a researcher can work at certain stages of his career in laboratories at enterprises, etc. 4) *Organizational and managerial mechanism of scientific and technological development*, including the introduction of innovative approaches to the management of scientific and technological development. An innovative approach to the management of scientific and technological development is carried out on the basis of a) systematic implementation of the optimal form of public-private partnership, which encourages all partners in the partnership (government, industry, universities, research institutes) to develop and commercialize technologies.

Within the framework of these partnerships, the key role of the regulator for the promotion of technological innovations and technology transfer is assigned to the market, where enterprises are the main subject. Strategic planning and the formation of scientific and technical policy is the responsibility of the structural units of the government, which should be exempted from the management of individual projects. The role of research institutes, sectoral research centers, enterprises and universities is reduced to the organization of specific scientific research; b) development and implementation of a layout of a new generation of projects – megaprojects "1 + N cluster".

The proposed structuring of the institutional field of scientific and technological development makes it possible to more clearly enshrine the norms and rules: 1) planning activities at the managerial and legislative level, which is reflected in the third projection – "Strategic planning documents aimed at the implementation of scientific and technological development mechanisms", which is an institution of documentary consolidation planning systems for scientific and technological development. 2) the relationship of scientific and technological development with an increase in the general welfare of society – the fourth projection, reflecting the key priorities of social development.

Summing up the analysis of the strategic planning system for the scientific and technological development of the PRC, a number of distinctive features can be identified in the context of the transition to a new world economic order, which may be of practical interest in the state management of the scientific and technological development of our country [12]: a) focus on overcoming poverty and building societies with a high level of quality of life; b) a weakening of the directive nature of planning scientific and technological development, a shift in emphasis in strategic plans of scientific and technological revolution on tasks, on the formation of conditions for solving social problems; c) indicative nature of strategic planning of scientific and technological development and the transition from quantitative to qualitative indicators; d) close connection with the strategic needs of the country; e) high decentralization in the development of science and technology, which implies the consideration of regional authorities as the main subject of responsibility in the development of science and technology from the point of view of the policy of protecting intellectual property; infrastructure; investments in increasing the mobility of resources in science and technology; f) high integration of science and technology in the military and civilian spheres; g) systematic management of scientific and technological development based on PPP,

carried out jointly by the government, research institutes, industry, universities and consumers of innovations; h) reforming the management of scientific and technological revolution towards a clear organization of the division of labor and a clear system of responsibility of each management structure for the formation of scientific and technical policy, the implementation of scientific programs, the allocation of resources, consultation and assessment; i) transformation of institutions and roles of the main participants in scientific and technological development: 1) displacement of the key role of the regulator for the promotion and transfer of technological innovations from the state to the market (enterprises); 2) consideration of fundamental science as a locomotive of the country's scientific and technological development; 3) creation of independent scientific and technical expertise and assessment of plans and projects; 4) transformation of existing research institutes towards socially oriented national research centers.

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THE TRANSFORMATION AND UPGRADING OF TRADITIONAL MARKET UNDER THE BACKGROUND OF INTERNET

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At present, the market network has become an emerging and huge trend, and its impact on the traditional market is increasingly prominent. The market network also brings challenges and opportunities to the traditional market in terms of time and space, information transmission and transaction modes. The traditional market should realize transformation and upgrading, expand the market from entity to virtual, and realize the organic combination of entity market and virtual market.

Key words: traditional market; virtual market; Internet background

The advantages of traditional markets are about market transformation and upgrading in the context of networking. Virtual market is built on the basis of traditional market, has its unique advantages. After years of development, a large-scale supporting logistics system has been formed around the traditional market. No matter small pieces, single goods or large goods, they can be delivered quickly, efficiently and at low cost through the existing logistics system. For example, in the urban area of Yiwu, China, there are several large logistics stations such as Jiangdong Freight Market, Binwang Freight Center, Yiwu International Logistics Center, where large goods can be consigned continuously. In addition, there are a number of express agencies where small items can be easily delivered. The strong logistics system greatly reduces and the transportation time and cost of goods are reduced either.

Second is the source of goods, information and customer advantage. In the traditional market, there are a stable number of dealers and retailers from all over the world, with a large number of operators and customers, as well as a rich supply of goods and information. With the participation of upstream or related industries, such as bidding comparison service and professional product photography, an obvious industrial agglomeration effect has been formed.

Moreover, it is the advantage of entity operation backing. Since virtual market operators all have physical stores in traditional markets, it can give buyers more trust and security, which is conducive to the two parties to reach a deal. In addition, the market management can also effectively supervise the integrity of the business owners and the quality of goods.

Finally, the brand advantage is important. After 70 years of development, Wal-Mart in the United States has left a deep impression in the hearts of customers and has become a market brand with certain influence. Brand is the embodiment of customer loyalty and trust, which makes Wal-Mart have incomparable advantages over new online commodity trading intermediaries. Usually after the establishment of an e-commerce website, in order to expand its popularity, it needs to invest a lot of manpower and material resources to publicize. The establishment of e-commerce websites in the traditional market can make full use of the existing brand reputation in the traditional market. The website can form a greater influence and obtain a higher popularity in a relatively small cost and a relatively short time.

The measures are about transformation and upgrading of traditional markets in the context of networking. The first is the market positioning from "product distribution center" to "product and information distribution center" change. Traditional markets generally attract a large number of

customers through the characteristics of many categories of goods, complete varieties, and sufficient supply of goods, large choice room and high degree of competition. But in the network age, we must give full play to the function of market information collection and distribution. With the development of the Internet, many netizens have gradually become accustomed to the way of searching first and then shopping. To this end, China Commodity City website and Sogou Search Engine Cooperation (A Chinese search engine), whether sales retail (B2C field), or foreign buyers, purchasers (B2B field), can find the source of goods through search, to solve the Internet users how to find the goods they want in a large number of goods.

Next is the entity management door to "modern" management door change. When the traditional market is introduced into the virtual market, the organization mode of the market is no longer just the physical shop, but the physical shop of the traditional market and the virtual shop of the virtual market are integrated into one. Entity enterprises should make full use of supply of goods, funds, experience and information of the four advantages, take physical stores do online, from entity enterprise to have the double identity of the entity management and virtual management "modern" enterprises, the two kinds of competitive into a mode of operation of alternative and complementary, and achieve the perfect combination of physical and virtual.

Finally, the physical market and virtual market are combined. After years of development, the traditional market has many advantages. It has established a large number of experienced business operators, a relatively stable customer group and a relatively complete logistics system. As payment systems, network security and other issues are solved, the virtual market will develop at a faster pace. The traditional market can innovate the transaction mode, management mode and marketing mode through the organic combination with the virtual market. The traditional market is a place where goods are arranged, looked at, traded and stored, while the virtual market is a collection of means such as information exchange, search, release and online trading. Virtual market, with its advantages of fast information transmission, long transaction time, quick transaction mode, low cost and wide radiation space, has enhanced the transaction mode of the traditional market. This combination produces "1+1 > 2" effect.

The network market, with its wide trading range, low transaction cost, convenient transaction mode and other advantages, has greatly impacted and challenged the original functional advantages of the traditional market. In order to adapt to the needs of the development of the Internet era, the traditional market must upgrade the hardware and software facilities, perfect the third party logistics and other supporting service system, pushing forward the construction of the informatization, the digital innovation way to trade, the trading method, at the same time, accelerate the construction of credit system, establish the credit evaluation, credit incentive and faithless punishment system, ensure the transaction security, promote the combination of physical and virtual market, known for transformation and upgrading, in order to adapt to the trend of the development of the market, in an impregnable position in the intense market competition.

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VALUE-MOTIVATIONAL ASPECT OF STUDENTS ' USE OF ONLINE PLATFORMS

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The article discusses the goals of interaction of modern students on the Internet. The division of different online platforms according to the purposes of use is revealed. The obtained data allow us to speak about the uniqueness of some online platforms, as well as about the ability of modern students to independently form their online environment.

Keywords: students, self-determination, the Internet.

ЦЕННОСТНО-МОТИВАЦИОННЫЙ АСПЕКТ ИСПОЛЬЗОВАНИЯ СТУДЕНТАМИ ОНЛАЙН-ПЛОЩАДОК

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В статье рассматриваются цели взаимодействия современных студентов в сети Интернет. Выявляется разделение разных онлайн-площадок по целям использования. Полученные данные позволяют говорить об уникальности некоторых онлайн-площадок, а также о возможности современных студентов самостоятельно формировать свою онлайн-среду.

Ключевые слова: студенты, самоопределение, Интернет.

Introduction. With the advent of the first computers, as well as the Internet, the world has changed irrevocably. The dynamics of modern life are much higher than they were 100 years ago. The world is becoming more open, mobile, and multitasking [1]. In society, especially among young people, there are also serious changes in values and goals [2].

Modern research confirm that people spend more time online (both the rate of Internet access and the amount of time spent), become more confident users, and often combine online activity with everyday tasks (for example, using the Internet on the way [3].

In connection with the dynamics of modern society, the rapid change in social institutions and living conditions, it is important to study the goals and values of a modern man, as this is what can help him cope with new challenges successfully.

We conducted a study to identify the goals of interaction between young people on the Internet. The technique of unfinished sentences was used. Respondents were asked to complete the phrase "I need Instagram for..." by suggesting up to 3 goals. The most popular online platforms were offered: Instagram, Telegram, V Kontakte, Odnoklassniki, Twitter, Facebook, Tiktok and YouTube. The study involved 33 full-time university students, 51.5 % women and 48.5 % men.

Research results. All respondents use 2 or more of the sites represented. Most often, respondents use 3 (24.2 %) or 5 (24.2 %) of the suggested online platforms in their daily lives.

Odnoklassniki (9 %) and Facebook (9 %) are the least popular social networks. The most popular were the social network Vkontakte (97 %) and the video hosting service YouTube (94 %).

The methodology allowed respondents to offer their own answer options, rather than choose from the suggested ones. The most common uses of online platforms were for communication (37.6 %), entertainment (28.4 %), information (19.9 %), and news viewing (17.7 %). It is worth noting that these goals are universal and were named as goals for the use of most online platforms.

The respondents identified specific goals for using different sites. For example, in the response about the purpose of using the social network Instagram, the answers were "for observing others" (18.2), "for self-presentation" (15.1 %) and for inspiration (6 %). For self-presentation, students also use Tiktok, the other options are unique. In addition, the options "for unloading" and for "lifting the mood" were named as unique viewing goals for Tiktok. These goals were not mentioned when describing other online platforms.

Vkontakte is a unique online platform for use. First, the vast majority of respondents have an account in this network. Secondly, 84.8 % of respondents use this social network for communication. Third, Vkontakte is the only social network that students use for their studies.

Youtube video hosting is most often used by respondents to get useful information (33.3 %) (the answer options are "for study", "for training", "for education"). 42.4 % of respondents noted that they need the platform to view content but did not specify which one.

Conclusions. All respondents use at least 2 of the proposed online sites, the maximum number of sites used is 6. Most often, respondents use the social network Vkontakte and the video hosting service YouTube. Less often – social networks Odnoklassniki and Facebook.

The following were named as universal purposes for using online platforms: for communication, for entertainment, for obtaining information and for viewing news. In addition to universal goals that do not depend on the proposed site, respondents identified unique goals for different sites. Most often, the goals proposed by the respondents were related to the personal sphere.

In the modern world, students have the opportunity to independently meet their needs through online platforms and form a list of online activities depending on the goals, without waiting for an offer from the outside.

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THE MAIN DIRECTIONS OF WOODWORKING ENTERPRISES DEVELOPMENT IN TERMS OF TRANSITION TO INDUSTRY 4.0.

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The article deals with the main directions of woodworking enterprises development in terms of transition to Industry 4.0. The current state of Russian wood pellets export has been analysed.

Keywords: Industry 4.0, technological transformation, woodworking, development areas, value-added, pellets.

ОСНОВНЫЕ НАПРАВЛЕНИЯ РАЗВИТИЯ ДЕРЕВООБРАБАТЫВАЮЩИХ ПРЕДПРИЯТИЙ В КОНТЕКСТЕ ПЕРЕХОДА К ИНДУСТРИИ 4.0

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В статье рассмотрены основные направления развития деревообрабатывающих предприятий в контексте перехода к Индустрии 4.0. Проанализировано текущее состояние российского экспорта древесных пеллет.

Ключевые слова: Индустрия 4.0, технологическая трансформация, деревообработка, направления развития, добавленная стоимость, пеллеты.

Russia contains a fifth of the world's forest resources. The importance of the forest industry in the country's economy is based not only on the huge reserves of wood and the territorial prevalence of forest resources, but also on its wide use in various sectors of the economy – construction, industry, transport, agriculture and utilities.

In recent years, the economy and society have experienced significant changes as a result of digitalization. Technological advances in software improve the efficiency of data storage, processing and transmission, which advances the industry.

The term 'Industry 4.0' is used in the context of industries and services, which is aimed at technological transformation.

The term 'Industry 4.0' was first introduced in 2011 by the German government at an exhibition in Hanover, where the aim was to expand the use of information technology in manufacturing.

The main idea of this program was to preserve and increase the competitive advantages of the country's enterprises, to combine industrial equipment and information systems in a single information space. That will allow them to interact with each other and with the external

environment without human participation. As a result, the following directions of enterprise development were highlighted in the context of Industry 4.0, as presented in Figure 1.

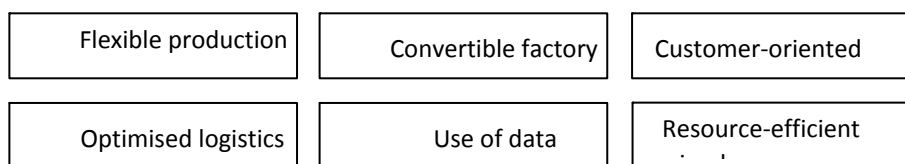


Figure 1 – Business Development Directions in the Context of Transition to Industry 4.0 [1]

As a result of the of these directions analysis, it can be distinguished that the resource-efficient circular economy plays an important role in the transition of enterprises to ‘Industry 4.0’.

At the same time for industrial enterprises, the digitalization directions remain very specific. The Russian Government's resolution ‘Strategy for the Development of the Russian Federation Forest Complex until 2030’ is devoted to the formation of industry development priorities In the context of this strategy, these areas are [2]:

- support for processing projects;
- stimulating demand and developing markets;
- conservation and restoration of forest ecological potential;
- ensuring that the existing raw material base is available;
- development of human, technological and scientific capabilities;
- encouraging forest management;
- improving forest protection.

At the same time the problems holding back the development of the forest complex are:

1. insufficient forest care causing low removal of wood from a unit of operational forest;
2. insufficient reforestation efficiency to ensure the necessary rate of commercial reproduction of commercially valuable forests on the most productive forest land;
3. lack of interest among forest tenants in forest infrastructure development, efficient use and reproduction of forest resources;
4. insufficient forest protection from fires, which leads to loss of forest resources and increases the total cost of protecting, protecting and reproducing forests;
5. need to improve individual standards for the provision of forest plots for use due to the lack of available data relevance on forest resources;
6. complexity and duration of administrative procedures, decision-making procedures, including for large forest processing projects, and the existence of conflicts related to the tightening of environmental restrictions in forest development;
7. low use of forest raw materials and waste paper collection;
8. the limited scale of the domestic market;
9. low investment attractiveness of new forest processing plants, due to country and macroeconomic risks and the high cost of capital raising, high capital costs and construction time;
10. insufficient logistical, scientific and human resources;
11. inadequacy of the regulatory framework and regulatory framework governing the use and reproduction of forests.

Industry 4.0's economic potential in the wood industry is aimed at creating high value-added products and reducing roundwood exports.

As a result of the forestry enterprises industrial activities in Krasnoyarsk region, about 6.8 million of m³ wood waste is generated. Comprehensive wood processing is therefore becoming increasingly important as a part of the transition to Industry 4.0.

Wood biorefining is currently one of the most prospective directions of woodworking development. It represents the production of knowledge-intensive products with high added value

on the basis of deep complex mechanical and chemical processing of forest resources. The production of pellets-sawdust pellets used as fuel is the most cost-effective. Figure 2 shows the structure of world consumption and Russian exports of wood pellets.

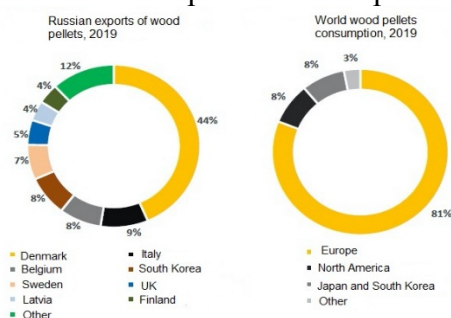


Figure 2 – Structure of world consumption and Russian exports of wood pellets [3]

Taking into account the existing reserves of wood, its high breed-quality characteristics, as well as the possibility of transition to renewable forest management on the basis of artificial reproduction of forests with specified characteristics, Krasnoyarsk region in the strategic perspective should become a leader in the country's forest industry in terms of production of high value-added products.

This will be ensured by the development of the production of mechanical wood processing products with high added value and the expansion of deep chemical-mechanical processing of wood with maximum involvement of small-scale, low-quality and soft-leaf raw materials.

The fourth industrial revolution is creating new business models based on platforms and ecosystems that are transforming value chains as well as production, supply and transportation systems.

Thus, the world industry is on the verge of a large-scale transformation and transition which depends on the competitiveness not only of individual industries, but also of the economy of the country as a whole.

Therefore, it is important to improve the instruments for managing technological transformation in the wood-processing industry to ensure the necessary economic development by improving information support.

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FEATURES OF BACHELOR'S DEGREE STUDYING IN THE FIELD OF ADVERTISING AND PUBLIC RELATIONS IN MODERN CONDITIONS

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Features of bachelor's degree training in advertising and public relations in the context of modern social changes are presented. Definitions of the concepts of "distance learning" and "student multitasking" are given. Distance learning is described in the context of changes in the educational process at the university.

Keywords: bachelor's degree, features of student teaching, advertising and public relations, distance learning, multitasking.

ОСОБЕННОСТИ ПОДГОТОВКИ БАКАЛАВРОВ СФЕРЫ РЕКЛАМЫ И СВЯЗЕЙ С ОБЩЕСТВЕННОСТЬЮ В СОВРЕМЕННЫХ УСЛОВИЯХ

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Представлены особенности подготовки бакалавров в области рекламы и связей с общественностью в условиях современных социальных изменений. Даны определения понятий «дистанционное обучение», «многозадачность студента». Описано дистанционное обучение в контексте изменений образовательного процесса в вузе.

Ключевые слова: бакалавриат, особенности подготовки студентов, реклама и связи с общественностью, дистанционное обучение, многозадачность.

Modern educational conditions impose the specifics of future bachelors in their teaching. Changes in the formats of educational content consumption, presentations, lectures, and webinars are clearly visible. In 2020 higher education has changed towards distance learning. Due to the need to solve social problems, this type of teaching has become mandatory in the situation of fighting the coronavirus and the pandemic. Distance learning is associated with special procedures that are carried out using modern information and telecommunications technologies, even if the participants in the educational process are geographically separated.

On the other hand distance learning is a form of full – time or part-time education. It is a learning system where all components of the learning process (goals, content, special methods, organizational forms and tools) have a place. The main purpose of distance learning as a form is related to the organization of teacher-student interaction and joint cognitive activity.

What exactly has changed in the bachelor's degree program? It is worth noting several factors and directions of changes.

- Updating the distance learning environment.
- Mastering new information through special interaction of students with teachers at a distance, taking into account all the goals, tasks, and content inherent in the educational process.

– Interaction with other participants in the educational process through Internet technologies and various Internet formats.

For future bachelors and teachers of Russian universities, 2020 has become a time of change not only in education, but also in life. Students spent a lot of time at home, and not at the University — this is of particular importance in the teaching of bachelors. Their educational environment has shifted to a different space – the space of Internet technologies. For example, they learned how to work and complete tasks remotely. Distance learning and interaction with the teacher takes place without direct contact between them, but only through digital methods of transmitting and receiving information [1]. This has a special impact on the educational activities of bachelors. In general in modern conditions working in a remote format is not generally recognized. This educational environment is unusual for them, as they received their previous education through the classroom-based system of education. This could affect their attitude to the remote form of work. Many future bachelors have a negative attitude to the distance learning format. They are scarce direct contact with teachers and other students. Among the respondents there are students who consider this type of work to be comfortable and versatile compared to classical classroom teaching. They believe that they save time for other activities.

It is necessary to note an important problem that occurs with the remote format of work. For successful training, a future bachelor requires not only theoretical knowledge, but also practical skills to master the features of professional activity. This context of distance learning is particularly pointed out by teachers who note a decrease in the level of professional skills. This problem has not yet been solved in the distance learning format, although elements of distance learning technologies have been actively used in their practice by University teachers for several years [2].

From our point of view distance education has created another problem. This is the problem of teaching a future bachelor for professional activity in a multitasking environment. In the modern sense multitasking is a phenomenon that indicates the ability of a specialist to perform several processes, solve problems simultaneously. The question is to what extent distance learning contributes or hinders the solution of this problem. If we assume that distance learning is one of the factors that complicate the process of professional training, then this training has some potential for developing future bachelors' readiness to work in a multitasking environment. However, this statement sounds hypothetical and requires special study in the context of the concept of developing the future bachelor's readiness from the single-tasking pole to the multitasking pole. Perhaps we should talk about "controlled multitasking" [3].

Thus we can conclude that current conditions of bachelor's degree teaching require analysis and rethinking of the results of this process. The main features of bachelor's teaching in advertising and public relations in modern conditions are the following. First, distance learning is an element of forming the ability of future bachelors, as professionals, to work remotely, master new subject knowledge and interact with other participants in a particular process. Secondly, PR and advertising specialists are characterized by the ability to work in a remote format. Third, the activity of these specialists is describe by multitasking both in form and content. Fourth, distance education potentially creates multitasking content. From our observations and work experience it follows, that higher education is only on the way to mastering remote forms of work and their potential.

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SPECIFIC FEATURES OF FEE BASED EDUCATIONAL SERVICES IN THE SPHERE OF ADDITIONAL PROFESSIONAL EDUCATION IN THE CONTEXT OF ADVERTISING AND PROMOTION CHANNELS CHOICE

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The article considers specific features of commercial educational services in the field of additional professional education, and what methods should be chosen to promote and advertise them.

Keywords: Additional professional education, professional competencies, competitiveness, commercial (fee based) educational services, promotion and advertising.

СПЕЦИФИКА ОКАЗАНИЯ КОММЕРЧЕСКИХ ОБРАЗОВАТЕЛЬНЫХ УСЛУГ В СФЕРЕ ДОПОЛНИТЕЛЬНОГО ПРОФЕССИОНАЛЬНОГО ОБРАЗОВАНИЯ В КОНТЕКСТЕ ВЫБОРА СРЕДСТВ ИХ ПРОДВИЖЕНИЯ И КАНАЛОВ РЕКЛАМЫ

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В статье рассмотрены специфические черты деятельности по оказанию коммерческих образовательных услуг в сфере дополнительного профессионального образования, на которые нужно обращать внимания при выборе методов их продвижения и каналов рекламы.

Ключевые слова: Дополнительное профессиональное образование, профессиональные компетенции, конкурентоспособность, коммерческие образовательные услуги, продвижение и реклама.

Introduction

In the market of additional professional education, the situation is escalating in such a way that with a high level of competition between educational providers, there is a rapid drop in demand from potential customers due to the economic down-turn, and therefore the key to success in competitive struggle is to reduce the cost of educational programs. At the same time Universities that provide commercial educational services for additional professional education programs on their platforms are able to provide a really high level of quality of education, but very often they do

not succeed in winning the competition for the customer due to organizational and economic reasons. Nevertheless the funds received in the implementation of commercial services of additional professional education for Universities are very important, because they make up extra-budgetary funds, which mean that they stabilize the situation of educational institutions [1].

The novelty of the study lies in the fact that the business of fee based educational services in the field of additional professional education before 2015 has been regarded as the object of research in the field of vocational education, postgraduate education within the concept lifelong learning, androgogy, acmeology. But only in 2018-2019 marketing experts showed interest to commercial educational programs in the field of additional professional education, though they are less likely to pay attention to advertising issues. However, paid professional education programs have a number of specific characteristics that distinguish them from other fee based educational services and should definitely be taken into account when choosing ways of promoting them to the market and choosing advertising channels.

Let's focus on the main characteristics from the perspective of marketing experts:

- educational services have the property of being extended over time; an educational service is not material and does not have the property of accumulating, but it forms the accumulation of human capital;
- educational services are provided by the manufacturer without mediators, with the exception of distance learning using computer technologies;
- the consumer of educational services may be subject to any requirements in the beginning of the process, these are established and stipulated at the legislative level, and some requirements may be set by an educational organization (a certain level of knowledge, practical experience in certain levels of positions – for example, managerial experience, etc; level of education);
- the quality of educational services directly affects society development in terms of intelligence and culture which is also in the state's interest.
- active participation of the consumer in the consumption of educational services, which is a mutually beneficial development of consumers and educational institutions;
- educational service is inseparable from the entity that produces it. This service is provided directly to the consumer. When an entity interrupts the provision of an educational service, the service is terminated or suspended;
- the demand for paid educational services is often seasonal,
- spread over results of training, the dependence of training results on the conditions at the place of work of the listener [2].

As the summary of the above said we can resume that private educational services for additional professional education, as a product to promote refer to the formats business B2B, B2C, C2C. However they have a limited target audience in the market. The values of the audience aimed at increase of intellectual property and intangible assets, and constantly developing competitive advantages in their markets. It is these clients who use periods of market downturns and crisis situations to systematically build up their competitive intangible assets.

This therefore suggests the following considerations and conclusions.

Education providers should use not only classical methods and channels for promoting their commercial educational services (mailing lists, websites with "landing" effects and "live questionnaires", social networks), and so on;

In addition it is necessary to create hackathons, forums and chats for "narrow" specialists as promotion channels, where specific topics are discussed and a target audience is gathered, for which you can quickly create educational programs that are a "unique sales offer" in the market of additional professional education and immediately promote these programs [3].

Practical experience and observations show that online and offline conferences as ways to gather a target audience for advertising and promotion purposes are somewhat a thing of the past, but exhibitions of unique technical "know-how" have a greater advertising success and return on investment.

Advertising of educational content should have a unique intellectual component and at the same time make it clear what competitive advantages their owner will be enriched by obtaining this unique intellectual component.

Perhaps many marketing specialists would agree that omni-channel scenarios as a means of promotion and advertising would be effective. The omni-channel approach assumes that the brand uses different sales and marketing channels — and the client can make purchases or communicate with the brand in any way that is convenient for him, in any channel while preserving the history of communications and sales [4]. This strategy focuses on the customer and their loyalty increases accordingly. Practitioners in the field of advertising and promotion believe that an omni-channel helps: to increase CLV (customer lifetime value), to reach new segments of the target audience, to improve operational efficiency and to increase market share.

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THE HISTORY OF THE TECHNOPARKS' EMERGENCE AND DEVELOPMENT

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The article deals with the history of the emergence and development of technoparks. One of the concepts of a technopark is given. The history of the emergence and development of technological parks on the territory of the Russian Federation is described. The main requirements for industrial parks are noted. The importance of the presence of technoparks in Russian cities is indicated.

Keywords: technology park, technopolis, innovation cycle.

ИСТОРИЯ ВОЗНИКНОВЕНИЯ И РАЗВИТИЯ ТЕХНОПАРКОВ

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В статье рассмотрена история появления и развития технопарков. Приведено одно из понятий технопарка. Описана история возникновения и развития технологических парков на территории Российской Федерации. Отмечены основные требования, предъявляемые к технопаркам. Обозначена важность наличия технопарков в Российских городах.

Ключевые слова: технологический парк, технополис, инновационный цикл.

The history of Technoparks has started in the USA. Stanford University owned a large plot of land but could not sell it. In this regard one of the deans of the university Professor Terman suggested rent the land for a long-term lease as an office park. At the same time only high-tech companies could act as tenants of this park. So the university began to receive income from land lease and its graduates were given the opportunity to find a job in this park. Over the years Professor Terman's idea served as the basis for the creation of Silicon Valley in America. Currently such global giant corporations as: Apple, Intel, Hewlett-Packard, and many others are among the residents of Silicon Valley. In the 1970s techno parks gradually began to appear in European countries.

It should be noted that one of the definitions of a technopark existing today is as follows: technoparks and technopolises are specialized property and land complexes in the city that have the appropriate official status and provide favorable conditions for conducting research, production and innovation activities for their residents [1].

Further let us turn to the history of the emergence and formation of technoparks in the Russian Federation. The first technoparks in Russia began to appear in the 90s of the XX century. For the most part these were divisions of universities or science campuses. It is believed that the

first technopark in Russia is the Tomsk Science and Technology Park. Today more and more attention is paid to technoparks in our country. Currently there are about 160 technoparks in the Russian Federation and in the next 10 years the number of technoparks and technopolises may double. So today only in Moscow there are about 35 technoparks and technopolises (data from the investment portal) [2]. The most famous of them is the Skolkovo Technopark [3]. It should be noted that in Russia technoparks' residents have the opportunity to gain access to equipment and services as well as consulting assistance. It is important to understand that any technopark has its own industry specialization. For example it can be microelectronics, biotechnology, mechanical engineering, IT-sphere etc.

Regarding the definition of a technopark, we can say that a technopark is understood as a set of real estate objects created for conducting small and medium-sized businesses in the field of high technologies, managed by a single management company and including office buildings, land, industrial premises, as well as social, transport and engineering infrastructure. The key function of any technopark is to unite several innovative companies in a single complex of real estate in order to achieve the highest productivity. A complete innovation cycle must be carried out. The main task of the technopark management company is to create the necessary working environment and fill the technopark with appropriate service functions. It is important to note that the activities of technopark residents can be quite diverse. They can include research, development and production technology.

The main requirements for the construction and placement of technoparks in Russia are contained in the National Standard. For example the requirements for the size of a technopark are as follows: the total area must be at least 5 thousand square meters; the presence of a separate territory is assumed, not less than 3.5 hectares [4]. The technopark must have access points to all communications. One of the main factors for the successful functioning of a technopark is undoubtedly the volume of financial investments, which can have a fairly wide spread. First of all the volume of financial investments is determined by three factors: the scale of the technopark; whether the technopark is being created from greenfield or based on existing facilities; the third factor is the equipment planned for placement on the territory of the technopark. According to the Association of Clusters and Technoparks there were 157 technoparks in the Russian Federation last year, including 65 industrial technoparks, 49 of them were operating, and 16 were just being created [5]. Despite the fact that the majority of technoparks are concentrated in large cities in Russia, small cities can also successfully create such facilities. The main factor here is the availability of appropriate scientific and technical potential and demand for applied developments. Thus technoparks can function in science cities or in settlements where large high-tech industries are located. But it is necessary to understand that in this case the scale of the technopark will probably be much smaller than in a large city, but this will not affect its efficiency. The presence of a technopark in a city whether it is a million-plus city or a small town is also beneficial for its residents due to the fact that a technopark provides additional jobs and opportunities for the development of entrepreneurial and innovative activities. And in general, the presence of a technopark in the city has a positive effect on its image.

Summing up the above we can state that a technopark is a complex, high-tech structure. Its successful development and functioning depends on many factors. In the coming years, there is a possibility of the emergence of new technoparks as well as the development of existing ones. This is facilitated by the increasing role of the state in supporting the development and functioning of technoparks and the restructuring of large industries.

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THE QUALITY OF MANAGEMENT A DESIGN ORGANIZATION IN ACCORDANCE WITH NORMAL REQUIREMENTS

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It is proposed to improve the quality of management a design organization by means of integrational interactions of functional, processional and design approaches in accordance with the requirements of the national and international standards, such as GOST R ISO 9001-2015, GOST R 56404-2015, GOST R ISO 21500-2014.

Key words: design organization, quality of management, the processes of production life cycle, profitable agreements.

КАЧЕСТВО УПРАВЛЕНИЯ ПРОЕКТНОЙ ОРГАНИЗАЦИЕЙ СОГЛАСНО НОРМАТИВНЫМ ТРЕБОВАНИЯМ

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Предлагается совершенствовать качество управления проектной организацией путем интеграционных взаимодействий функционального, процессного и проектного подходов в соответствии с требованиями национальных и международных стандартов: ГОСТ Р ИСО 9001-2015, ГОСТ Р 56404-2015, ГОСТ Р ИСО 21500-2014.

Ключевые слова: проектная организация, качество управления, процессы жизненного цикла продукции, доходные договоры.

The appearance of the latest version of GOST (National state standard) R ISO 9001-2015 standard was, among other things, directed at removing the problem of existing the quality management system (QMS) of the organization as if parallel with its control system. Therefore, introducing the requirements of the given standard provides an integrated approach to the organization management and in this way improves its whole control system. In addition, it becomes possible to move from quality management to management quality [1]. Here the improvement of the quality of organization control comes to the forefront. The latter must be considered taking into account its organizational characteristics.

There is no generally accepted definition of the term of «Quality of organization management». In the research by Zh. V. Abakumova [2] several approaches are indicated as to its definition. These are directed at such issues as: improving the quality of product properties, the organization efficiency and effectiveness, staff recruitment, the activity standardization.

The object of our research was a design organization [3] in the «upstream» sector, which was part of the vertically integrated structure of the oil and gas industry and which carries out design and survey work (paragraphs 71.12.3 and 71.12 OKVED (All-Russian classifier of economic activities) [4]. In an organization management a functional approach is actively used. And a processional approach is introduced according to the requirements of the GOST ISO 9001-2015 standard. Thus, we propose to improve the quality of controlling a design organization using integrational interactions of the functional, processional and design approaches in accordance with the requirements of the national and international standards, which are GOST R ISO 90001-2015 called «Quality management systems. Requirements», GOST R 56404-2015 called «Lean production. Requirements for management systems», GOST R ISO 21500-2014 called «Project Management Guidance».

The main activity of the studied design organization consists of concluding and realizing profitable agreements for fulfilling designed and prospecting works. An organization processional model was improved by means of its modeling. Interrelation of the processes of the product life cycle (first level) and their decomposition at the second level were reflected in it.

Let's observe that random sample was taken from 10 % formed profitable agreements. Then their content was studied. The analysis gives it was determined that the agreement included only some of the second level processes necessary for making products and /or rendering services required by a customer. These may be the main processes of manufacture. Namely: «Designing geological prospecting works», «Seismic prospecting works», «Calculation and audit of hydrocarbon reserves», «Designing and monitoring mining deposits», «Design and surveying works» etc.

The profitable agreements were classified according to the following criteria: the number of the first and second level processes included in the agreement, types of project results, and quality of project results characteristics.

Additionally, the types of processional models of the profitable agreements were identified. For example, the functional ones include only one structural unit. As regards cross-functional ones, they implement several main processes which are controlled by two structural divisions. Besides, it concerns profitable agreements performed with the participation of subcontractors. Management facilities applied in profitable agreements of various types were determined. According to the point 8.4.3 of the GOST R ISO 9001-2015 standard, various means of control may be used in them, including analysis, verification and validation.

The fact that it is determined that the results of profitable agreements are such products as information account, scientific and technical account, technical documentation, design documentation etc; and services e.g. concerning inspecting engineer construction, engineering and geodetic findings, etc.

Thus, the required quality characteristics of the project results include:

- in case of products: laws and regulations, industry standards, internal regulations of the Company and the customer, examination requirements, etc.
- in case of services these include: the possession of a license to work authorization, SRO certificates for admission to work, suitable specialists, certified laboratories and other things.

Therefore, the results presented open up the possibility on integrating functional and processional approaches in a design organization, including spreading this on the profitable agreements realized by it. They also enable to additively implement introducing the project (design) control being guided by the requirements recommendations of GOST R 56404-2015 standard-«Lean production. Requirements for management systems» and GOST R ISO 21500-2014 – «Guidance on design management». For this it is necessary to carry out the diagnostics of the existing design approach and apply the mapping of the project life cycle process. Besides, it is necessary to additively realize introducing the design control and evaluate the effectiveness of improving controlling the quality of a design organization.

Account should be taken that measuring the effectiveness must be aimed at ensuring confidence that QMS of the design organization may reach set results and constant improvement of

the processes of QMS and the system of managing an organization on the whole. It also contributes to getting information for decision-making.

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DEVELOPMENT MODEL AND STRATEGIC SUGGESTIONS OF CROSS-BORDER E-COMMERCE IN CHINA

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According to the analysis method of system theory, based on the analysis of the system connotation and motivation of the rise of cross-border e-commerce, this paper proposes the development mode of cross-border e-commerce in China – cloud platform logistics development mode, points out that cross-border logistics and its global layout is the lifeblood of cross-border e-commerce development in China, the industrial integration of information technology is the fundamental of cross-border e-commerce development in China, and from the cross-border legal regulation system and credit system.

Keywords: cross-border e-commerce, cross-border logistics

Cross-border e-commerce refers to an international business activity in which transaction subjects belonging to different customs borders reach a transaction, make payment and settlement through an e-commerce platform, and deliver goods and complete the transaction through cross-border logistics, which is generally regarded by the society as a business mode with electronic data exchange and online transaction as the main content. According to the viewpoint of system theory, cross-border e-commerce itself is a system, which is an organic whole with the function of commodity exchange between countries according to certain structural form composed of information flow, capital flow and logistics, and has not only the common basic characteristics of all systems such as openness, self-organization, complexity, wholeness, correlation, hierarchical structure, dynamic balance and temporal order, but also has such special characteristics as virtuality. It also has special characteristics such as virtualization, competition, etc.

As a system, cross-border e-commerce is mainly composed of four basic elements, including information flow with "cloud" attributes, capital flow with "virtual finance" attributes, logistics with property rights attributes and "human" attributes. The four basic elements are: information flow with the attribute of "cloud", capital flow with the attribute of "virtual finance", logistics with the attribute of property rights and subject with the attribute of "people".

In cross-border e-commerce activities, natural persons, legal persons, organizations and state agencies engaged in cross-border e-commerce are the subjects of cross-border e-commerce, such as consumers, producers, manufacturers, suppliers, distributors, agents, platform providers, financial institutions and state regulatory agencies (such as China's customs, entry-exit and quarantine bureaus, foreign exchange authorities, etc.). Among them, the state and its related agencies are the decisive subjects, which determine and constrain the activities of other subjects of cross-border e-commerce.

In the process of developing cross-border e-commerce development, we should not only recognize the dynamic role and positive impact of cross-border e-commerce on the transformation and upgrading of foreign trade and domestic enterprises stepping into the international market, but also soberly recognize that cross-border e-commerce involves many issues such as domestic and foreign economic and political laws, cultural and historical traditions and geographic customs, and

moreover, we should soberly recognize that cross-border e-commerce also has its own advantages, disadvantages and weaknesses.

The essence of international trade is the exchange of goods between countries. Therefore, the government, as the leading player of cross-border e-commerce in China, should strengthen the innovation of management functions and services, and actively strive for the international discourse and initiative of cross-border e-commerce. On the one hand, it actively participates in transnational cooperation and dialogue, formulates and modifies new rules of international trade together with other countries in the world, solves a series of new problems brought by cross-border e-commerce such as tariff and taxation, unified commercial code, transnational payment and settlement, intellectual property rights, technical standards, etc., and strives for the international discourse of cross-border e-commerce; on the other hand, it actively participates in activities to combat illegal and criminal acts in the cross-border e-commerce market, and jointly Create a safe and harmonious cross-border e-commerce environment, and continuously promote the innovation and development of international trade pattern.

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UNIVERSITY STUDENTS' SELF-DIRECTED LEARNING

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The article reveals the peculiarities of the independent mastering of new information by students of universities in modern conditions of extended distance learning form of education. Interrelation of two concepts -independence and self-education is shown, a brief analysis is given.

Keywords: information, independence, university students, mastering information, self-education.

О САМОСТОЯТЕЛЬНОМ ОСВОЕНИИ НОВОЙ ИНФОРМАЦИИ ОБУЧАЮЩИМИСЯ ВУЗОВ

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В статье раскрываются особенности самостоятельного освоения новой информации обучающимися вузов в современных условиях расширения формата дистанционного обучения. Показана взаимосвязь понятий самостоятельность и самообразование, для чего представлен их краткий анализ.

Ключевые слова: информация, самостоятельность, обучающиеся вуза, освоение информации.

The paradigm of education in Russia has undergone significant changes in the context of the pandemic. The changes include the fact that the independent mastering of new information by students is taking a bigger part of their preparation at the university. In the face of the coronavirus pandemic, with distance-learning taking over face-to-face classes, students and teachers had to navigate through challenges of solving educational problems that had not been previously tested and more of what you might call situations of uncertainty. It's impossible to ignore the recent appearance of certain obstacles, which made the harnessing of knowledge and specific skills, in particular, more complicated.

However, the practice of education concerning this problem shows that higher education takes into consideration the current situation and makes every effort to adapt the educational program to the format of distance learning. It should be noted that to educate students successfully, more than theoretical knowledge of the subject is required. Teachers are expected to consider their students' psychology, educational potential, and willingness to master new information on their own. Therefore in relation to the distance learning format, it is necessary to look for effective approaches to learning in interactive forms.

First of all let us turn to the concept of independence. Investigating the psychological aspects of independence, S.L. Rubenstein noted that following the initiative which characterizes one by the way one performs the very first stage of strong-willed action, it is necessary to point out self-determination, independence, as an essential feature of the will. Its direct opposite is vulnerability to other people's influences, heightened suggestibility. Genuine independence of the will implies, as the analysis of suggestibility, negativism and stubbornness shows, its conscious feeling of motivation and validity. Resisting other people's influences and suggestions is not willfulness but a genuine manifestation of one own independent will since one individually sees objective reasons for acting the certain way and not otherwise [1, p. 581].

These ideas of the scientist indicate the willful aspect of independence.

V. Frankl also talks about independence as a personal quality that is associated with free will. His theory is characterized by the fact that independence is limited by both external conditions and internal conditions, but a person himself chooses how to relate to them. V. Frankl characterizes this position as follows: a person is free to search for the meaning of his life and in realizing the meaning of his life, even if his freedom seems to be noticeably limited by objective conditions. Man is not free from external conditions and from internal conditions, but they do not fully determine his will. In his opinion, independence coexists with necessity, and they are localized in different dimensions of human existence [2, p. 158]. Thus, it follows from the above that independence is an important component of the meaning of human life, and in relation to students, independence can be noted as one of the important characteristics of the point of learning.

A.G. Asmolov, talking about self-realization of individuality, says that a personality can truly manifest itself only in a complex, problematically conflict situation, which cannot be overcome with the help of once assimilated, stereotyped means. It can be assumed that such situations were the ones that encourage one to manifest one's independence, which, in turn, is expressed in behavior, increased initiative, activity, and creative transformation of the situation itself. In his opinion, these situations are the ones that induce self-development of personality, "in situations of free choice, the personality is particularly true as a subject of activity." [3, p. 52]

Along with the concept of independence it is necessary to highlight the concept of self-education. In the scientific literature, there are a considerable number of both definitions of the term self-education and its characteristics. Here are some of them: "Self-education is a purposeful cognitive activity controlled by the personality itself; an obtainment of systematic knowledge in any field: science, technology, culture, politics, life, etc. Self-education is based on the direct personal interest of the student in balance with the independence in studying the material. Self-education is one of the means of self-training/self-upbringing". [4, p.156] N.A. Rubakin also talks about the impact of life situations on self-education issues. "The first and most important rule," he says, "is to start self-educational work not with a book, but with life. Life teaches us so much more than even best of the best books can do. The book is only a tool and a manual. It is not life that needs to be tested with books and theories, but exactly the opposite. The second rule: every phenomenon of life must be discussed necessarily and constantly from many perspectives. Possibly, as many perspectives as possible..." [5, p. 13]

Rubakin emphasized that there are three main purposes of self-education: to give a person "knowledge, understanding and mood". Not only to see the meaning of self-education in developing the skill of contemplation of the world, but also in a certain revolutionary action.

The survey revealed the following difficulties encountered by students. Firstly due to the lack of non-verbal feedback from the teacher, students' motivation decreases. Teacher enthusiasm in giving assignments, as well as discussing challenges of independent study, can significantly reinforce students' intrinsic motivation. Secondly the remote learning format implies a nominal test of the formed competencies as well as knowledge and skills. To reduce the speed of evaluating assignments, students are now given more tests, which prevent them from expressing thoughts in detail and get involved in a discussion to defend their positions, as well as widen their outlook based on teacher's opinion. Thirdly students lack enough communication with peers and their teacher; there are no formats of social interaction, familiar to students in the classroom. If we

consider self-dependence an essential peculiarity of the will, independence from the influence of others then this factor should contribute to the formation of self-dependence, its development.

Formally there have been no significant changes regarding academic performance in terms of grades. However students noticed that a new approach to assigning and evaluating works makes it easier to get a better grade than it used to be during pre-pandemic studies.

Thus in order to fully understand the impact of the new form of education on the development of independence, additional research is required.

Speaking about self-learning new information, it's important to mention that not only do the interactive forms of teaching allow students to formally obtain new information and receive positive assessments, but also to comprehend it in their own way and discuss it with their teacher and classmates.

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Post-Graduate Students' Research (Technical & Scientific Spheres)

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COMPARATIVE ANALYSIS OF FILTERS FOR DATA PROCESSING IN THE SPACE INDUSTRY

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In this paper, algorithms for filtering data received from the spacecraft are considered. We consider an algorithm for filtering data received from the spacecraft. The filters can be used either in spacecraft control software or in ground-based software. The research presents a comparative analysis of various modifications of the Kalman filter and the least squares method.

Keywords: Standard Kalman Filter, Extended Kalman Filter, Unscented Kalman Filter, method of least squares, spacecraft.

СРАВНИТЕЛЬНЫЙ АНАЛИЗ ФИЛЬТРОВ ДЛЯ ОБРАБОТКИ ДАННЫХ В КОСМИЧЕСКОЙ ОТРАСЛИ

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В данной работе рассмотрены алгоритмы фильтрации данных, получаемых с космического аппарата. Фильтры могут быть использованы как в программном обеспечении для управления космическим аппаратом, так и в наземном программном обеспечении. Представлен сравнительный анализ различных модификаций фильтра Калмана и метода наименьших квадратов.

Ключевые слова: стандартный фильтр Калмана, расширенный фильтр Калмана, сигма-точечный фильтр Калмана, метод наименьших квадратов, космический аппарат.

Today, there are more than hundreds of thousands spacecraft for various purposes in outer space. To ensure their operation and prevent collisions with other satellites, it is necessary to obtain measurements of the current navigation parameters.

Thus, the task is to determine the state vector of the spacecraft from a sample of measurements of the current navigation parameters. To solve this problem, performing many steps is required:

choosing a mathematical model of the spacecraft motion, a mathematical model of measurements, solving a boundary value problem, and checking the solution for the convergence criterion. One of the important processes in determining the state vector is the use of filters. Filtering is necessary to get closer to the true values, know the measured data and the calculated data.

Before applying the filtering algorithms, it is necessary to describe the spacecraft motion model and the measurement model.

In this paper, we consider various Kalman Filters and the least squares method.

First, we scrutinize the Standard Kalman Filter. Here we research the linear case of the problem statement. The Standard Kalman Filter is applicable only for well-conditioned problems and diverges in most practical problems. Therefore, the use of this algorithm for filtering data from the spacecraft is undesirable [1].

The Extended Kalman Filter is used for nonlinear problems. In comparison with a linear filter, it is possible to use a nonlinear motion model and / or a measurement model. The matrices that define linear transformations are replaced by functions that can generally be nonlinear [2].

Extended Kalman Filter takes into account the unknown phase noise affecting the system. The special feature of the Extended Kalman Filter is that the current values of the estimated parameters must be in a fairly close neighborhood relative to their true values. The method requires that there are no long time intervals, where there are no measurements. Thus, Extended Kalman Filter is advisable to use for on-board software [1].

The Unscented Kalman Filter is used in the problems where simple linearization leads to the destruction of useful connections between the components of the state vector. In this case, the linearization is based on the sigma-point transformation.

The Sigma-point transformation provides a transformation of the covariance matrix of the state vector, taking into account the quadratic term of the expansion of the transformation function. The function does not require the calculation of the partial derivatives of the transformation function, unlike the Extended Kalman Filter. In fact, the sigma-point transformation abstracts the transformation of the state vector and its covariance matrix for use in algorithms [3].

The Least Squares Method is based on minimizing the square of residuals. Unlike the Kalman Filter, it does not require preliminary estimates of the trajectory state vector, but it is linear and requires linearization of the equations. The Kalman Filter is recurrent and requires an initial estimation of the state vector for its operation and it is suitable for nonlinear systems. In the process, the Kalman Filter accumulates the weight of the state vector estimate, and the incoming measurements give a smaller contribution to the filter [3].

Further, the method of hierarchy analysis is used to compare the methods in pairs.

The alternatives in this method are least squares method, Standard Kalman Filter, Extended Kalman Filter and Unscented Kalman Filter. They are compared according to the following criteria: the accuracy of calculations, the speed of calculations, the need for linearization, and the use of all the data obtained, the need to construct covariance matrices, and the need to calculate partial derivatives.

Thus, the goal is to select the most appropriate method for filtering changes in the current navigation parameters of the spacecraft.

The construction of the model and the choice of one of the alternatives are carried out in the Super Decisions software facility. The result of the program is shown in the figure. In this table, the "Raw" column is derived from the super matrix, the "Normals" column represents the normalized values from the "Raw" column, and the "Ideals" column shows the result obtained by dividing the values of the normalized or limit columns by the largest value.

Name	Graphic	Ideals	Normals	Raw
EFK		0.454400	0.158222	0.079111
MLS		1.000000	0.348200	0.174100
SFK		0.431195	0.150142	0.075071
UFK		0.986317	0.343436	0.171718

Solving the problem by hierarchy analysis

Finally, using the least squares method is recommended to filter changes in the current navigation parameters of the spacecraft. The Unscented Kalman Filter is also suitable for this problem, because it has comparable indicators. Therefore, the Unscented Kalman Filter for on-board software is advisable, as data processing is quite fast. And for the ground-based software, the least squares method could be suggested, as it is demonstrated the most accurate results in the task of constructing a model of the spacecraft motion based on the calculations performed.

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EVOLUTION OF INDICATORS IN INFORMATION SECURITY

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The paper considers the evolutionary path of the development of indicators in information security. The shortcomings of Indicators of Compromise are described. These shortcomings served as an impetus for the emergence of new types of indicators – Indicators of Attack and Indicators of Behavior. Particular attention is paid to the issue of practical implementation of new types of indicators. The author highlights the conditions to prepare the information security industry for the possibility of widespread implementation of Indicators of Behavior.

Keywords: IoC, IoA, IoB, Indicator of Behavior, UEBA.

ОБ ЭВОЛЮЦИИ ИНДИКАТОРОВ В ИНФОРМАЦИОННОЙ БЕЗОПАСНОСТИ

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В работе рассмотрен эволюционный путь развития индикаторов в информационной безопасности. Описываются недостатки индикаторов компрометации, послужившие толчком к появлению новых типов индикаторов – индикаторов атаки и индикаторов поведения. Особое внимание уделяется вопросу практического внедрения новых типов индикаторов. Выделены условия, которые следует выполнить, чтобы подготовить отрасль информационной безопасности к возможности повсеместного внедрения индикаторов поведения.

Ключевые слова: индикаторы компрометации, индикаторы атаки, индикаторы поведения, поведенческая аналитика.

Introduction. A resistance to threats is an invariable task of information security. Many protection methods and information security tools were invented for threat defense. Despite existing protection measures, attackers successfully implement threats as before. New attacks are taken place every second [1]. This challenges information security specialists to improve existing solutions and create new ones. In the research, we consider the evolution of indicators in information security. In information security, indicators are used to detect implemented threats or such attempts. Today, indicators of compromise (IoCs) are the most widely used.

Indicators of Compromise (IoCs). An Indicator of Compromise (IoC) is an object observed on a network or an endpoint, that is highly likely to indicate unauthorized access to the system (that is, its compromise) [2]. These indicators are used to detect malicious activity at an early stage, as well as to prevent known threats. Popular types of IoC are IP addresses, DNS names, and file hashes.

However, IoCs have not become the «silver bullet» capable of detecting all attempts to implement threats. The major shortcomings of compromise indicators are highlighted [3]:

1. Professional attackers who conduct targeted attacks either develop new tools or modify known hacker tool signatures, such as mimikatz. Due to their uniqueness, such tools are not detected by indicators.

2. Possibility of flooding databases with indicator noise. Attackers send a lot of false indicators, due to which professionals need to filter indicators. It also leads to a decrease in the informativeness of the indicators.

3. Professional attackers use the «fileless» malware technique. In this technique, the malicious file is not delivered to the victim's device, but is built on the end-device by downloading the malicious code through standard OS features, such as PowerShell.

4. Generally, IoCs are used in a reactive mode. It means a completed attack is discovered when IoCs are found out in forensic artifacts. Thus, IoCs are instruments to identify compromising, but not to provide proactive protection.

Thus, the use of IoCs can help detect attacks that use already well-known objects (files, dns, ip, etc.). But IoCs remain powerless against modern, targeted attacks. Therefore, it is proposed to develop a new kind of indicators – Indicator of Attack (IoA) and Indicator of Behavior (IoB).

Indicators of Attack (IoAs). Indicators of Attack (IoAs) have been introduced for proactive defense. In most cases, an adviser's behavior (chain of actions) is relevant to the typical model. The Kill Chain model is the most popular model to describe the stage of an attack. Accordingly, IoAs are a set of features that can identify a stage of the attack. It is possible to stop the beginning attack if it is detected in the early-stage (for example Reconnaissance) using IoAs.

Indicators of Behavior (IoBs). IoBs are digital behavior monitored to understand risks within an organization. Attackers may create new tools, but their methods and techniques remain the same (trademark). Radically changing their behavior is much more difficult than developing a new tool. The promise of behavioral indicators builds on this. Examples of IoBs: stockpiling on a local drive, USB upload, screen captures, attempt to uninstall protection tool, etc.

What is the difference between IoAs and IoBs? IoAs are more related to TTP (Tactics, Techniques, and Procedures) of professional advisers (APT-groups). In turn, IoBs show potentially malicious behavior. It is possible to detect an internal intruder using IoBs. Also, IoAs are connected to operation system behavior, for example, DLL injection. IoBs are related to the user's actions.

An Implementation of IoAs and IoBs have required user and entity behavior analytics. It is necessary to capture each user's action and compare it with IoBs database. Gartner defined UEBA as a technology that uses analytics to profiling the behavior of users and entities across time and peer group directions [4]. The many UBA/UEBA solutions have a rule-based component. The rule-based component is a set of if-then rules. The structure of the rule is shown on the equation below

$$\text{if } ACTION, \text{ then add } RISK_SCORE,$$

where *ACTION* is a potentially malicious action, and *RISK_SCORE* is the number of points to add to the user's risk level. Actions from these rules can be attributed to IoBs. The difference between IoBs and actions in UBA/UEBA solutions consists in augmentability. The actions in UBA/UEBA solutions are static set provided by vendors. In turn, IoBs are an updatable and extendable set of data. There are providers of indicators, which add new indicators.

There is a separate class of cybersecurity tools to ensure centralized interaction with indicators. Threat Intelligence Platform (TIP) is the name of this class. Threat Intelligence Platform is able to collect the information about possible threats from different sources (commercial and free, closed and open, public and private) in real time, classify it and perform various operations with it, including uploading it to the information security tools. A simple typical diagram of the TIP application is shown in Figure 1.

The IoBs are useless if an organization has no user behavior profiling solution. Therefore, organizations should add UEBA functions to their information security tools. In this connection, the new scheme for using TIP with IoAs and IoBs is shown in Figure 2.



Figure 1 – Current simple schema of Threat Intelligence Platform



Figure 2 – Future simple schema of Threat Intelligence Platform

The next complexity is a description of IoBs. Any behavior has a context. Using IoBs without context will lead to a large number of false positives. Therefore, it is necessary to unify the standard for IoBs. The standard must define fields and should answer how to correlate one IoB with another.

Conclusion. There is evolution among indicators in information security. The established Indicators of Compromise were supplemented by IoAs. Indicators of Behavior have become a recent progress vector. This is the right direction because IoBs can early detect unknown attacks, «fileless» attacks, zero-day attacks, and internal intruders. However, for the widespread implementation of IoBs, several conditions must be met:

1. The widespread implementation of information security tools with behavioral analysis functions is required.
2. IoBs must be precise and has a context to avoid a lot of false positives.
3. A uniform standard for describing behavior is required for compatibility with information security tools.
4. Organizations with a streamlined process for monitoring and investigating incidents should extract and share IoBs with the community.

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УДК 519.6

SELECTION OF FREE PARAMETERS IN THE PROBLEM OF AUTOMATIC GROUPING OF INDUSTRIAL PRODUCTS BY HOMOGENEOUS PRODUCTION BATCHES

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We research a problem of the impact of data normalization on the selection of free parameters in the problem of automatic grouping of industrial products on homogeneous production batches of semiconductor devices based on the FOREL model. The semi-automatic selection of free clustering parameters does not allow using the FOREL algorithm without the initial analysis of the task features. The algorithm has been tested on various data sets with a dimension of up to 18 data vectors. We research real data of semiconductor devices for testing purposes. Computational experiments showed the lower efficiency of algorithms according to traditional for the considered clustering problems. The FOREL algorithm is compared to p-median, k-means with Euclidean distance measure with normalization by standard deviation and normalization by acceptable parameter values.

Keywords: FOREL, free parameters, normalization, automatic grouping, industrial products.

ПОДБОР СВОБОДНЫХ ПАРАМЕТРОВ В ЗАДАЧЕ АВТОМАТИЧЕСКОЙ ГРУППИРОВКИ ПРОМЫШЛЕННОЙ ПРОДУКЦИИ ПО ОДНОРОДНЫМ ПРОИЗВОДСТВЕННЫМ ПАРТИЯМ

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Исследуется проблема влияния нормализации данных на подбор свободных параметров в задаче автоматической группировки промышленной продукции по однородным производственным партиям полупроводниковых приборов, основанной на модели FOREL. Полуавтоматический выбор свободных параметров кластеризации не позволяет использовать алгоритм FOREL без предварительного анализа особенностей поставленной задачи. Работа алгоритма протестирована на различных наборах данных размерностью до 18 векторов данных. В качестве тестовых примеров использованы реальные данные испытаний полупроводниковых приборов. Вычислительные эксперименты показывают низкую эффективность алгоритма в сравнении с традиционными решениями автоматической группировки. Проведено

сравнение алгоритма FOREL с p-median, k-means с евклидовой мерой расстояния с нормализации по стандартному отклонению и нормализацией по допустимым значениям параметра.

Ключевые слова: FOREL, свободные параметры, нормирование, автоматическая группировка, промышленная продукция.

The research of automatic grouping (clustering) is greatly influenced by increase in volume and variety of data that requires new advances in methodology of clustering. Various approaches to solve problems of clustering propose are simple models of greedy heuristics based on p-median, k-means and the FOREL. These models are used to detect clusters of the metric space of characteristics of a simple shape, and to initially separate data array into a large number of small-disjointed clusters [1].

The non-hierarchical algorithm of clustering FOREL [2] proposed by Zagoruiko N.G. and Belkina V.N in 1967 is based on the idea that detects location of condensation of a spherical shape with radius and combines them into clusters. Similarly, p-median and k-means require a priori value of the number of clusters. In addition, it is necessary to select the free parameter by which the radius of the sphere increases or decreases. At each next iteration of algorithm, these updated values are used. Before the algorithm starts, we normalize the features of objects to the values from zero to one [3]. The choice of these parameters determines algorithm accuracy and relevance of clustering model [4, 5].

The FOREL method divides a set of vectors to the clusters divided by radius. To allocate a single cluster, a random vector is selected as the initial centroid. Therefore, all vectors, which distance [6] to the centroid is less than or equal radius, are iteratively selected. After that, the centroid is replaced by arithmetic mean of the selected vectors. This process repeats, until difference between new centroid and centroid obtained in previous step is less than determined. After that, all vectors found for this centroid are combined into a cluster and excluded from the clustering set. In summary, clusters are sequentially allocated, until the clustered set becomes empty [1, 6].

In this research, we use data of the test result performed at the test center for batches of integrated circuits (microchips). The initial data is a set of some parameters of the electronic radio products (ERP) measured during the required tests. The sample (mixed) batch initially consists of product data belonging to homogenous batches of the integrated circuits (IC) 140UD25A before and after electro-thermal training (ETT).

The total number (n) of electric radio component (ERC) is 1228 for the IC, which consists of 18 batches. Each batch of IC has 134, 31, 360, 29, 3, 39, 49, 155, 158, 58, 12, 19, 49, 21, 57, 32, 7 and 15 devices in its composition. The products (devices) in each batch are described by 18 input measured parameters.

We use the Rand Index (RI) [7] as a measure of clustering accuracy, which define the proportion of objects, which reference and resulting cluster splitting are similar.

To allocate probably homogeneous batches with some accuracy, we used well-known clustering models:

- DE model, where k-means is used with Euclidean distance measure;
- DE2 model, where p-median is used with Euclidean distance measure;
- FE model, where FOREL is used with Euclidean distance measure, the selection of free parameters R into semi-automatic mode.

In the next experiment, the working sample consists of four batches and 18 significant parameters. The dataset is grouped with standard deviation normalization, which uses data from 3 to 18 parameters, and parameters 1 and 2 are not informative and assigned to zero.

The dataset with allowable parameters normalization values is calculated from 3 to 16 parameters for which corresponding norms are set, remaining data are assigned to zero. The added 19 to 22 parameters have difference between changes in 3-6 parameters before and after ETT.

The results are calculated by clustering k-means, p-medians, and FOREL with Euclidean distances. We conducted 30 experiments for each model. The average clustering results are shown in Table 1 showing maximum (max), minimum (min), mean (mean), and standard deviation (std) for the Rand index.

Table 1

A comparison of clustering results with selection of various free parameters for data normalization

	Before ETT			After ETT		
	DE	DE2	FE	DE	DE2	FE
1, 3, 8 and 9 batches (n=201) IC 140YJ25A						
Normalization by standard deviation. Rand index						
max	0.643	0.661	0,51932	0.718	0.838	0,51723
min	0.465	0.466	0,48094	0.548	0.746	0,47827
mean	0.586	0.606	0,50662	0.637	0.775	0,50330
std	0.040	0.053	0,00842	0.045	0.025	0,01114
Normalization by parameter acceptable value limits. Rand index						
max	0.615	0.625	0,58072	0.601	0.680	0,59279
min	0.515	0.532	0,53151	0.573	0.566	0,57501
mean	0.591	0.601	0,53528	0.590	0.640	0,54687
std	0.024	0.022	0,01270	0.007	0.027	0,00576

Our experiments with labeled data from a test batch of semiconductor devices show that semi-automatic selection of free parameters of the FOREL method is not promising.

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SYNTHESIS OF N-ALKYL-SUBSTITUTED 3,5-DIMETHYL-4-NITROSO-1H-PYRAZOLES

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This paper describes the alkylation of 3,5-dimethyl-4-nitroso-1H-pyrazole with haloalkanes. The structure of a previously unknown synthesized compound product is proved by 1H NMR spectroscopy, UV-Vis spectroscopy and chromato-mass spectrometry.

Keywords: alkylation, N-alkylpyrazole, nitrosopyrazole, superbasic medium.

СИНТЕЗ N-АЛКИЛЗАМЕЩЕННЫХ 3,5-ДИМЕТИЛ-4-НИТРОЗО-1Н-ПИРАЗОЛОВ

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Настоящее исследование посвящено алкилированию 3,5-диметил-4-нитрозо-1H-пиразола галогеналканами. Строение ранее неизвестных синтезированных соединений доказано с помощью спектроскопии ЯМР 1H, электронной спектроскопии и хромато-масс спектрометрии.

Ключевые слова: алкилирование, N-алкилпиразол, нитрозопиразол, суперосновная среда.

Nitrogen-based heterocycles are of particular importance in the synthesis of biologically active substances. A large number of synthetically useful products based on the pyrazole ring are known [1]. For instance, pyrazole derivatives have practical applications in agrochemicals as herbicides [2]. Figure 1 shows agrochemical molecules containing pyrazole scaffold. The prevalence of pyrazole cores in biologically active molecules which makes them synthesize particularly interesting.

A nitroso group in the pyrazole ring will significantly increase the synthetic potential associated with the transformation to various classes of compounds and will influence the biological activity [3]. Introduction of alkyl substituents improves the delivery of the active substance through biological membranes. Therefore, this work is about the alkylation of 4-nitroso-1-H-pyrazoles.

4-Nitroso-1H-pyrazoles are nucleophiles having two nucleophilic sites. Therefore, we selected the conditions for the alkylation of 3,5-dimethyl-4-nitroso-1H-pyrazole with n-butyl bromide in a superbasic medium [4]. According to the method that showed the high-yield of the n-alkyl-substituted product, we carried out the alkylation of nitrosopyrazole with ethyl bromide, isopropyl bromide, and benzyl chloride (Fig. 2).

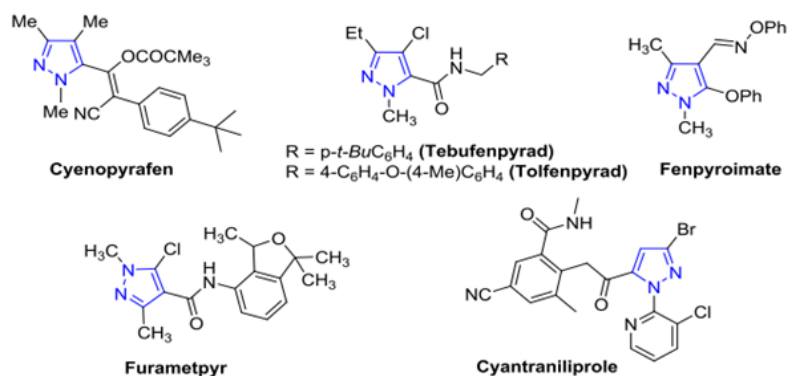


Fig. 1. Pyrazoles used as agrochemicals

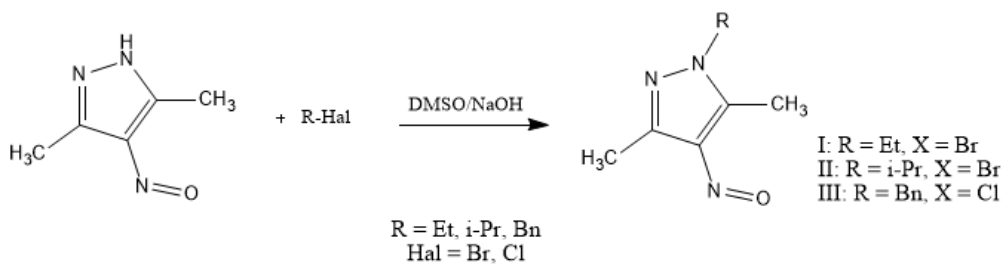


Fig. 2. Synthesis of the N-alkyl-substituted 4-nitrosopyrazoles

As a result, N-alkyl-substituted 4-nitrosopyrazoles were obtained.

Experimental Section

General procedure of N-alkyl-substituted 4-nitrosopyrazoles preparation

3,5-dimethyl-4-nitroso-1H-pyrazole (0.1 g, 0.8 mmol) was dissolved in 20 ml of DMSO, crushed NaOH (0.04 g, 1.04 mmol) was added, and the mixture was stirred at 80 °C for 1 h. After that, 2 equivalents (1.6 mmol) of an alkylating agent were introduced into the reaction mass. After 5 hours stirring at 80 °C, the reaction mixture was diluted with 650 ml of water and extracted with chloroform (15 ml x 7). The combined extracts were dried over Na₂SO₄, evaporated under reduced pressure and purified by column chromatography (silica gel; hexane-ethyl acetate 50: 3).

1-ethyl-3,5-dimethyl-4-nitroso-1H-pyrazole: Blue oil, yield 0.039 g (27 %), λ_{max} (ε) = 673 nm (58) (N = O).

1-isopropyl-3,5-dimethyl-4-nitroso-1H-pyrazole: Blue crystals, yield 0.083 g (62 %), λ_{max} (ε) = 672 nm (53) (N = O).

1-benzyl-3,5-dimethyl-4-nitroso-1H-pyrazole: Blue oil, yield 0.076 g (44 %); ¹H NMR (600 MHz, [D₆]DMSO): δ = 7.27 – 7.39 (m, 5H; Ar-H), 5.38 (s, 2H; N – CH₂), 2.97 (s, 3H; Pz-CH₃), 2.11 (s, 3H; Pz-CH₃).

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TECHNICAL VISION SYSTEM AS A TOOL FOR IMPROVING THE EFFICIENCY OF PRODUCTION PROCESS

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To this date, the most expensive part of costs in industrial production is spoilage in production. It can cause material and reputational damage not only to large industrial companies, but to the owners of small and medium-sized businesses as well. To solve this problem, it is necessary to build smart production environment using modern intelligent solutions, such as vision systems.

Keywords: technical vision, system, production, analysis, efficiency.

СИСТЕМА ТЕХНИЧЕСКОГО ЗРЕНИЯ, КАК ИНСТРУМЕНТ ПОВЫШЕНИЯ ЭФФЕКТИВНОСТИ ПРОИЗВОДСТВЕННОГО ПРОЦЕССА

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На сегодняшний день наиболее затратной частью расходов в промышленном производстве является брак. Он способен нанести материальный и репутационный ущерб не только крупным промышленным компаниям, но и владельцами малого и среднего бизнеса. Для решения данной проблемы необходимо построение умной производственной среды с использованием современных интеллектуальных решений, таких как системы технического зрения.

Ключевые слова: техническое зрение, система, производство, анализ, эффективность.

Technical vision systems are used to improve the efficiency of the production process and the quality of products in almost all the areas of modern industrial production, where there are production lines. This technology allows you to check the contents of labels, compare indicators and cut off defective products at a high speed of the production conveyor, which significantly reduces the complexity of performing all production operations [1].

The modern complex of technical vision tools of the conveyor line is shown in Figure 1.

This complex consists of the following elements:

- 1) A synchronization sensor that monitors whether an object enters the inspection line.
- 2) Smart photo / video camera (one or more) for checking and recognizing the object being analyzed.
- 3) Equipment for input / output and data transmission.
- 4) Specialized lighting systems for highlighting the object being analyzed.

5) Software for processing the received data and analysis according to the specified parameters.

6) An executive mechanism in the form of an industrial robot designed to cull an object that does not meet the control parameters.

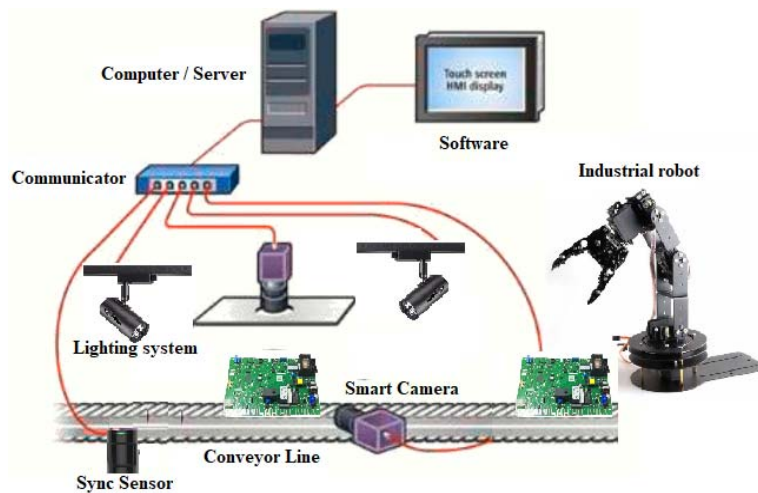


Fig. 1. Modern complex of technical means of view

Capabilities of modern vision systems:

- determining the presence/absence of an object;
- segmentation of the object for calculation and comparison;
- checking for a given pattern (shape, color, size, etc.);
- recognition of characters, serial number, barcode and QR code [2].

Let us consider the principle of operation of the technical vision system on the example of the production of ECUs (electronic control units). Objects passing through the conveyor line are moved to the control line for further inspection for defects using 3 examinations.

At the first stage, the monitoring sensors determine the presence of an object and count the quantity of goods to be entered into the database.

The second control section starts the process of recognizing characters and QR codes. The smart camera performs character verification and sends serial numbers and product data to the main server by reading QR codes as well.

As part of the third control section, quality control is performed according to the specified parameters. The image of the object being checked is compared with the saved template and sent to the main server for further production and process control (Figure 2).



Fig. 2. Quality control according to the specified parameters

If the object being analyzed does not meet at least one of the regulatory parameters of the test, the equipment being used automatically rejects it from the production line.

It can be concluded that modern vision systems cover almost all the areas of industrial production and are the main element in improving the efficiency of the production process of the production line [3].

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DEVELOPMENT OF AN AUTOMATED SYSTEM FOR MANAGING THE LIFE CYCLE OF ROCKET AND SPACE TECHNOLOGY PRODUCTS

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The article discusses the problems and formulates the problem of automation of the process at managing the life cycle of products of rocket and space technology. The requirements for an automated system for managing the life cycle of rocket and space technology products are presented, which allows quickly to obtain the necessary information about the product handed over to the Customer at all stages of production in the context of materials the product is made of and purchased components.

Keywords: automated system, product life cycle, rocket and space technology, incoming control, quality documents.

РАЗРАБОТКА АВТОМАТИЗИРОВАННОЙ СИСТЕМЫ УПРАВЛЕНИЯ ЖИЗНЕННЫМ ЦИКЛОМ ИЗДЕЛИЙ РАКЕТНО-КОСМИЧЕСКОЙ ТЕХНИКИ

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Рассматриваются проблематика и постановка задачи автоматизации процесса управления жизненным циклом изделий ракетно – космической техники. Представлены требования к автоматизированной системе управления жизненным циклом изделий ракетно-космической техники, позволяющей оперативно получить нужную информацию о сданном Заказчику изделии на всех этапах производства в разрезе списанных в изделие материалов и покупных комплектующих изделий.

Ключевые слова: автоматизированная система, жизненный цикл изделия, ракетно – космическая техника, входной контроль, документы качества.

The life cycle of a rocket and space technology product includes a set of different stages, starting with research and development and ending with the repair and disposal of the product [1].

At the same time, at the production stage, one of the key sub-steps that affect the subsequent product life cycle is the process of purchasing materials and components, their input control, delivery and launch into production. Ensuring the identification and traceability of materials at this sub-stage of the life cycle allows to ensure the level of product quality set by a Customer [2].

Conducting the process of input control and material launch into production in a «paper» form leads to numerous errors in the design of accompanying documentation. It creates prerequisites for re-sorting materials in the production of products, increases the complexity of the input control

process, which does not add value to the product, and significantly complicates the process of forming actual costs for presenting a fixed price of the product to the Customer.

At the moment, in the rocket and space industry, there are no automated systems of the SCM, ERP, MES class allowing to take into account the features of the process of input control and material launch into production of materials for rocket and space and combat rocket technology in terms of forming a batch when conducting control and sample tests of parts made of single heat metal, coefficients of difficult-to-control processes, and other things.

At the same time, this system should allow to record all deviations at the input control and in the production process, decisions made on them (including the conduct of complaint work) and provide the possibility of traceability when further completing parts as part of assembly units.

Thus, in order to create a single information space for managing the production and life cycle of manufactured products and products, aimed at improving the quality of manufactured products and services, it is necessary to develop a system digitally [3-5]:

- keep records of materials and purchased components in warehouses and storerooms of divisions;
- record in the system all the certificate data from the quality document for the purchased material;
- record all deviations detected at the entrance control, as well as decisions made on them;
- deliver material from the warehouse to production, taking into account the requirements of design and regulatory documentation for a specific part;
- start production of lots of parts and assembly units from the material received from the warehouse;
- track the movement of parts and assembly units at subsequent technological stages;
- track the complete set of parts and assembly units in products.

At the same time, all enclosed documents issued for the above operations should be produced by the system and have a barcode that allows them to be processed quickly at the workplace. Approval must also be issued electronically with the Technical Control Bureau, the Supply Department, the Chief Technologist's Department, and other responsible executors by affiliation.

At the same time, the system should have all the data to quickly get the necessary information about the product delivered to the Customer (including at the stage of operation, repair and disposal of the product) in the context of materials used in the product and purchased components, their batches, melts, factory batch and product numbers, warranty periods, available deviations and decisions on them.

As a result, this system should significantly reduce the time for the input control of materials, their delivery and launch into production, while also taking into account the specifics of the requirements of industry documentation for the production of rocket and space and combat rocket technology.

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CHARACTERISTICS OF LEAF APPARATUS OF WINTER APPLE VARIETIES FROM THE COLLECTION OF THE V. KRUTOVSKIY BOTANICAL GARDEN

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The studies of leaf mass and leaf area per square centimeter (LMA) of 27 winter apple varieties growing in the V. Krutovskiy Botanical Garden in Krasnoyarsk are presented. The most productive by this indicator varieties were selected.

Keywords: apple tree, winter variety, variability, LMA index.

ХАРАКТЕРИСТИКА ЛИСТОВОГО АППАРАТА ЗИМНИХ СОРТОВ ЯБЛОНИ КОЛЛЕКЦИИ БОТАНИЧЕСКОГО САДА ИМ. ВС.М. КРУТОВСКОГО

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Приведены результаты исследований массы одного листа и квадратного сантиметра листа (LMA) у 27 зимних сортов яблони, произрастающих в Ботаническом саду им. Вс.М. Крутовского в Красноярске. Отобраны наиболее продуктивные сорта по изучаемому показателю.

Ключевые слова: яблоня, зимний сорт, изменчивость, показатель LMA

In order to maintain the ecological and economic balance of areas where natural landscapes are degraded and the ecological condition is deteriorating, it is necessary to preserve and develop green spaces, which are a factor in improving the quality of the environment. The maximum filtering effect of plantations occurs during the vegetation period. The biological productivity of plants during the growing season is influenced by a complex of factors, such as plant genotype, as well as environmental and agronomic conditions of their cultivation [3]. The intensity of dry matter accumulation depends on the clear photosynthetic productivity, which is defined as the accumulation of dry biomass by a unit of leaf area per unit of time [2].

The leaf is the main assimilating organ of the plant. The total leaf surface of a plant allows to assess the photosynthetic potential and intensity of the plant. The leaf mass per square centimeter of a plant, LMA (leaf mass per area), is a quantitative indicator reflecting the cost of the plant for building this square centimeter [1].

In this paper, we present leaf weight and LMA data for 27 winter apple varieties growing in the collection of the V. Krutovskiy Botanical Garden. Winter varieties are appreciated for their winter hardiness. Not only do they successfully tolerate temperature fluctuations over a long period of time, but they are also resistant to frosts that can persist for a long time, particularly at the

beginning of the winter period and in the middle of it. In addition, winter apple varieties have a good storability of their fruits, which do not fall off and hang on the tree until frosts fall. The harvest of winter apples does not mature until autumn. They do not reach their full maturity until harvesting, only during storage.

The average weight per leaf was 0.83 ± 0.022 g in the fresh state. It was found that the weight index for one fresh leaf changed in winter varieties from 0.38 to 1.24 g. The highest value of the index was noted in the varieties Malinovka, Aport sredny Russkii, Bismark, Common Antonovka, Voronezh Vorgul, Waxen, Pendant Chinese, Titovka. The lowest weight of the leaf blade was observed in the varieties Common Anisik, Arcade Winter, Slavyanka, Pepin Kitayka.

A high intraspecific variability (30.5 %) is observed for fresh leaf weight. The coefficient of variability ranges from 7.4 (General Orlov) to 42.8 % (Krasnoyarskiy Sibiryak).

The percentage of moisture loss by leaves of winter apple varieties during drying to absolutely dry state depending on variety affiliation was calculated. This figure ranged from 54 % (Krasnoyarskoye) to 65 % (Common Antonovka). The greatest amount of moisture loss was noted in the varieties Common Antonovka, Saffron Antonovka, Krasnoyarskiy Sibiryak, Malinovka, Reinette Bergamot.

The weight index of 1 cm² of fresh leaf was determined (Table). It was found that the weight index of 1 cm² of fresh leaf varied in winter varieties from 0.019 to 0.030 g. The lowest values of this index were observed in the varieties Common Anisik, Antipashalnoe, Befler Chinese, Voronezh Vorgul, Waxen, General Orlov, Krutovski Green, Cinnamon stripe, Krasnoyarskiy Sibiryak, Shade, Titovka, № 22. Differences with the mean value for all studied varieties were confirmed statistically ($t_{\text{fact.}}$ greater than t_{05}). The lower the LMA, the less photosynthetic products the plant expends to form its leaves and the faster it grows. On the weight index of 1 cm² of fresh leaf the variability (14.7 %) is observed, which is characterized as medium according to the scale of assessing the level of variability of the studied traits by S.A. Mamaev.

Weight of 1 cm² (LMA) of fresh leaf depending on variety, g

Variety	\bar{x}	$\pm m$	$\pm \sigma$	V, %	P, %	t_f when $t_{05}=2,04$
Common Anisik	0,019	0,0008	0,0019	9,7	4,3	5,89
Antipashalnoe	0,024	0,0006	0,0014	6,0	2,7	3,25
Antonovka yellow	0,027	0,0010	0,0022	8,1	3,6	1,17
Common Antonovka	0,028	0,0010	0,0022	7,7	3,4	0,67
Saffron Antonovka	0,027	0,0005	0,0012	4,3	1,9	1,31
Aport sredny Russkii	0,029	0,0011	0,0025	8,8	3,9	0,40
Arcade Winter	0,027	0,0010	0,0023	8,6	3,9	1,36
Babushkino	0,029	0,0024	0,0053	18,3	8,2	0,32
Befler Chinese	0,026	0,0009	0,0021	8,1	3,6	2,12
Bismarck	0,029	0,0007	0,0016	5,5	2,5	0,55
Voronezh Vorgul	0,024	0,0011	0,0024	10,1	4,5	2,99
Waxen	0,025	0,0006	0,0014	5,8	2,6	2,95
General Orlov	0,025	0,0013	0,0030	11,7	5,2	2,07
Krutovski Green	0,024	0,0005	0,0012	5,0	2,2	3,18
Cinnamon Stripe	0,025	0,0004	0,0009	3,7	1,6	2,88
Krasnoyarskoye	0,026	0,0026	0,0059	23,0	10,3	1,26
Krasnoyarskiy Sibiryak	0,022	0,0011	0,0025	11,8	5,3	4,18
Pendant Chinese	0,030	0,0016	0,0035	11,8	5,3	-
Malinovka	0,028	0,0012	0,0026	9,3	4,2	0,68
Pepin Kitayka	0,028	0,0010	0,0023	8,4	3,7	0,86
Saffron Pepin	0,027	0,0006	0,0012	4,6	2,0	1,64
Reinette Bergamot	0,026	0,0018	0,0040	15,6	7,0	1,66
Slavyanka	0,029	0,0017	0,0038	12,9	5,8	0,18
Shade	0,025	0,0014	0,0031	12,4	5,5	2,07

Titovka	0,019	0,0022	0,0048	25,0	11,2	3,90
Sharopay	0,027	0,0015	0,0033	12,1	5,4	1,16
№ 22	0,023	0,0013	0,0028	12,1	5,4	3,19
Average	0,026	0,0003	0,0038	14,7	1,3	1,92

The calculated leaf area mass per square centimeter (LMA) of different apple varieties characterises the competitiveness of the species. This indicator can be used in plant breeding to select the most productive varieties.

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IDENTIFICATION OF DEFENSIVE COUNTERMEASURES AGAINST LATERAL MOVEMENT TECHNIQUES IN COMPROMISED ENTERPRISE INFRASTRUCTURE

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The article describes the recommended preventive mitigation measures to counteract adversary's Lateral Movement techniques inside a compromised local network and search for the most critical protected resources in the information system. The implementation of the proposed security measures will significantly complicate the adversary's movement through the network.

Keywords: MITRE ATT&CK, Lateral Movement, defensive countermeasures in Windows and Linux systems.

ОПРЕДЕЛЕНИЕ МЕР ПРОТИВОДЕЙСТВИЯ ТЕХНИКАМ ДЕЙСТВИЙ ЗЛОУМЫШЛЕННИКА ПО РАСПРОСТРАНЕНИЮ ВНУТРИ СКОМПРОМЕТИРОВАННОЙ ЛОКАЛЬНОЙ ВЫЧИСЛИТЕЛЬНОЙ СЕТИ

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В статье описаны рекомендуемые превентивные меры защиты информации, направленные на противодействие техникам действий злоумышленника по распространению внутри скомпрометированной локальной вычислительной сети и поиску наиболее критичных защищаемых ресурсов в информационной системе. Внедрение предложенных мер защиты позволит существенно затруднить продвижение злоумышленника по сети.

Ключевые слова: MITRE ATT&CK, Lateral Movement, распространение злоумышленника в скомпрометированной сети, меры защиты.

An approach to structure of cybersecurity attack based on the Kill Chain concept over the past few years has allowed researchers to identify and describe possible methods (techniques) of attackers' actions. The ATT&CK matrices [1], developed by MITRE Corporation specialists, are recognized as the most structured and complete descriptions of possible actions of attackers in the global community.

In practice, there is an issue of information security protection in the compromised local network from adversary's actions of moving through the network to gain access to servers with critical data or other resources processed. That is to say, this activity is named Lateral Movement (LM).

The proliferation activity inside the local network becomes possible after the attacker gains initial access to the internal perimeter of the information infrastructure because of achieving several

previous goals (tactics) described in the ATT&CK. High frequency of LM methods usage by attackers is confirmed in research reports of companies such as Cisco [2] and CarbonBlack.

At this moment, the ATT&CK Enterprise matrix contains nine techniques that implement LM [3]. Each technique describes how attackers use the information technologies, such as remote access protocols, on which enterprise networks are built to achieve the goal of spreading over a compromised network. These technologies include the following:

1) Vulnerabilities in shared services such as SMB (T1021.002-SMB/Windows Admin Shares, T1210-Exploitation of Remote Services).

2) Vulnerabilities in the RDP (T1021.001-Remote Desktop Protocol, T1563.002-RDP Hijacking, T1210-Exploitation of Remote Services).

3) Windows Remote Management Service (T1021.006-Windows Remote Management).

4) Applications possible to be used within internal networks, such as MySQL and web server services (T1210-Exploitation of Remote Services).

5) Availability of a fake ticket (Silver Ticket, Golden Ticket) of the Kerberos network authentication protocol in the Microsoft Windows environment for further access to network resources through compromised user credentials (T1550.003-Pass the Ticket).

6) Bypass standard Microsoft Windows authentication methods (T1550.002-Pass the Hash)

7) Transfer of tools or other files between hosts in compromised Microsoft Windows, Linux, and MacOS environments with FTP, SCP, RSYNC, and SFTP (T1570 – Lateral Tool Transfer) protocols.

8) SSH remote access service (T1021.004-SSH, T1563.001-SSH Hijacking).

9) VNC remote access service (T1021.005-VNC).

9) DCOM protocol, which allows software components to communicate over a network using Remote Procedure Call (RPC) technology (T1021.003-Distributed Component Object Model).

The techniques of an attacker's actions described in ATT&CK can be implemented both by exploiting vulnerabilities in operating systems and application software, and by their general misconfiguration.

The T1210-Exploitation of Remote Services technique involves the ability of an attacker to exploit vulnerabilities that exist in services such as SMB and RDP, MySQL and web server services. To minimize the possibility of implementing this LM technique, the authors of ATT&CK recommend the implementation of vulnerability, security updates, and exploit protection (Windows EMET / WDEG) programs.

However, in some cases, it is not possible to eliminate vulnerabilities and install security updates on the servers of the information system, for example:

a) The information infrastructure uses outdated versions of operating systems that cannot be decommissioned.

b) The installation of security updates leads to errors in the application software and disrupts its functioning.

According to the SANS study [4], in such cases, selective installation of security updates is allowed. At the same time, a threat model should be created, that reflects the locations of the protected information resources, information protection measures that have been already taken, and possible attack scenarios.

The authors [4] proposed the following criteria for closing vulnerabilities:

a) «...it makes more sense to patch a low-rated vulnerability system that houses critical data than to patch a high-rated vulnerability on a system that doesn't appear anywhere in the threat model»;

b) «For similarly rated vulnerabilities, it makes more sense to prioritize patching a system that contains no critical data but appears on many intrusion maps...».

The following techniques are recommended: T1021-Remote Services (RDP, SMB, DCOM, SSH, VNC and WinRM sub-techniques), T1550-Use Alternate Authentication Material (Pass the Hash, Pass the Ticket and other sub-techniques), T1563-Remote Service Session Hijacking (RDP and SSH Hijacking sub-techniques) and T1570-Lateral Tool Transfer allow an adversary to get

access to different servers and workstations on the network due to errors in the configuration of the system and application software.

Taking into consideration the technologies / protocols, which attackers use to do LM within the compromised network, the authors of MITRE ATT&CK recommend the following measures against the implementation of LM techniques [3]:

- 1) Account management (Privileged Account Management, User Account Management).
- 2) Network Segmentation, including setting up local firewalls to filter traffic on TCP/UDP ports over which remote access service protocols operate (Table presents an example for the SMB protocol).

Recommendations for configuring firewalls to limit SMB traffic on the network

Technique	Content	Technical recommendations to implement mitigating measures to prevent technique
T1570-Lateral Tool Transfer	Remote file copying by an adversary to the attacked system and file copying between system hosts using SMB, FTP, SCP, RSYNC, and SFTP protocols	Perimeter firewalls should block communication from the internet and outgoing traffic (to the internet) to the following ports [5]: <ul style="list-style-type: none"> – 445 TCP (SMB) – 137 UDP (NetBIOS Name Resolution) – 138 UDP (NetBIOS Datagram Service) – 139 TCP (NetBIOS Session Service) For Windows clients and servers that do not host SMB shares, firewall should block all inbound SMB traffic to prevent remote connections from malicious or compromised devices. In the Windows Firewall, this includes the following inbound blocking rules [5]: <ul style="list-style-type: none"> – DCOM – Inbound Traffic – File and Printer Sharing (SMB-In) – Netlogon Service (NP-In) – Remote Event Log Management (NP-In) – Remote Service Management (NP-In)

3) Configure remote access services on operating system or software level to increase the security of the local network, for example, the following recommendations can be implemented:

- a) Change Active Directory GPOs to define shorter timeouts sessions and maximum amount of time any single session can be active. Change GPOs to specify the maximum amount of time that a disconnected session stays active on the remote desktop session host server.
 - b) Modify Registry settings for COM applications.
 - c) Disable the RDP, WinRM service if it is unnecessary.
 - d) Protect shared folders by minimizing users who have write access.
 - e) Ensure SSH key pairs have strong passwords, do not allow remote access with SSH as root or other privileged accounts, and ensure that SSH-agent forwarding is disabled on systems that do not explicitly require this feature.
 - f) Reset the built-in KRBTGT account password twice.
 - g) Apply UAC restrictions to local accounts on network logon.
 - h) Disable autorun for removable media if it is unnecessary (Especially for T1091-Replication Through Removable Media).
 - i) Configure browsers or tasks to delete regularly persistent cookies.
- 4) Develop Software Restriction Policies (Especially for T1080-Taint Shared Content).

More detailed recommendations for implementation of these security measures can be found in the ATT&CK matrices, where additional links to external sources of information are provided.

In conclusion, implementation of measures listed in the article will allow to limit adversary's actions to LM within the compromised network, including to prevent unauthorized access to the most critical components of the protected information infrastructure.

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USING REFERENCE NODES IN THE STRUCTURE OF SPACECRAFT HONEYCOMB PANELS

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The research considers and analyses analytical and experimental techniques of defining the bearing strength of reference nodes under the tear-out load. Reference nodes are made in the form of open-type embedded elements, which are installed into the honeycomb panels of a spacecraft.

Keywords: reference node, honeycomb panel, spacecraft, embedded element.

ПРИМЕНЕНИЕ В КОНСТРУКЦИИ СОТОВЫХ ПАНЕЛЕЙ КОСМИЧЕСКИХ АППАРАТОВ ОПОРНЫХ УЗЛОВ

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Рассматривается и сравнивается аналитическая и экспериментальная методика по определению несущей способности опорных узлов при нагрузке типа «вырыв». Опорные узлы выполнены в виде сквозных закладных элементов, установленных в сотовую панель космического аппарата.

Ключевые слова: опорный узел, сотовая панель, космический аппарат, закладной элемент.

Three-layered honeycomb structures can no doubt, be placed among the most effective inventions of 20th century. Beginning since the 50s of the previous century, they are widely used in many branches of the global industry.

Using honeycomb structures has determined successful development of aeronautical and space-rocket technology, and has given a boost for developing adhesive-bonded joint technology. Due to the honeycomb integration, engineers have a really good possibility to project more qualitative and durable constructions.

These factors affected a number of designed constructions of various types. This number is still growing because a great number of these constructions, nodes and technology gives an opportunity to create more combinations. Hence they can get a ready product with necessary characteristics [1-2].

The main and basic elements of any construction, which consists of honeycombs are honeycomb panels and installed embedded elements, which play a role of reference nodes. It is impossible to provide the connection between some honeycomb panels and installation of equipment, waveguides, power lines without reference nodes. Nowadays there are numerous types of the embedded elements, however, in this work only through embedded elements are considered [3-4].

In general, a honeycomb panel form is made in the form of two thin claddings that are bearing layers. Between these two layers there is a relatively light but durable core. Bracing of claddings and a core between each other are made with adhesive film that provides their collaborative work in the structure. [2].

After making the honeycomb panel, reference nodes are forming by the installation of embedded elements in it. Installation of embedded element consists of the following actions: making the perforations in a honeycomb panel, preparing of a hole (bench work, degrease, etc.), preparing of an embedded element (electroplating, installing of a clamping unit, etc.), installation of the embedded element strictly perpendicularly the cladding cavity and infilling the plane between the core and the embedded element with an adhesive composite.

In this research, it is necessary to compare analytical and experimental data of bearing strength for some open-type embedded elements (picture 1).

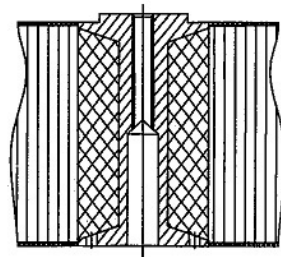


Fig. 1 Example for positioning the embedded element

The first variant of embedded element installation is in honeycomb panel with the height 40 mm, honeycomb core is made of aluminum with the size 3.5-30, width of cladding is 0.6 mm, cladding material – carbon ribbon with the scheme of reinforcement ((0/+45/-45/90)+(90/-45/+45/0)) and the diameter of the perforated hole is 30 mm.

The second variant of embedded element installation is in honeycomb panel with the height 40 mm, the honeycomb core is made of aluminum with the size 3.5-30, width of cladding is 0.3 mm, cladding material – carbon ribbon with the scheme of reinforcement (0/90/90/0) and the diameter of the perforated hole is 20 mm.

The third variant of embedded element installation is in honeycomb panel with the height 30 mm, the honeycomb core is made from aluminum with the size 3.5-30, width of cladding is 0.6 mm, cladding material – self-regulating heating tape with the scheme of reinforcement (2(0/90)+2(0/90)) and the diameter of the perforated hole is 20 mm.

The calculation of the tear-out ability of the bearing strength of the embedded element is determined by the formula:

$$F = 2 \cdot \pi \cdot r_{\text{eff}} \cdot h \cdot \tau_{\text{hon}} + k_0 \cdot \sigma_{\text{clad}} \cdot r_{\text{eff}} \cdot \delta_{\text{clad}},$$

F – tear-out ability of the bearing strength of the embedded element; r_{eff} – effective radius; h – height of honeycomb core; τ_{hon} – shear strength of the honeycomb
 k_0 – coefficient (determined experimentally from 0.65 to 1, the initial calculations take the value of 0.65); σ_{clad} – fluidity limit of cladding; δ_{clad} – cladding width; According to this formula, the bearing

strength of the presented embedded elements was determined. 5371 H, 2681 H, 3585 H correspondingly.

The below figures (fig. 2 – 3) show a schematic diagram of the tests and photos of the test moment.

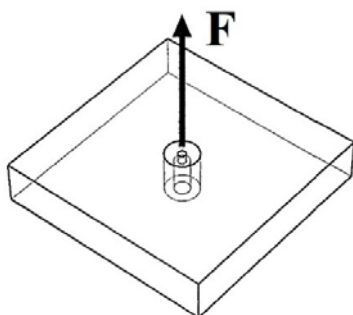


Fig. 2 Principle control test



Fig. 3 Picture of the test moment

We may compare the calculated values with the test data (Fig. 4).

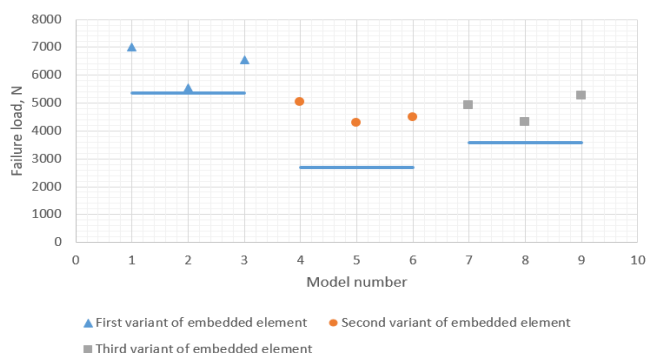


Fig. 4. Test data

Based on the test, it is possible to make a conclusion that on the embedded elements of the same configuration the bearing strength is similar to each other. Moreover, based on the test data, it can be concluded that, regardless the materials used in the production of a honeycomb panel and the geometric characteristics they have, the formula takes into account all the main factors of bearing strength for analytical calculation. According to the results of the tests, the k_0 coefficient allows to adjust the formula for each specific type of the embedded element.

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ABRASIVE-EXTRUSION PROCESSING OF THE DEFECTIVE LAYER AFTER ELECTRICAL DISCHARGE MACHINING

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Using Electrical discharge machining (EDM) can often presents a problem of a defective layer on the cut surface in semi-finished products made of hard-to-process conductive materials. The research gives an overview of the results of experimental studies in the field of using the finishing method: abrasive – extrusion processing is used after EDM. The researchers also propose an additional finishing operation after EDM.

Keywords: electrical discharge machining, abrasive-extrusion, finishing treatment, defective layer.

АБРАЗИВНО-ЭКСТРУЗИОННАЯ ОБРАБОТКА ДЕФЕКТНОГО СЛОЯ ПОСЛЕ ОПЕРАЦИИ ЭЛЕКТРОЭРОЗИОННОЙ ОБРАБОТКИ

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С применением метода электроэрозионной обработки, зачастую встречается проблема дефектного слоя на поверхности реза в полуфабрикатах из труднообрабатываемых токопроводящих материалов. Приведен обзор результатов экспериментальных исследований в области применения метода финишной обработки, а именно абразивно – экструзионной обработки после операции электроэрозионной обработки. Предложена дополнительная отделочная операция после электроэрозионной обработки.

Ключевые слова: электроэрозионная обработка, абразивно – экструзионная, финишная обработка, дефектный слой.

The analysis of publications of works of national and foreign authors based on the production experience of machine-building industries shows that it is difficult, and often impossible, to produce high-quality products without the using of electrophysical and electrochemical technology. This is due to the constant complication of the geometric shape of the modern design of products and the complication of the physical and mechanical properties as a result of the use of materials with the increased performance for their manufacture [1]. At the same time, one of the types of non-contact processing, namely electrical discharge machining (EDM), is an essential, popular, progressive and economically feasible method of spatial processing of conductive alloys in mechanical engineering [2].

Many researchers give recommendations on the choice of certain parameters of the EDM modes to achieve the required quality parameters of the manufactured product from various materials. However, it is worth noting that modern electroerosive machines use tables of processing modes recommended by the computer numerical control system (CNC), the parameters of which cannot be changed in the process. Therefore, after the EDM of the required contour, it is possible to

obtain the qualitative and geometric parameters of the part without exceeding the data given in the passport of each used electroerosive CNC machine [3-4].

According to recent relevant experimental results, reflected in [5-6], it was found that the EDM of steel, titanium and nonferrous alloys on the treated surface forms an undeleted layer consisting of oxide, nitride and carbide metal compounds of various thicknesses.

Practice shows that the destruction of the piece during operation, as a rule, begins with the surface layer. The resulting problem of the existence of such a defective layer is the possibility of microcracks when the internal stresses of the ultimate strength of the processed material are exceeded. Therefore, to improve the performance of the product, it is necessary to reduce the size of this defective layer, and if possible, remove it [7]. We could assume that such a layer may prevent further electroplating parts that have undergone EDM, and as a consequence there could be non-compliance of the final product with existing standards and design documentation.

A group of authors found that using abrasive extrusion processing could improve the finishing treatment of micro-cracks, micro-holes and micro-slots after EDM. The result of this finishing operation is the effective removal of the formed defect layer after EDM, while the roughness of the treated surface is decreased [8-9].

Abrasive-extrusion processing consists in extrusion under a certain pressure through the treated surface of a part by the flow of an abrasive medium, the basis of such a medium is a polymer medium filled with abrasive. To date, there are studies in details describing the current phenomena and recommendations in the application of this treatment method in the Russian Federation. However, until now, to solve the problem of a defective layer after EDM, manual finishing is used in accessible places, characterized by low productivity and instability of processing.

It is proposed to introduce an additional finishing operation: abrasive- extrusion processing into the technological process of manufacturing parts with the use of EDM finishing. Alternatively, removing the modified layer or improving the quality of the surface layer after EDM is used by bi-directional abrasive extrusion treatment of through channels and external surfaces in closed chambers of special equipment. Before finishing, the EDM should be introduced with a technological allowance for the surface size to be processed for the effectiveness of the finishing method.

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ON THE IDENTIFICATION OF DYNAMIC SYSTEMS

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The paper discusses the main features of the identification theory of dynamical systems. It presents the main identification methods of dynamic systems and considers their disadvantages. The necessity of developing identification methods based on evolutionary algorithms is substantiated.

Keywords: identification of dynamical systems, parametric methods, nonparametric methods, evolutionary algorithms.

ОБ ИДЕНТИФИКАЦИИ ДИНАМИЧЕСКИХ СИСТЕМ

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В данной статье рассматриваются основные положения теории идентификации динамических систем. Представлены основные методы идентификации динамических систем, рассмотрены их недостатки. Обоснована необходимость создания методов идентификации на основе эволюционных алгоритмов.

Ключевые слова: идентификация динамических систем, параметрические методы, непараметрические методы, эволюционные алгоритмы.

For recent decades, the identification of dynamical systems has remained a relevant direction where classical approaches are being modified, new approaches are being developed. The identification of systems started as a subject of building mathematical models based on observations and it is associated with the study of Karl Friedrich Gauss, where he developed and applied a method of least squares to predict the trajectory of planetary motion. Most of the early work on system identification was done by specialists in statistics, economics (they were especially interested in identification applications related to time series) and formed an area called statistical estimation. Until about the middle of the 20th century, most of the identification procedures in automation were based on observing the reactions of controlled objects in the presence of certain control actions. Identification methods were divided into frequency and time depending on the type of information about the object was used,

Nowadays, a multiple number of methods for solving identification problems of a dynamic object is based on an evaluation of the transition function $h(t)$. If we know a transition function, it is possible to determine the reaction $y(t)$ of a linear (or linearized) system to an arbitrary input action $x(t)$ applying the Duhamel integral.

Modeling a transition function based on sample data is often reduced to the problem of minimizing the difference between the value of the transition function and its evaluation. This problem can be solved using nonparametric methods [1]. However, the quality of nonparametric methods depends significantly on the properties of the sample.

Such methods of data mining as recurrent neural networks, systems based on fuzzy logic can be applied to build a function that describes a response of the system to the known control action [2-3]. But these methods can only be used for forecasting. They do not allow obtaining a model that reflects the true nature of the process and has a form that is understandable to a specialist in the concrete industry.

In some works, a search for a dynamic object model is carried out in the form of a differential equation according to its known structure. That is, we are talking about parametric identification. The solution to the problem of parametric identification of differential equations is presented in papers [4-6].

Consequently, it is necessary to develop procedures that automate both the selection of the structure and the selection of model parameters based on sample data. For this purpose, it is possible to use evolutionary algorithms. Among evolutionary algorithms, one should single out the genetic programming algorithm and the grammatical evolution method. They make it possible to obtain a model in symbolic form, which is convenient for further research.

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ABOVEGROUND PHYTOMASS FORMATION OF PÍNUS SIBÍRICA OF THE FIRST AGE CLASS ON A PLANTATION

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The article presents the research results of three-year-old Pinus sibirica forest cultures growth, created by three-year-old seedlings of local origin in the territory of the Biryusinsky district forestry of the Yemelyanovsky forestry. The survival rate of crops at the facility is satisfactory (77.6 %). We indicate a high level of variability of growth indicators of Pinus sibirica in forestry crops. The fast-growing specimens are selected for breeding.

Keywords: Siberian cedar, forest cultures, variability.

ФОРМИРОВАНИЕ НАДЗЕМНОЙ ФИТОМАССЫ СОСНЫ КЕДРОВОЙ СИБИРСКОЙ ПЕРВОГО КЛАССА ВОЗРАСТА НА ПЛАНТАЦИИ

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В статье приведены результаты исследования роста трехлетних лесных культур кедра сибирского, созданных трехлетними сеянцами местного происхождения на территории Бирюсинского участкового лесничества Емельяновского лесничества. Приживаемость культур на объекте удовлетворительная (77,6 %). Отмечен высокий уровень изменчивости показателей роста кедра сибирского в лесных культурах. Для селекционной работы проведен отбор быстрорастущих экземпляров.

Ключевые слова: кедр сибирский, лесные культуры, изменчивость.

We pay special attention to the problem of creating crops of the Siberian cedar (*Pinus sibirica* Du Tour) in Russia. Currently, the area of cedar crops in Russia, reaches 355.8 thousand hectares, including 283.8 thousand hectares in the Siberian Federal District (80 % of the total area of Siberian cedar forest cultures), according to the state forest register. In the Krasnoyarsk Territory, the area of Siberian cedar forest plantations is 86.4 thousand hectares [3]. Dark coniferous species, which include Siberian cedar, are shade-tolerant and slow-growing in the juvenile period of development [4]. Siberian cedar forest crops have been planted on vast areas in Siberia, but their economic efficiency is questioned by a number of scientists [2]. Siberian cedar gradually displaces accompanying species from plantations, eventually becoming an edifier of biogeocenoses within its natural range [1].

In 2016, forest crops were planted with three-year Siberian cedar seedlings in the furrows under Kolesov's sword on the territory of the Biryusinsky district forestry of the Yemelyanovsky forestry. In 2019, the growth of forest crops was studied. The survival rate of crops was 77.6 %.

Forest crops were measured on three sample plots. The results of measurements on three test plots are shown in Table 1.

Table 1

Indicators of cedar forest cultures of Biryusinsky uchastkovoye forestry

Indicator	Average value	$\pm m$	$\pm \sigma$	V, %	P, %
First trial plot					
Height, cm	40,6	2,42	19,5	48,0	6,0
Current growth in height, cm	12,0	0,75	6,0	50,3	6,2
Stem diameter, cm	0,9	0,04	0,4	39,2	4,9
Second trial plot					
Height, cm	41,6	3,43	17,14	41,2	8,2
Current growth in height, cm	11,3	1,12	5,59	49,4	9,9
Stem diameter, cm	0,9	0,07	0,34	37,3	7,4
Third trial plot					
Height, cm	42,4	2,06	15,98	44,5	5,7
Current growth in height, cm	12,1	0,69	5,37	37,7	4,9
Stem diameter, cm	1,0	0,09	0,71	68,1	8,8
Average value based on the results of three trial plots					
Height, cm	41,0	1,44	17,3	42,3	3,5
Stem diameter, cm	0,93	0,026	0,309	33,4	2,8
Current growth in height, cm	11,4	0,41	5,01	44,0	3,6

Analyzing table 1, we could note that the coefficient of variability of growth indicators is high. Cedar crops were planted in 2016 by 2019 and they had an average height of 0.41 ± 0.014 m, stem diameter at the root collar – 0.93 ± 0.026 cm. The current growth was 11.4 ± 0.41 cm

A breeding evaluation and selection of Siberian cedar specimens were carried out at the facility. Biometric indicators in comparison with average values are very different (exceeding the average values by the standard deviation and more). 26 specimens of Siberian cedar, which had a height of more than 58.3 cm ($41 + 17.3$ cm), were selected (table 2).

Table 2

Siberian cedar plants selected in height

Plant number	Height		Stem diameter, cm	
	cm	% of mean value	cm	% of mean value
7	79	192,7	1.0	107,5
8	78	190,2	1.0	107,5
18	65	158,5	1.3	139,8
20	61	148,7	1.3	139,8
21	81	197,5	1.5	161,2
22	61	148,7	1.0	107,5
25	71	173,1	1.3	139,8
26	78	190,2	1.7	182,7
41	70	170,7	1.6	172,4
46	64	156,1	1.1	118,2
49	64	156,1	1.3	139,8
50	60	146,3	1.2	129,0
63	62	151,2	1.4	150,5
67	63	153,6	1.4	150,5
69	70	170,7	1.3	139,8

73	69	168,2	1,4	150,5
88	65	158,5	1,3	139,8
90	61	148,7	1,3	139,8
91	81	197,5	1,5	161,2
92	61	148,7	1,0	107,5
95	71	173,1	1,3	139,8
96	78	190,2	1,7	182,7
111	70	170,7	1,6	172,4
116	64	156,1	1,1	118,2
127	59	143,9	1,3	139,8
140	69	168,2	1,2	129,0

Plants selected for their speed of growth are expedient to use for reproduction and creation of fast-growing plantation crops.

The researchers should note that six-year-old Siberian cedar plants planted with three-year-old seedlings in a permanent place are characterized by sufficient survival rate and satisfactory growth in height and stem diameter.

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MULTI-STAGE ANALYSIS OF BUSINESS PROCESSES USING GERT-NETWORKS

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This study discusses the algorithm of multi-stage business process analysis using GERT networks. GERT networks for business process graph analysis help to get the average process execution time and infer the probability of business process completion. Next step is optimization for achievement of the top-level goals.

Keywords: GERT-networks, ARIS eEPC, business process.

МНОГОЭТАПНЫЙ АНАЛИЗ БИЗНЕС-ПРОЦЕССОВ С ИСПОЛЬЗОВАНИЕМ GERT-СЕТЕЙ

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Рассматривается алгоритмист многоэтапного анализа бизнес процесса с использованием GERT-сетей. Использование GERT-сетей для графоаналитического анализа бизнес процесса помогает вывести среднее время выполнения процесса и вывода вероятности завершения бизнес процесса. Следующий шаг – оптимизация для достижения целей верхнего уровня.

Ключевые слова: GERT-сети, ARIS eEPC, бизнес процесс.

Every business with a complex structure nowadays is looking for opportunities to optimize its business processes. Optimization can give the business an opportunity to earn additional money, reduce costs, and reduce the time for production and implementation from the moment of the needs up to product realization.

Any delay in time or inconsistency of processes can lead to losses for businesses; optimization is necessary for further business development. To avoid chaos in the system and allow optimization it is necessary to structure it. For this step, researchers need to describe the business process in detail, identify drawbacks and then perform optimization and create a new description for a new structure.

There are many methodologies for describing business processes. For example IDEF, there are (basic flowchart в visio, cross-functional flowchart в visio, BPMN 2.0, EPC (event-driven process chain), VAD (value added chain diagram), UML (Unified Modeling Languages) and many others [1].

Different methodologies can be used to analyze business processes at different levels. The most popular methodologies are: description of the business process using the IDEF0 notation (top-level business process model and first-level decomposition), then, for a detailed description of subprocesses – EPC.

In this paper, we will consider the point of a multi-stage description of a business process using a graph-analytical method based on the use of GERT networks. With the help of GERT networks, the average time of the process execution and the probability of completion of the business process is revealed.

The first stage is a description of the top level of the business process model. The description is executed as a context diagram (IDEF0). The second stage is the decomposition of the first level (IDEF0). We highlight the process of further decomposition in the EPC notation.

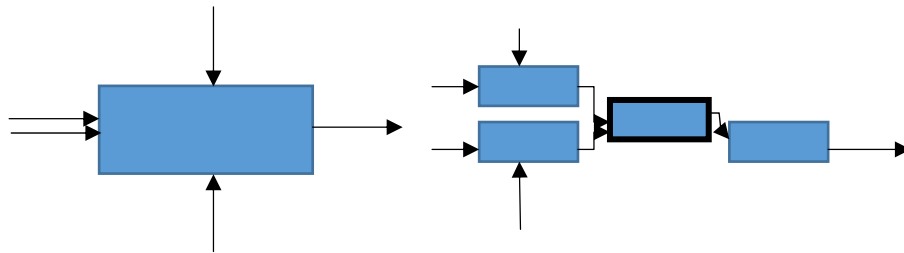


Fig. 1. Context diagram and first-level decomposition in IDEF0 notation

The third stage is the next level of decomposition for a more detailed description of subprocesses-EPC. The fourth stage is the transformation of the matrix view of the business process model description from ARIS eEPC to the matrix view of the GERT network description. The transformation is carried out according to the algorithm proposed by A. A. Zyryanov and M. G. Dorrer [2].

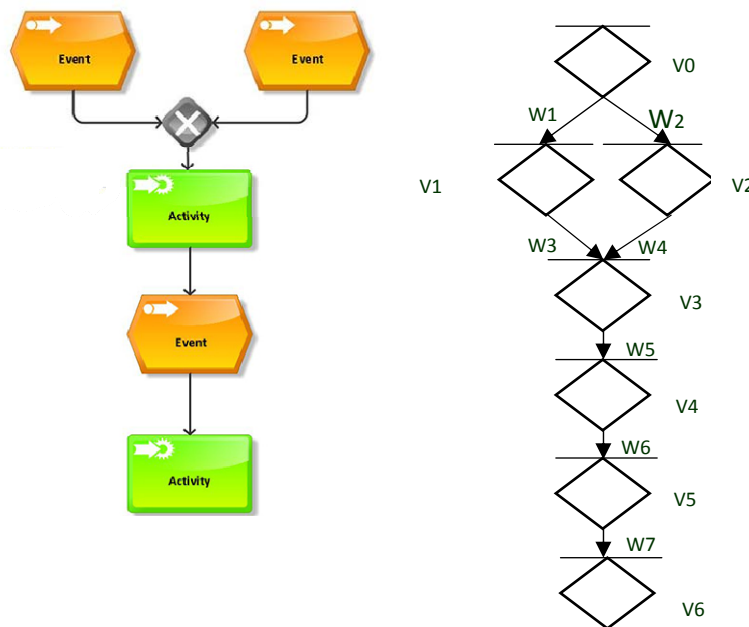


Fig. 2. ARIS eEPC and the corresponding GERT network

While using GERT networks for business process analysis, we get the ability to obtain analytical expressions for the probabilistic characteristics of the processes under study. A more complete account of the probabilistic characteristics of the simulated process is the ability to calculate any number of moments of the distribution functions of the output values of the system; the ability to model parallel and cyclic processes [3].

By calculating the average execution time of the process and deducing the probability of completion of the business process, the business process is analyzed in more details. Striving for less time to complete a business process and a greater likelihood of completing a business process result in a more optimized model. Further, after the transformations of the GERT network, the reverse conversion to the ARIS eEPC model is performed and optimization is performed. If there is a necessity, then the top-level business processes are rebuilt.

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MILLIMETRON MICROVIBRATION ANALYSIS AT LOW FREQUENCY RANGE

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This paper presents the results of Millimetron microvibration analysis at low frequencies. Millimetron telescope structure behavior was studied in order to predict its central mirror response from microvibration disturbance caused by mechanical cryocoolers. To make it possible the microvibration analysis technique was derived from the theoretical aspects and other researches results.

Keywords: spacecraft, microvibration, cryocooler, vibration.

АНАЛИЗ НА МИКРОВИБРАЦИИ КОСМИЧЕСКОГО АППАРАТА МИЛЛИМЕТРОН В НИЗКОМ ЧАСТОТНОМ ДИАПАЗОНЕ

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В настоящей статье представлены результаты анализа на микровибрации космического аппарата Миллиметрон в низком частотном диапазоне. Проведено исследование конструкции телескопа Миллиметрон с целью определения отклика его центрального зеркала на воздействие микровибрации, вызванной работой механических криокулеров. Сформирована методика анализа на микровибрации на основании теоретических знаний об этом процессе и результатов подобных исследований.

Ключевые слова: космический аппарат, микровибрации, криокулер, вибрация.

Microvibration effects and problem of their correct estimation are the key issues of modern space missions. Nowadays, spacecrafts are equipped with high accuracy pointing payloads. In spite of the fact that microvibration levels have no influence on a structural stability of a spacecraft, they may cause severe disturbances of pointing performances of its sensitive payload instrument [1].

The problem of microvibration assessing, as well as almost any other technical problem, can be solved using a computational method or an experimental one, or a combination of both. The last method is the most effective one due to the opportunity to correlate the results [2]. However, the main purpose of the current research was to consider a possibility of computational microvibration analysis applying on practice. Within the scope of the underlined purpose, the microvibration

analysis technique was derived from the theoretical aspects and adapted to the practical task performing. This task was to determine the line-of-sight jitter of Millimetron telescope in its flight configuration influenced by the microvibration sources – cryocoolers, within interested frequency band and to determine the main assumptions of the technique used.

The microvibration prediction has become a rather actual issue in modern science. A lot of scientists and engineers presents their developments, approaches and methods in order to solve the microvibration problem and study, how it can be analyzed. For instance, the authors [3] presents the methodology of microvibration prediction with a technique named in this paper as the Craig-Bampton stochastic method. Another author [4] provides the readers with rather volume knowledge of how to account for dynamic variability in microvibration analysis of satellites.

Microvibrations are the low-level vibrations occurring during on-orbit operations of mobile or vibratory parts [1]. The acceleration magnitude of such vibrations is about 10^{-6} – $10^{-3}g$. These perturbations are transmitted to sensitive payload equipment through the spacecraft structure. As a result, microvibrations might cause severe disturbances of instrument pointing performances. It is strong limitation for normal functioning of such sensitive payloads as telescopes, space cameras and other equipment with high pointing stability requirements.

Considering even such a brief description of the problem, it becomes clear that assessing of the microvibration levels is the actual task. This task can be implemented by carrying out an experiment or analyzing a mathematical model. In general, a combination of both is used to predict the microvibration effects. The accuracy of the test results mostly depends on the test conditions that are rather difficult to provide. When applying analytical method based on the mathematical model using, it is necessary to consider a wide spectrum of model parameters that make it a correct one.

The main feature of every mathematical model is the frequency range, on which the model provides acceptable representation. On this evidence, such methods as finite-element analysis (FEA) or statistical energy analysis (SEA) and their variations are used. These two methods are widely used to predict dynamic responses [3]. Each of them has their assumptions. At low frequency, up to several hundred Hertz, where a dense mesh is not required, the finite-element approach is representative enough [1]. At mid- and high frequency ranges it is recommended to use the energy approach because the behavior of real structures assumes more nondeterministic characteristics [3]. In this case, the modal density is sufficient to justify the using of SEA methods [1].

For such finite-element models (FEM) as Millimetron space observatory the modal density of which is high enough, it should apply a SEA method. However, if the analysis of such a spacecraft is required to perform at low frequency band, the using of FEA method is also feasible. Moreover, it seems to be a rational approach not to create a new model for the separate microvibration analysis, but to use the model that was created on the earlier steps of the spacecraft constructing. In this case, it is important to examine this finite-element model in order to make sure that it is valid in terms of the microvibration propagating conditions. One more considerable step is to determine assumptions of the method used.

The first issue that should be taken into consideration before the microvibration analysis starting is the disturbance characterization. The microvibration disturbance is produced by mechanical, electric or other onboard instruments called sources. The disturbance excitations can be classified by the physical nature, the duration and the disturber physics [1]. Besides, these excitations might be also classified with respect to whether they are constant frequency periodic (harmonic) or transient in nature [1]. This parameter determines what type of analysis is more applicable for the response computation under the current conditions whether frequency or time domain.

In general, cryocoolers operates with a fixed drive frequency at the range of 30 to 60 Hz [1]. The other disturbance excitations are generated at that frequency and its multiples. It means that the load induced by the mechanical (or pulse tube) cryocooler is a complex of harmonic signals with the main frequency and its multiple harmonics. So the drive frequency can be chosen for analysis as having the most significant amplitude.

In order to assess more accurately the microvibration effects, it is necessary at first to estimate a higher bound of the response. To do this, a modal analysis of the FEM of spacecraft structure was performed. The coincidences of frequencies of the disturbance harmonics and the resonant modes may cause the most significant perturbations of the telescope optical axis. The modal analysis of the FEM was performed up to 100 Hz. Such a limitation have been chosen because, as it was described above, the main frequency of disturbance excitation is from 30 to 60 Hz.

In this article the microvibration analysis technique was applied for Millimetron spacecraft. Thus, the FEM that was created on previous steps of the spacecraft constructing is applicable for the microvibration analysis with several assumptions. They relate to the frequency band, the mesh quality, the analysis approach, the source modeling and described above in more detailed way. The main assumptions were made for an approximate low-frequency response evaluation by the finite-element model.

A finite-element harmonic analysis was performed to assess the influence of the cryocoolers disturbance on the sensitive payload instrument within low-frequency band. Such an instrument in this case was Millimetron central mirror. The optical axis deflection was also calculated.

The results can be used as the starting point for more detailed assessing of the microvibration effects on Millimetron spacecraft as well as others, which have the sensitive payload on board.

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SELECTION OF OPTIMAL PARAMETERS IN THE TASK OF OPTIMIZING THE CONTROL OF THE FILTRATION PROCESS IN HYDROMETALLURGY

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The process of filtration of technological pulps in hydrometallurgy is one of the main stages of obtaining semi-finished products containing precious metals. The selection of filtration parameters improves the quality of the preparation areas. Investigating the problem of suspension slip during filtration of process pulps results in selecting the parameters at which the optimal values for controlling the filtration process in hydrometallurgy are chosen.

Keywords: parameters, controlling, process management, semi-finished products.

ПОДБОР ОПТИМАЛЬНЫХ ПАРАМЕТРОВ В ЗАДАЧЕ ПО ОПТИМИЗАЦИИ УПРАВЛЕНИЯ ПРОЦЕССОМ ФИЛЬТРАЦИИ В ГИДРОМЕТАЛЛУРГИИ

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Процесс фильтрования технологических пульп в гидрометаллургии является одним из основных этапов получения полуфабрикатов, содержащих драгоценные металлы. Подбор параметров фильтрации повышает качественную работу участков подготовки. Исследуя проблему проскока взвеси при фильтрации технологических пульп можно подобрать параметры, при которых осуществляется выбор оптимальных значений управления процессом фильтрации в гидрометаллургии.

Ключевые слова: параметры, контроль, управление процессом, полуфабрикаты.

The behavior of the filtration process is influenced by the characteristics of both the solid and liquid phases of the pulp. These characteristics can determine the entire variety of existing suspensions. All characteristics can be divided into three categories: basic properties [1], the state of the liquid-solid system [2], and macroscopic parameters [3].

The basic properties can be measured independently from other system parameters and include: the physical properties of the solid and liquid phases, particle size and particle size distribution, particle shape, and surface properties of the particles [4]. The characteristics that evaluate the state of the liquid-solid system depend on the main properties and include: the difference, concentration, homogeneity and degree of dispersion of the particles. Finally, macroscopic parameters usually determine the feasibility of a particular separation method. These parameters may include: the permeability or resistivity of the sediment, the particle deposition rate, etc. [5].

After the leaching process, the deactivated catalyst is dissolved, and its components (Pt or Pd) pass from the solid state to the liquid state, forming a suspension in the solution, which must be filtered out at the next stage. When the suspension is filtered, a solid precipitate is formed at the outlet of the filter press (which is used for disposal) and a solution containing noble metals-Pt or Pd.

The purity of the masterbatch affects the overall course of the further process.

The next step is the cementation of the solution containing Pt or Pd. The presence of suspension in the masterbatch solutions can increase the consumption of reagents during carburization and increase the time of the process itself, since the purpose of carburization is to transfer Pt or Pd from the liquid state to the solid state as much as possible that is to obtain a concentrate.

The cementation process is continued by filtration, in which the liquid phase is separated from the solid phase and, accordingly, the concentrate is obtained.

The resulting suspension in the masterbatch solutions can react with chemical reagents during the cementation process, which can, in turn, adversely affect the filtration process, resulting in a poor-quality concentrate.

Having considered the process of processing the deactivated catalyst, we can come to the following conclusion. The frequency of masterbatch solutions affects the quality and processing time of the catalyst and the preparation of a concentrate with no impurities.

Below in Table 1 we provide data for ideal conditions.

table 1

	loading, quantity,	Loading weight, kg	Volume of solutions, l, V	Average content Pt (Pd), mg / dm ³ , C	Pt (Pd) concentrate yield (including 35 % wet) kg, M
Uploading to a single device	1	200	1000	180	0,243
Per shift	5	1000	5000	180	1,215
Per days	10	2000	1000	180	2,43
Per month (30 days)	300	60000	300000	180	72,9

$$M=(V*C/1000000)+35 \%, (1)$$

Consider the process in production conditions, in which at the stage of filtration of solutions after the dissolution of the deactivated catalyst, a suspension slip occurs. The volume of the suspension can vary from 150 mg / dm³ to 100,000 mg / dm³.

The calculation results for the minimum and maximum slip are demonstrated in Table 2 below.

table 2

	Uploading to a single device	Per shift	For days	Per month (30 days)
loading, quantity	1	5	10	300
Volume of solutions, l, V	1000	5000	10000	300000
Average content Pt (Pd), mg / dm ³ , C	180	180	180	180
The particle suspension a minimum mg/dm ³ , Pmin	150	150	150	150
The breakthrough of suspended solids max mg/dm ³ , Pmax	100000	100000	100000	100000

Pt (Pd) concentrate yield (including 35 % wet) kg, M _{min}	0,445	2,227	4,455	133,65
Pt (Pd) concentrate yield (including 35 % wet) kg, M _{max}	135,243	676,215	1352,43	40572,9

$$M_{\min}=(V*(C+\Pi_{\min})/1000000)+35 \%, (2)$$

$$M_{\max}=(V*(C+\Pi_{\max})/1000000)+35 \%, (3)$$

Analyzing the data from tables 1 and 2, we come to the conclusion that even with a minimal suspension slip, the yield of Pt (Pd) concentrate increases by more than 80 %, by weight, but not by the amount of precious metal. The purity of the concentrate decreases and at the same time the amount of the reagent increases during the cementation of masterbatch solutions from 2 to 10 times or more, if we take the parameter of the maximum slip P_{max}.

To improve the quality of control during processing the catalyst at the filtration stage (after dissolution), after the filter press, we need to install a device for monitoring the suspension slip and control automation, for sampling and stopping the filter press.

Methods and devices that enable automatic rapid control of sedimentation and electrokinetic parameters of the suspension are given in [6,7]. According to these indicators, the control system can assess the progress of the coagulation process and, based on the assessment of the coagulation, control this process.

At the first stage, the control system can be limited to a single reaction-switching off the filter press with a signal to the operator, providing a sample of the solution.

Next, the condition of the filter elements of the filter press is analyzed and their replacement, partial or complete, is performed. After carrying out preventive maintenance, the filtration process is performed. A change in the process of processing the deactivated catalyst will fully improve the quality of the resulting concentrate (Pt or Pd).

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ANALYSIS OF PACKET LOSSES IN MPLS NETWORKS

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This article presents the basic features of Multi-protocol label switching (MPLS) technology and the cases of using it in the IP backbone networks. The paper identifies open problems that require further research as well.

Keywords: MPLS, IP, WFQ, D-ITG, Cisco, Label, Flow.

АНАЛИЗ ВЕРОЯТНОСТИ ПОТЕРЬ ПАКЕТОВ В СЕТИ MPLS

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В данной статье представлены основные возможности MPLS технологии и варианты использования в магистральных IP-сетях. Так же выявляются открытые проблемы, которые всё ещё требуют дальнейшего изучения.

Ключевые слова: MPLS, IP, WFQ, D-ITG, Cisco, метка, поток.

MPLS is a routing technology in telecommunication networks that switches packets from one node to another one using a short label number. MPLS can work together with any link layer protocol. It can create end-to-end links in any network topology. Thus, the main advantage of MPLS is the ability to be independent of the link-layer protocols such as ATM, Frame Relay, or Ethernet [1].

However, MPLS has complex packet forwarding processes. These processes are more complex than those that can be observed in a traditional network. Therefore, these processes require careful analysis.

After a router has received a packet, it analyzes and determines whether the packet has been labeled or not. If the packet has not been labeled, then the router searches for the next-hop IP address. In Cisco routers, this means that the next-hop IP address is searched for using the CEF table. When the router receives a labeled packet, this means that the next hop is searched for using the LFIB table.

Fig. 1 shows the difference between CEF lookup and an LFIB lookup [2].

Отступить одну строку

If a router receives an IP packet and forwards it according to the LFIB table, this flow is called IP-to-Label. If the router receives an IP packet and forwards it according to the CEF table, this flow is called IP-to-IP. When a router receives a labeled packet, it can extract a label from the packet and forward the packet as a traditional IP packet, or forward the packet as a labeled packet.

The first case is called Label-to-IP flow, the second case is called Label-to-Label flow. Thus, in MPLS networks, routers work with the different types of flows.

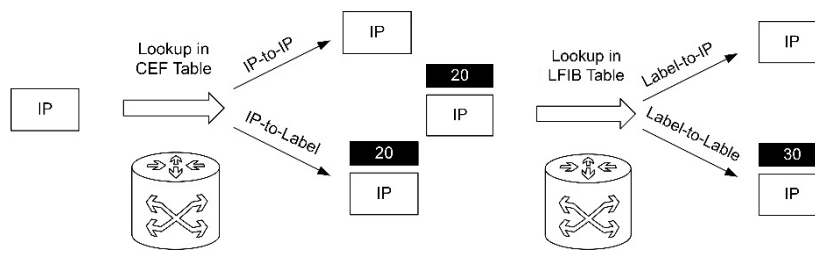


Fig. 1. Principle of packet switching with a label

Fig. 2 shows the network topology based on the Cisco 2811 series routers. It will help us estimate labeled and IP packet loss.

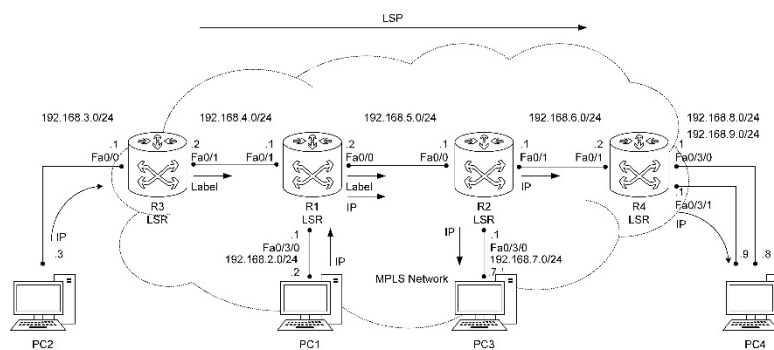


Fig. 2. An MPLS Network

The bandwidth of the link between the routers R1 and R2 was limited to 10 Mbps. Thus, we will observe packet loss on the Fa0/0 interface of the router R1.

In order for the R1 router to automatically split traffic into separate flows and try to divide the bandwidth between them, Weighted fair queuing (WFQ) was enabled. However, the labeled flows such as Label-to-Label and IP-to-Label are, from the point of view of WFQ, placed in one queue. In this case, there will be unpredictable results during the measurements. It has to do with the fact that these Label-to-Label and IP-to-Label flows directed to PC4, which is in the subnet with the 192.168.8.0/24 prefix, will be assigned the same FEC class. Therefore, PC4 must be on two different subnets with different prefixes.

According to RFC 2544, the ideal way to implement the series of tests is to use a tester with both transmitting and receiving ports [3]. In this work, the D-ITG software package was used to create and analyze traffic in the MPLS network.

The bottleneck in this topology is a channel with the bandwidth of 10 Mbps, so the measurements were carried out at the maximum speed relative to this link channel, with a further decrease up to 90 % of the maximum speed. The percentage of packet loss in the communication channel was calculated using the following formula:

$$L = \left(\frac{I - O}{I} \right) \times 100,$$

where ‘L’ is the percentage of lost packets;
 ‘I’ is the number of packets received;
 ‘O’ is the number of packets served.

If the number of served packets is less than the number of received packets, then the measurement is repeated, and the speed will slow down until two results are recorded without any packet loss. The speed step should not exceed 10 % of the maximum speed.

Fig. 3 shows the plot of losses versus flow rate.

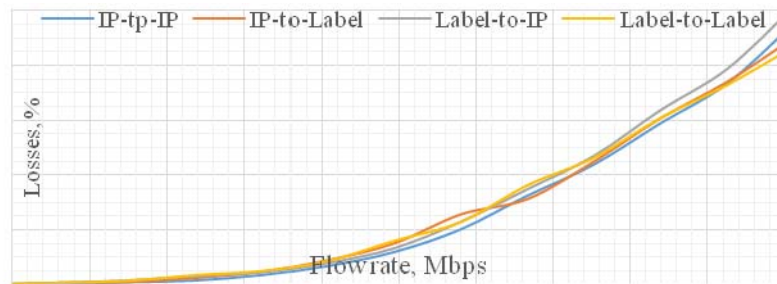


Fig. 3. The plot of losses versus flow rate.

We can see that the loss ends up at 8 Mbps on each flow. Most of the loss is observed in flows that route IP packets and the least loss is observed in flows associated with labels switching.

After that, four parallel flows were created at equal speeds to test the work of WFQ.

Fig. 4 shows a plot of losses versus the sum of flow rate.

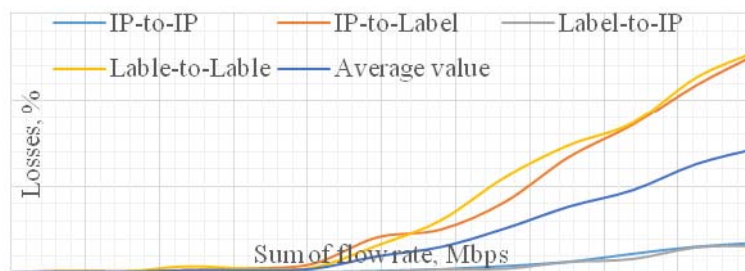


Fig. 4. A plot of losses versus sum of flow rate

The flows have approximately the same number of losses up to 8.8 Mbps, after 8.8 there is a significant deviation from an average value. The flows whose process is associated with label switching have more losses than the flows whose process is associated with routing IP packets. This occurs due to the fact that, in Cisco IOS, WFQ gives more priority to IP routing flows when there are label switched flows. Thus, when a mixed flow is transmitted on an interface, WFQ is not provided. This behavior requires further analysis.

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AIRPORT SIMULATION MODEL FOR DECISION-MAKING SYSTEM IN THE AREA OF GROUND SUPPORT OF FLIGHTS

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A simulation model of technological processes for servicing aircraft, passengers and baggage at the airport has been formed. Special attention is paid to their complexity and mathematical models required for their successful solution. Prospects for the application of the model in decision support systems are outlined.

Key words: airport, ground handling, simulation, information system, decision making.

ИМИТАЦИОННАЯ МОДЕЛЬ АЭРОПОРТА ДЛЯ СИСТЕМЫ ПРИНЯТИЯ РЕШЕНИЙ В ОБЛАСТИ НАЗЕМНОГО ОБЕСПЕЧЕНИЯ РЕЙСОВ

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Сформирована имитационная модель технологических процессов обслуживания воздушных судов, пассажиров и багажа в аэропорту. Особое внимание уделяется их сложности и математическим моделям, необходимым для их успешного решения. Изложены перспективы применения модели в системах поддержки принятия решений.

Ключевые слова: аэропорт, наземное обслуживание, имитационное моделирование, информационная система, принятие решений.

Modern conditions of the air transport market require airport enterprises to improve the quality of services provided to carriers and air transport users, while reducing the time spent on maintenance and meeting the requirements for safety and regularity of transportation. One of the directions of the practical solution to this problem is the optimization of technological parameters of airport complexes on the basis of modeling.

All the events taking place in this process can be divided into two types. The events of the first kind happen regularly. For example, anti-icing treatment is performed in the event of the onset of negative temperatures. The events of the second kind happen by chance. For example, a lightning strike on a plane. As we know, most of these events entail a load on the analytical decision-making apparatus. It takes much "power" to process information coming in continuously and in varying amounts. Depending on the situation, the analytical apparatus receives different amount of information, the more complex and dangerous in terms of the consequences of the situation, the more information needs to be analyzed. In other words, predictable events and random events require different decision support algorithms. Therefore, they should be considered separately.

Since the ground maintenance process is the order of events, both predictable and random, this process can be characterized as stochastic. In view of this fact, the most suitable model for describing this process will be a simulation model.

Since the main production activity of the airport consists in the implementation of technological processes for servicing flights, including a certain set of operations, the composition, duration and labor intensity of which depends on the parameters of the flight, the activity must first be decomposed; the process of servicing one flight is taken as a single execution of the model algorithm.

Direct use in the simulation model of real technological flight service schedules developed and used at operating airports is impossible for a number of reasons, among which the most significant are, firstly, a variety of schedule options that differ depending on the type of aircraft being served, flight categories and transportation, etc.; secondly, excessive detail of the displayed service process. Nevertheless, the available graphs can be used as a basis for constructing a reduced model technological graph. The operations included in this schedule must meet three requirements:

- 1) be performed (in all cases or in most if any cases) while servicing transit or return flights;
- 2) be (or possibly be) on the critical path of the process;
- 3) have significant duration for the considered level of model detailing.

The model technological schedule, which includes operations with the above properties, and is valid for describing the process of servicing most types of aircraft, is shown in Fig. 1. Despite the fact that the parameters of operations depend on the type of aircraft, their values vary over a wide range, and in some cases some of the operations are generally excluded from the technological process, this does not lead to the violation of the links between operations and "destruction" of the schedule.

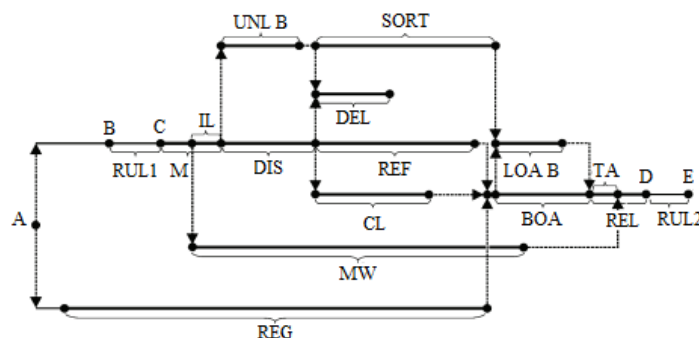


Figure: 1. Model technological schedule of aircraft preparation for departure:
 Events: A – receiving a message about aircraft movement, B – aircraft landing,
 C – arrival of the aircraft at the parking space (PS),
 D – departure of the aircraft from the PS, E – departure of the aircraft.

Operations (or time slots): REG – ticket registration and issuance luggage of departing passengers; RUL 1 – aircraft movement to the PS; M – meeting the aircraft on PS; IL – installation of a ladder; DIS – disembarkation and delivery of passengers to the airport;

UNL B – unloading luggage and transporting it to the luggage rooms of the terminal;

DEL – luggage delivery to arrived passengers; REF – aircraft refueling;

CL – interior cleaning; MW – maintenance work; BOA – delivery of departing passengers

to the aircraft and boarding the aircraft; SORT – sorting and picking of baggage by flights

departing passengers; LOA B – transportation to the aircraft and loading of baggage

departing passengers; REL – work on releasing aircraft from the parking lot;

TA – take away the ladder; RUL 2 – aircraft movement with PS

In accordance with the resulting schedule, a statistical model of individual operations is formed, which in turn determines the overall simulation model. From each run of the model of single trips, parameters are taken that form the model. The model feeds the data to a decision support system (DSS).

DSS synthesis includes monitoring and analysis systems, situational modeling, forecasting and planning, and includes data warehouse as well. The data obtained from the model are passed through the DSS systems, after which the most acceptable solution is found.

Summing up, we can state that complex technological processes with an ever-increasing intensity require a simplifying model and information support for decision-making. The flight service simulation model presented in this paper provides the possibility of using DSS in the processes of ground maintenance of flights. DSS, in its turn, will create conditions for the formation of the most effective management decisions.

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ON THE BASIC METHODS OF DECISION TREES LEARNING

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This paper considers a widespread application of decision trees in the field of modern data analysis. The classical methods of training trees are described; the necessity of developing new learning algorithms to overcome the shortcomings of the existing ones is substantiated.

Keywords: decision tree, learning algorithm, ID3, CART, C4.5, genetic programming.

ОБ ОСНОВНЫХ МЕТОДАХ ОБУЧЕНИЯ ДЕРЕВЬЕВ РЕШЕНИЙ

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В данной работе обосновывается широкое распространение деревьев решений в области современного анализа данных. Описываются классические методы обучения деревьев, обосновывается необходимость разработки новых алгоритмов обучения для преодоления недостатков существующих.

Ключевые слова: дерево решений, алгоритм обучения, ID3, CART, C4.5, генетическое программирование.

Decision trees are one of the most effective classification methods, successfully applied in the practice of data mining [1-2].

The first ideas for developing decision trees are presented in the works of Hunt and Howland in the late 1950s. And in 1966 a book of Hunt E.B., Marin J. and Stone P. J. "Experiments in Induction" was published; it is considered a fundamental study in this direction [3].

Decision trees have become widespread due to the intuitive form of the results that is close to the formal reasoning of an expert. It is believed that decision trees are the only method that can be used to solve problems of medical diagnostics, bank scoring, and marketing in view of the possibility of interpreting the result in a form understandable for an industry specialist.

A decision tree must be trained on the training data before it is applied directly. During training, a tree structure is formed and the numerical parameters of the threshold functions are adjusted. Today there are many regular training algorithms, including ID3, CART, C4.5.

ID3 is an algorithm developed by John R. Quinlan. This algorithm uses the entropy criterion; the construction is carried out until objects of the same class appear in each leaf, or until the partition of the vertex gives a decrease in the entropy criterion.

C4.5 is an algorithm is an improved version of the ID3 algorithm of the same author [1]. Haircut (Error-Based Pruning), modification for operation with numeric attributes, handling of

missing values have been added to the C4.5 algorithm. C4.5 uses a normalized entropy criterion (Gain Ratio). The stop criterion is the limit on the number of objects in the sheet.

CART (Classification and Regression Tree) is an algorithm developed in 1974-1984 by four professors of statistics: Leo Breiman (Berkeley), Jerome H. Friedman (Stanford), Charles Stone (Charles Stone, Berkeley) and Richard Olshen (Richard A. Olshen, Stanford) [4]. This algorithm uses the Gini criterion as a criterion of informativeness, haircut is possible (CostComplexity Pruning method), processing of gaps is carried out by the method of surrogate predicates.

However, the described methods do not allow obtaining the best structure for a specific task. These algorithms try to build an "almost optimal" tree by performing a specific local search at each node in the hope that the resulting tree will be as close to optimal as possible. Such algorithms are called "greedy". Moreover, a decision tree should be highly generalized, i.e. the algorithm should not just "remember" the belonging of the training sample to the classes, but reflect the dependencies between inputs and outputs [5]. Therefore, it is advisable to develop new procedures for training decision trees.

Genetic programming is an effective tool for computer-aided design of information technologies. Individuals are represented in the form of binary trees in one of the variants of genetic programming, so this algorithm is convenient for finding the optimal structure of a decision tree by searching in the space of trees. Consequently, the development of procedures for the automated construction of decision trees is a relevant direction.

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DIMENSIONAL STABILITY OF HYBRID COMPOSITE MATERIALS

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In this paper, we investigate the effect of modification of thermosetting epoxy resins by materials with high negative temperature expansion on the size of warping products made of hybrid composite material, taking into account the possible disorientation of the layers. The results obtained confirm the effectiveness of using carbon nanoparticles as a modifier, which allows not only to reduce the amount of warping in fibrous composite materials, but also to increase the technological stability.

Keywords: nanocomposites, polymer-matrix composites, warping, carbon nanotubes.

РАЗМЕРОСТАБИЛЬНОСТЬ ГИБРИДНЫХ КОМПОЗИЦИОННЫХ МАТЕРИАЛОВ

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В данной работе изучается влияние модификации терморезактивных эпоксидных смол материалами с высокими отрицательными температурным расширением, на величину коробления изделий из гибридного композиционного материала с учетом возможной дезориентации слоев. Полученные результаты подтверждают эффективность использования углеродных наночастиц в качестве модификатора, способного не только снизить величину коробления в волокнистых композитных материалах, но и увеличить технологическую устойчивость.

Ключевые слова: нанокompозиты, полимерные композиционные материалы, коробление, углеродные нанотрубки.

Dimensionally stable materials and structures are necessary for many fields of science and technology, especially for the space industry. The most promising are composite materials based on carbon fibers and a polymer matrix [1]. However, there are opportunities to increase the performance properties of composite materials; these opportunities are associated with the directed modification of the polymer matrix. The synergy between the modifier, the polymer matrix and the reinforcing material allows to create a new improved composite material with a unique three-dimensional network structure, the elements of which have geometric characteristics that differ by several orders of magnitude [2].

Thermal residual stresses arise in the process of manufacturing composite materials at the cooling stage from the curing temperature to the environment temperature, due to the difference in

the thermomechanical properties of the polymer matrix and the carbon reinforcing material. Residual stresses irreversibly affect the characteristics of the composite material, causing warping or forming defects. There is a need to develop methods for reducing residual stresses. One of the methods is the modification of the polymer matrix by modifiers with a negative coefficient of linear expansion [3]. Using modifiers that have a negative coefficient of linear thermal expansion (CTE) and a high modulus, we can create matrices with regulated thermal expansion.

Single-walled carbon nanotubes (SWCNTs) and multiwalled carbon nanotubes (MWCNTs) are used as modifiers in this work. The addition of modifiers to the polymer, matrix was produced by ultrasound treatment. Samples of a hybrid polymer composite material based on a modified resin are received using the vacuum infusion method.

After the curing process, the CTE of the manufactured samples was determined using a thermomechanical analyzer TA Instruments Q400. The content of the reinforcing component in the composite material was determined using a thermogravimetric analyzer Discovery TGA55 TA Instruments (USA). The flat of the samples was measured using a portable coordinate measuring machine absolute arm 7520 GU with an external CMV 108 scanner using Geomagic software (Romer) with a spatial accuracy of ± 0.033 mm.

The Mori-Tanaka method was used to evaluate the CTE of the modified epoxy resin [4]. The classic laminate theory method was used to evaluate the CTE of the composite material. The estimation of the mathematical expectation of the standard deviation of the surface of composite samples is carried out according to the model of predicting the shape of the sample of an asymmetric composite material proposed by Dano and Hyer [5].

We obtained results on the effect of modifiers on the thermomechanical properties of epoxy resin. For multiwalled carbon nanotubes, the most effective concentration is 1 %, at which the CTE of the epoxy matrix is reduced by 14.2 % and is $58.37 \cdot 10^{-6}$, for single-walled carbon nanotubes, the optimal concentration is 0.05 %, at which the CTE is reduced by 8.4 % and is $62.3 \cdot 10^{-6}$.

Samples of a composite material based on unidirectional carbon fibers and modified and unmodified epoxy resin were produced. To assess the effectiveness of the modification, measurements of CTE were made out-plate of the sample plane. The results showed a high convergence with the calculated values. For a composite sample based on an epoxy resin with 0.05 % SWCNTs, the thermal expansion is $36.1 \cdot 10^{-6}$, which is a decrease of 15.6 % compared to the same result for a composite material based on an unmodified resin. For the hybrid composite material with MWCNTs, the reduction of the CTE sample was 35.8 % and was $27.4 \cdot 10^{-6}$.

The efficiency of modifying the epoxy matrix in the manufacture of a hybrid composite material is higher than in the manufacture of a nanocomposite. The data on the thermomechanical behavior of the hybrid composite material completely coincide with the calculated values. While the CTE values of the modified epoxy matrix are lower than the calculated results, which may be due to the greater agglomeration of carbon nanotubes.

A series of polymer-matrix composites (PMC) samples with the structure [0/60/-60] were produced. The samples are made of fabric based on IMS65 carbon fibers and T67 epoxy resin, unmodified and modified by SWCNTs. The average value of the standard deviation of the surface of the composite plate based on modified and unmodified epoxy resin is 0.1328 and 0.1636, accordingly. Modification of the polymer matrix with carbon nanotubes reduces the warping of the composite material.

The influence of modification of the epoxy resin by materials with a negative CTE on the thermomechanical behavior of the polymer matrix was determined. For multiwalled carbon nanotubes, the most effective concentration is 1 %, at which the CTE of the epoxy matrix is reduced by 14.2 % and is $58.37 \cdot 10^{-6}$, for single-walled carbon nanotubes, the optimal concentration is 0.05 %, at which the CTE is reduced by 8.4 % and is $62.3 \cdot 10^{-6}$. A hybrid composite material based on modified epoxy resin was manufactured. For a composite sample based on an epoxy resin with 0.05 % SWCNTs, the thermal expansion is $36.1 \cdot 10^{-6}$, which is a decrease of 15.6 % compared to the same result for a composite material based on an unmodified resin. For the hybrid composite material with the MWCNTs, the reduction of the CTE outside the sample plane was 35.8 % and

was equal to $27.4 \cdot 10^{-6}$. Based on the obtained data, it can be concluded that the efficiency of modifying the polymer matrix in the manufacture of a hybrid composite material is higher than in the manufacture of a nanocomposite. The experimental data show a high convergence with the calculated values, which indicates an effective distribution of the modifier in the polymer matrix.

Warping samples of composite material based on modified and unmodified resin was investigated; the average value of the standard deviation of the sample surface decreased by 18.83 % when modifying the polymer resin.

This work was carried out by the team of the scientific laboratory “Smart Materials and Structures” within the state assignment of the Ministry of Science and Higher Education of the Russian Federation for the implementation of the project “Development of multifunctional smart materials and structures based on modified polymer composite materials capable to function in extreme conditions” (Project No. FEFE-2020-0015).

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ANALYZING DATASETS FOR THE SOFTWARE REGULATOR OF AUV NAVIGATION AND ORIENTATION SYSTEM

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When developing a deep learning algorithm, one of the most important tasks is analyzing the data and sampling that can be represented as input and output sets. This paper analyzes the data for the navigation system of an underwater vehicle.

Keywords: regulator, navigation, datasets, bionic robot, underwater robot

АНАЛИЗ НАБОРОВ ДАННЫХ ДЛЯ ПРОГРАММНОГО РЕГУЛЯТОРА СИСТЕМЫ НАВИГАЦИИ И ОРИЕНТАЦИИ АНПА

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При разработке алгоритма глубокого обучения одна из самых важных задач – анализ данных и выборка тех, которые могут быть представлены в качестве входных и выходных наборов. В данной работе проведен анализ данных для системы навигации подводного аппарата.

Ключевые слова: регулятор, навигация, наборы данных, бионический робот, подводный робот

According to the research of the global economy, the market for autonomous underwater vehicles (AUVs) without payload is forecast to grow by an average of 20.8 % from 2020 to 2025. [1] The main constraint to the growth of the AUV market is that submersibles are relatively expensive marine systems. The high costs of deploying autonomous systems, as well as the complexity of linking navigation systems, lead to the slow implementation of AUVs throughout the entire world. To reduce the costs related with navigation systems, various hardware and software controllers based on Kalman and Madgwick filters are used. [2] However, due to the widespread use of deep learning algorithms, which show high prediction accuracy, it was decided to develop a software controller for AUV navigation and orientation systems.

The purpose of this work is to determine the sets of input and output data required for a software controller based on deep learning algorithms.

For the analysis, a developed bionic underwater robot was taken, which has two side wings as main propellers, and stern fins as auxiliary propellers. [3] Fig. 1 shows the diagram of the underwater vehicle.

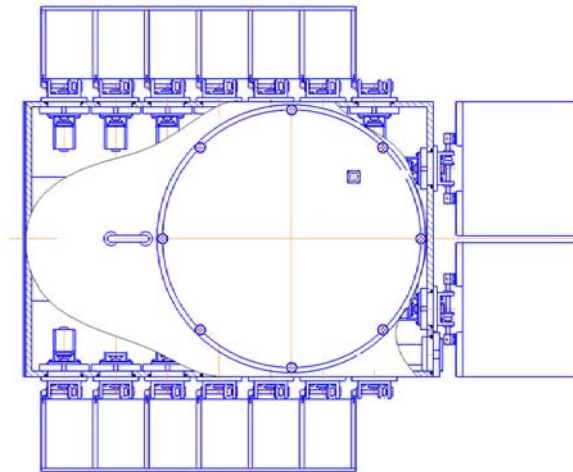


Fig. 1. Diagram of a bionic underwater robot

Each wing of the underwater vehicle changes its geometry using spokes that move according to the following law:

$$\alpha_i = \alpha_0 + (U \times ((i-1) + d_x)^2 + d_y) * \sin((i-1) * \alpha_0 + \omega t) \quad (1)$$

According to this law of motion of spokes, we obtained two datasets of outputs for the left and right wings. Each set contains the following variables:

- U – bending coefficient of a wing amplitude line,
- d_x – shift of the wing amplitude line along the underwater vehicle,
- d_y – shift of a wing amplitude line transversely to the body of the underwater vehicle,
- α_0 – starting position of the i-th spoke,
- ω – spoke angular velocity.

To determine the input dataset, a structural diagram of navigation and orientation system was developed. It is shown in Fig. 2. This underwater vehicle contains position sensors for the output shafts of the spoke drives, strapdown inertial navigation system (SINS), vision system.

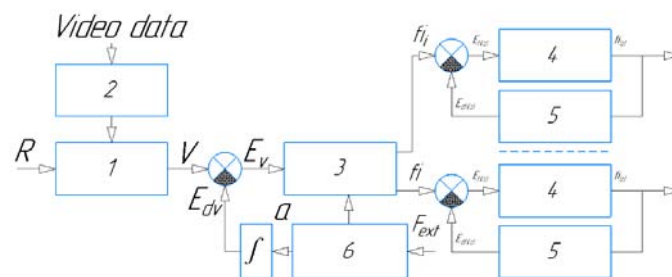


Fig. 2. Simplified block diagram of the navigation and orientation system:
 1 – digital processing unit, 2 – vision system, 3 – program controller, 4 – spoke drive,
 5 – spoke output shaft position sensor, 6 – SINS

The driving signal – the route, enters the digital processing unit; the data from the computer vision system, correcting the route taking into account the dynamic environment, enters the digital processing unit as well. The signal from the digital processing unit goes to an adder, which takes into account the current state of the underwater vehicle. Further, the error signal comes to the software controller, which receives data from the SINS as well. The result of this processing is the required position angle of each spoke of the underwater vehicle, depending on the environment and

the current state of most of the AUV elements. Based on this structural diagram, the input datasets for the software controller are:

E_V – AUV velocity vector error,

a – AUV acceleration vector,

ω_g – AUV rotation speed vector.

The result of the work done is the structural diagram of the AUV. This diagram shows the input control signal, the signals from various data acquisition devices, and the output signals of the control system. In the course of the work, input and output datasets were identified. The resulting sets are required for the research and the development of a software controller based on deep learning algorithms.

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THE INFLUENCE OF MWCNTs ON THE GENERATION OF CARBON-BASED COMPOSITE WITH A STABLE LOW COEFFICIENT OF THERMAL EXPANSION

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This paper explores the optimization macrostructure to reach a stable low coefficient of thermal expansion (CTE) of a composite with carbon fibers. The reduction variance opportunity of a finite-sample of a CTE distribution by modifying the polymer matrix with MWCNTs under conditions of reinforcing fibers disorientation is investigated. Requirement thermomechanical properties are reached by determining the orientation of anisotropic layers. The stiffness tensor and CTE of carbon nanotube reinforced composites are modeled using the Mori – Tanaka theory based on Eshelby's inclusion theory. The objective function is a weighted sum of CTE and variance. The effective stiffness and CTE of composites are modeled using classical laminate theory (CLT).

Keywords: optimization of macrostructure of hybrid composite, stable low CTE of composite, MWCNTs, Mori – Tanaka model, classical laminate theory.

ВЛИЯНИЕ УГЛЕРОДНЫХ МНОГОСТЕННЫХ НАНОТРУБОК НА ФОРМИРОВАНИЕ КОМПОЗИТОВ С СТАБИЛЬНО НИЗКИМ КЛТР

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Рассмотрена задача оптимизация макроструктуры для обеспечения низкого КЛТР композита, армированного углеродными волокнами. Определена возможность снижения дисперсии выборки расчетных случаев КЛТР модификацией полимерной матрицы многостенными углеродными нанотрубками (МУНТ) в условиях дезориентации армирующих волокон. Требуемые термомеханические свойства макроструктуры композитного материала достигаются за счет определения ориентации анизотропных слоев. Тензор упругости и КЛТР полимера с МУНТ оцениваются согласно модели Мори-Танака на основе тензора Эшелби. Целевая функция для оптимизации представлена в виде взвешенной суммы КЛТР в продольном направлении и его дисперсии. Модуль упругости и КЛТР определяются согласно классической теории ламинирования.

Ключевые слова: оптимизация макроструктуры гибридного композита, стабильно низкий КЛТР, МУНТ, модель Мори-Танака, классическая теория ламинирования.

The size changes control is very important in some applications, for example, in space structures. Zero thermal expansion materials are needed in structures subject to temperature changes such as a backplane support structure for a large space telescope, antenna booms, solar array frames, etc. Unlike classical materials, composite laminates can be designed in such a way as to

reduce the coefficients of thermal expansion (CTE) in the desired direction to a specified value, in particular, to zero. This can be done by the appropriate sequence of laminate layers, by the angular orientation of each layer and by the microstructure properties control.

The structure optimization problem of a composite material to obtain the specified mechanical and thermomechanical properties has repeatedly attracted the attention of researchers. The authors of the research [1] determined the optimal structure of the composite to provide near-zero CTE by evolutionary optimization method. The authors of Ref. [2] presented a project of a composite platform for a satellite with low temperature deformations. The authors of the paper [3] presented a solution to the stiffness and strength optimization problem of anisotropic composite macrostructures. The authors of Ref. [4-9] present the topological optimization results of the composite structure and products according to the criteria of stiffness and reliability using various methods: homogenization design method, divergence-free vector field, neural network and genetic algorithm, etc. The study [10] presents the result of optimization to achieve near-zero CTE of a two-dimensional composite structure consisting of three phases.

In addition to macrostructure optimization of composite materials, many works are presented [11, 12, 13] investigating modifications of the microstructure, including for CTE reduction of the polymer matrix. To change the composite material microstructure, modifiers with negative thermal expansion are used, which can compensate for the high thermal expansion of the polymer material. An example of such modifiers are carbon nanoparticles: single-walled and multi-walled carbon nanotubes.

The task of macrostructure optimization of the composite is complicated by the high sensitivity of the theoretically achieved near-zero CTE to the disorientation of the reinforcing fibers and lamina properties variability, which inevitably present in practice. Therefore, it is important to take into account the possible variance of the CTE, i.e., the determined composite structure must satisfy the minimum variance of the target parameter.

The object of this work is a composite material based on carbon fibers and a modified polymer matrix with a nanoscale filler to achieve a stable low CTE under the conditions of macrofibres disorientation. As a nanoscale filler, we consider MWCNTs. Its Young's modulus and CTE at the room temperature are taken to be 1000 GPa and $-12 \cdot 10^{-6} \text{ K}^{-1}$ [14], respectively. The length and the diameter of the MWCNTs are taken 3.5 μm and 35 nm [15], respectively. The matrix is epoxy. In this study we use carbon fibers with following thermomechanical properties: $E_1=430$ GPa, $E_2=14$ GPa, $\nu_{12}=0.2$, $\nu_{23}=0.46$, $\nu_{13}=0.2$, $G_{12}=8.78$ GPa, $G_{23}=2.1$ GPa, $G_{13}=8.78$ GPa, $\alpha_1=-0.9 \cdot 10^{-6} \text{ K}^{-1}$, $\alpha_2=6.8 \cdot 10^{-6} \text{ K}^{-1}$.

The required mechanical and thermomechanical properties of the composite material are achieved by determining the orientation of the anisotropic layers. The choice of the layer orientation of reinforcing material is derived from the search result for the composite architecture that satisfies the specified requirements. In this paper, in addition to the mathematical expectation of the CTE, the variance of the CTE of the composite material samples under conditions of a variability of the properties of the source materials and anisotropic layers disorientation is an additional optimization criterion.

Stiffness tensor and CTE of carbon nanotube reinforced composites are modeled using the Mori – Tanaka theory based on Eshelby's inclusion theory. The evaluation of the microstructure thermomechanical properties of a single layer is determined according to well-known relations given by Hashin, Halpin-Tsai and Scharpery. The objective function for optimization is represented as a weighted sum of the longitudinal CTE of the composite material and its variance. The variance of the calculated cases sample of the target parameter is determined from the assumption of the normal distribution of disorientation angle with parameters: $E=0$, $\sigma=2$.

The search for the local minimum of the objective function is performed by the gradient descent method. The objective function is nonlinear and not-convex, so the result of the gradient method strongly depends on the initial set of variables. Therefore, the gradient descent method must be repeated for different initial values of the angles.

The solutions to the optimization problem are the local minima of the nonlinear non-convex function in the design space of the layers' orientation angles for composites with different

microstructure modifiers. To program the described method, we use the Python programming language. The chart below shows the calculated thermomechanical properties of the composite macrostructure for different volume ratio of the MWCNTs. The markers on the chart are the mathematical expectation of the CTE. The graph shows the boundaries of the possible values of the CTE relative to its expectation.

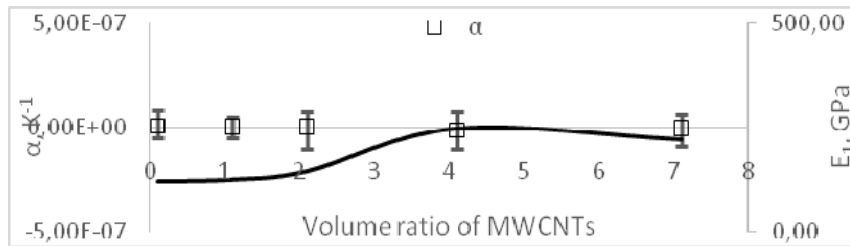


Figure 1 – Expectation and boundaries of the possible values of CTE

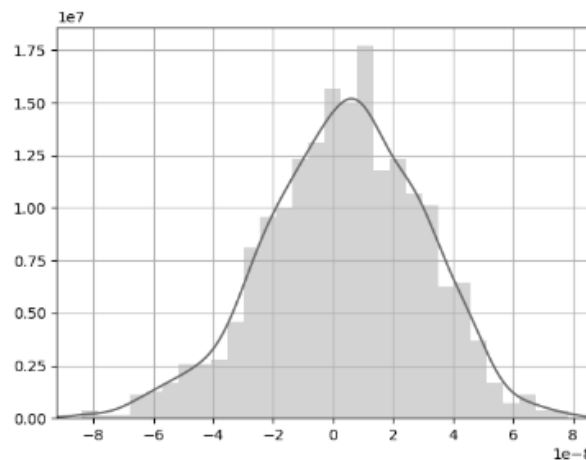


Figure 2 – Probability density function for the CTE of the composite with 2 % volume ratio of the MWCNTs

As we can see from the chart presented above, the microstructure modification of the polymer composite material allows to reduce the variance of the CTE by 78 % with a volume ratio of MWCNTs up to 2 %. In addition to the requirements for thermal behavior, it is important to consider more general elastic properties. A comparative estimate of the longitudinal Young's modulus change for optimal solutions are also shown in the chart. Resin modification with the addition of MWCNTs slightly increases the CTE and the effective stiffness of the lamina in the longitudinal direction, and significantly reduces the CTE in the transversal direction, which together causes a change in the optimal reinforcement architecture — the angle reduction between the reinforcing fibers direction and the direction of the longitudinal axis of the material. Consequently, the material has a large longitudinal elastic modulus, while, due to the reduction of the CTE of the lamina in the transversal direction, it has a lower variance of the CTE compared to the non-modified composite.

For the purpose of experimental verification of the calculated CTE, samples of a polymer composite material based on modified resin were obtained using the method of vacuum assisted resin infusion molding (VARIM). The CTE of the manufactured samples was determined using a TA Instruments Q400 thermomechanical analyzer. The tests were carried out with constant heating to 100 ° C at a constant heating rate of 5 ° C / min. The carbon fiber volume ratio was determined using a Discovery TGA55 TA Instruments thermogravimetric analyzer (USA).

Conclusions and future research directions. The symmetric stacking sequence of composite has been determined using gradient descent, which in our case of the source material provides the

expectation of CTE equal to $3.52 \cdot 10^{-8} \text{ K}^{-1}$. The probability density function (Fig. 2) for the CTE has been found. The upper and low calculated CTEs are $7.65 \cdot 10^{-8} \text{ K}^{-1}$ and $-1.06 \cdot 10^{-7} \text{ K}^{-1}$, respectively. The calculated CTEs of unidirectional laminas with modified and non-modified resin show high convergence with the experimental data. As a next step, it is necessary to check the obtained calculated stacking sequence of layers on a significant series of samples, sufficient to confirm the stability of the researched parameter. It is important to continue research on effective reinforcement architectures using alternative analytical methods of machine learning to find more complicated stacking sequence.

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УДК 634.21

VARIABILITY OF BIOMETRIC PARAMETERS OF SIX-YEAR-OLD APRICOT (VARIETY SAMPLE OF BRODSKY) IN THE CONDITIONS OF SOUTH ZONE OF KRASNOYARSK TERRITORY

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The article presents the results of studying the variability of the growth and fruiting indicators of apricot in the conditions of south zone of Krasnoyarsk territory. Promising apricot specimens were selected for further propagation by grafting.

Keywords: apricot, variability, height, fruiting, south zone, Krasnoyarsk territory.

ИЗМЕНЧИВОСТЬ ПОКАЗАТЕЛЕЙ АБРИКОСА ШЕСТИЛЕТНЕГО ВОЗРАСТА (СОРТООБРАЗЕЦ БРОДСКОГО) В УСЛОВИЯХ ЮЖНОЙ ЗОНЫ КРАСНОЯРСКОГО КРАЯ

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В работе приведены результаты изучения изменчивости показателей роста и плодоношения абрикоса обыкновенного (сортобразец Бродского) в условиях южной зоны Красноярского края. Отселектированы перспективные экземпляры абрикоса для дальнейшего размножения прививкой.

Ключевые слова: абрикос, изменчивость, рост, плодоношение, южная зона, Красноярский край.

Common apricot is a valuable fruit crop that combines such biological properties as intensive growth, rapid entry into the fruiting season, high yield and rich biochemical composition of the fruit. According to its properties (taste, nutritional value, dietary value), this species occupies the first place among other stone fruit crops. Apricot fruits are valued for their high quality and have therapeutic and preventive properties [3].

The areas occupied by apricots, in comparison with other stone crops in the south of the Krasnoyarsk Territory are extremely small [4]. The main reason for this is the insufficient range of late-flowering apricot varieties, since early-flowering varieties are systematically damaged by recurrent frosts.

The aim of the research is to study the variability of growth and fruiting indicators of the Brodsky variety sample at the age of six in the conditions of the southern zone of the Krasnoyarsk Territory and to select promising specimens for further propagation by grafting

Objects and methods of research. The research was carried out on the basis of the collection nursery garden of the farm "Druzhiba", located in the village called Krasny Khutor in the Shushensky District of the Krasnoyarsk Territory. The object of the study was six-year-old apricot trees (Brodsky variety sample). Apricot seeds were obtained from the biologist Yu. V. Brodsky from the Far East and sown in the spring of 2015 after stratification. The observations of growth and fruiting were carried out in the autumn of 2020. Biometric indicators were determined according to the methodological developments set out in the Program and methodology for variety studies of fruit, berry and nut crops [2]. The variability of apricot growth and fruiting indicators was determined by the method of S. A. Mamaev [1]. Statistical processing of the results was carried out using the MS Excel software package.

Results and discussion. The seed material had a high germination rate (98-99.5 %). The variability of apricot indicators, including fruit and growth rate, is shown in Table 1.

Table 1

Variability of indicators of six-year old common apricot (Brodsky variety sample)

max	min	X av.	± m	V, %	P, %	Level of variability
Fruit weight, g						
38,7	18,4	29,5	1,96	17,71	6,65	average
Width of fruit, cm						
3,5	1,8	2,3	0,15	13,7	5	average
Fruit length, cm						
4,5	1,6	3,2	0,20	19,7	3,8	average
Height of trees, m						
6,4	4,2	5,1	0,30	15,8	5,8	average
Barrel diameter, cm						
19,0	14,5	17,9	0,62	9,3	3,5	low
Average growth of the central shoot, cm						
107,0	71,0	85,0	51,6	15,9	6,0	average

The level of variability of indicators is mainly average. The low level is marked only by the diameter of a barrel. The maximum value for the weight of the fruit is 38.7 g, length-4.5 cm. The largest fruits were recorded in samples No. 6 and 7 (Fig. 1, 2).



Fig. 1. Instance № 6



Fig. 2. Instance № 7

The height of the trees at the age of six ranged from 4.2 to 6.4 m, the trunk diameter-14.5-19.0 cm. The maximum height was for trees No. 7 (6.42 m) and No. 5 (5.84 m), exceeding the average value of 25.1 and 13.8 %, respectively. The average growth of the shoot was 71-107 cm. The largest increase in the central shoot on all specimens being studied was recorded in 2017 and 2018 and was 90.0 and 118 cm, respectively (Fig. 3).

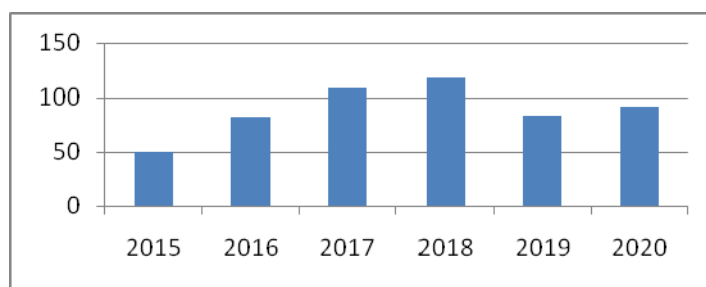


Fig. 3. Average growth of the central shoot by year, cm

According to the compared indicators, the specimen No. 7 was distinguished by the intensity of growth, large fruits and winter hardiness.

Conclusion. The selected specimen is recommended for reproduction by grafting in order to obtain breeding planting material.

Prospects for further research: In the future the research will be aimed at the selection of apricots in order to expand the range for cultivation in the southern zone of the Krasnoyarsk Territory.

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WAYS TO ENSURE THE VALIDITY OF THERMAL VACUUM TESTS OF SPACECRAFT USING A SOLAR SIMULATOR

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Providing the luminous characteristics of a solar simulator that meets the requirements for the thermal vacuum tests of spacecraft is a complicated technical challenge. We offer an integrated solution, which consists in using, on the one hand, a fundamentally new design of a solar radiation simulator, and on the other hand, alternative methods and equipment for measuring its luminous characteristics.

Keywords: thermal vacuum testing of spacecraft, solar simulator, photoelectric converter, heat flux radiometer.

ПУТИ ОБЕСПЕЧЕНИЯ ДОСТОВЕРНОСТИ ТЕРМОВАКУУМНЫХ ИСПЫТАНИЙ КОСМИЧЕСКИХ АППАРАТОВ С ИСПОЛЬЗОВАНИЕМ ИМИТАТОРА СОЛНЕЧНОГО ИЗЛУЧЕНИЯ

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Обеспечение световых характеристик имитатора солнечного излучения, соответствующих предъявляемым для термовакуумных испытаний космических аппаратов требованиям, является сложной технической задачей. Предлагается комплексное решение, заключающееся в использовании как принципиально новой конструкции имитатора солнечного излучения, так и альтернативных методов и средств измерения его световых характеристик.

Ключевые слова: термовакуумные испытания космических аппаратов, имитатор солнечного излучения, фотоэлектрический преобразователь, тепловой радиометр.

Introduction

One of the basic and most complicated elements of trial facilities being used in thermal vacuum testing of spacecraft is a solar simulator. In accordance with the requirements, currently existing large-sized domestic solar simulators for thermal vacuum testing should provide the following main characteristics:

- the level of irradiance is 1340 – 1440 W/m²;
- spatial non-uniformity is no more than 15 %;
- spectral distribution close to the spectral distribution of out-atmospheric solar radiation;
- non-parallelism of the luminous flux is no more than 4 ° [1].

Statement of the problem

The overwhelming majority of large-size solar simulators for thermal vacuum tests are based on gas-discharge xenon lamps, the spectrum of which is close to the out-atmospheric spectrum of the Sun. The location of gas-discharge xenon lamps is possible only outside a thermal vacuum chamber with a ponderous and complicated optical system. To obtain a quasi-parallel luminous flux and the required spatial uniformity of irradiation, it is necessary to adjust and align a large number of optical elements. This is a difficult task and it requires specialized methods and equipment with the participation of experienced personnel.

It should be noted that the solar simulators based on gas-discharge lamps have practically reached their technical perfection for several decades, and further radical improvement of their characteristics is impossible.

Another side of the problem resides in the traditional use of the radiometers based on silicon photoelectric converters for measuring the irradiance of a solar simulator. Their output is non-linear, longterm unstable, largely dependent on the received spectrum and its own temperature. The measurement accuracy achieved in this case directly depends on the number and accuracy of the tools being used and the methods of necessary correction. At the same time, the correction of the spectral mismatch is the most difficult and laborious, since the calculation of the spectral mismatch coefficient additionally requires high-precision measurement of the actual solar simulator spectrum.

Ways to solve the problem

It is obvious that a promising solar simulator with higher technical and operational characteristics should be based on other technical solutions, in particular, it must have a compact design with a simple optical system and be located inside a thermal vacuum chamber. The most rational implementation of a light source is a matrix of a set of many uniformly distributed single elements with simple optical systems that form narrow-angle luminous distributions, which, in turn, are summed up directly on the illuminated area – the test object [2]. The implementation of such a technical solution in a thermal vacuum chamber became possible due to the latest developments of high-efficiency LEDs, for example, [3]. Thus, in the acquisition order, the authors proposed a combined solar simulator in the form of a matrix of tungsten lamps in the predominantly infrared area and integrated assemblies of highly efficient LEDs in the visible area of the solar spectrum. The light module of proposed solar simulator with an area of 0.1 m^2 is shown in Fig. 1, the light source from such modules in a horizontal thermal vacuum chamber is shown in Fig. 2. The spectral distribution of the proposed combined solar simulator, corresponding to the class A of the international standard IEC 60904-9, is shown in Fig. 3.

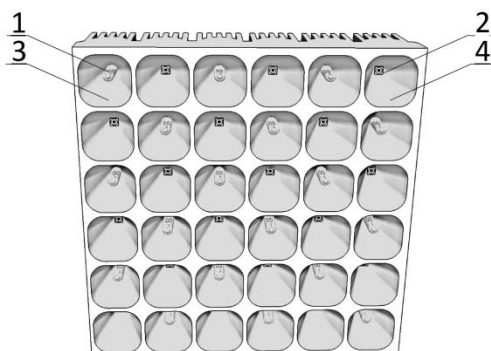


Fig. 1. Combined solar simulator light module:

1 – tungsten lamps, 2 – integrated LED assemblies, 3, 4 – optical systems

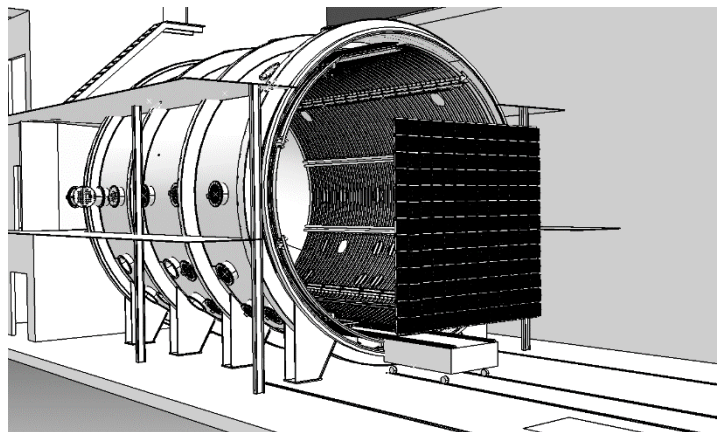


Fig. 2. Light source from combined solar simulator modules in a horizontal thermal vacuum chamber

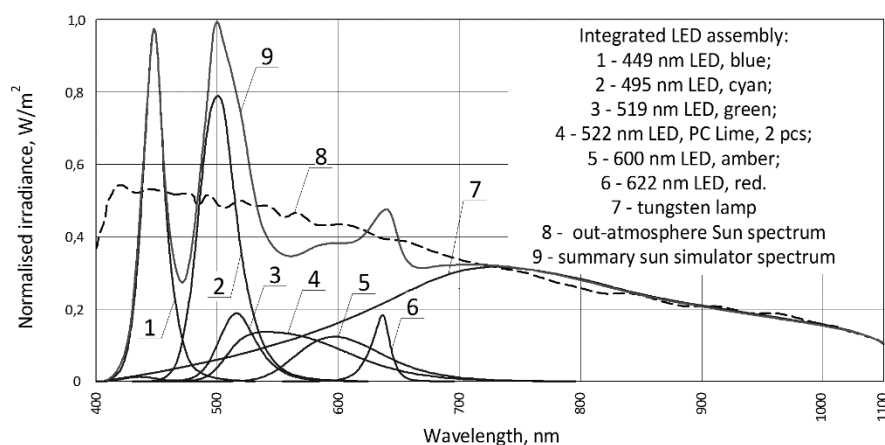


Fig. 3. The spectral distribution of the combined solar simulator based on tungsten lamps and 7-die LED integrated assemblies

In terms of measuring luminous characteristics of solar simulators, heat flow radiometers are a full-fledged alternative to the radiometers based on silicon photoelectric converters. They are spectrally nonselective, require minimal correction, and due to the smaller number of components of the systematic measurement error, they are able to provide higher measurement accuracy.

Results

2. The measurements of the light characteristics of integrated LED assemblies under normal conditions and mathematical modeling of the light source matrix, carried out by the authors, have confirmed that the technical and operational characteristics of the proposed solar simulator are superior to those of the solar simulators based on gas-discharge xenon lamps.

3. Our experiments with various radiometers have confirmed the low accuracy and complexity of measuring the irradiance with radiometers based on silicon photoelectric converters. On the contrary, heat flux radiometers are practically free from disadvantages and have shown high accuracy using the simple method of direct measurement [4].

Thus, when using the proposed complex solution, which includes a fundamentally new design of a solar simulator for thermal vacuum testing of spacecraft and alternative methods and equipment for measuring its light characteristics, high accuracy of solar radiation imitation can be obtained, which is unattainable using traditional methods.

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COMPARING THE OPERATION OF A NEURAL NETWORK ON THE CORES OF THE ARM AND CUDA ARCHITECTURES

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In addition to various sensors for detecting a person in the working area of the robot, technical vision has been significantly developed. This article discusses the use of a neural network to identify a person. That can help collaborative robots work in the same area with people.

Keywords: collaborative robot, neural network, TensorFlow, technical vision, Intel RealSense D435i.

СРАВНЕНИЕ РАБОТЫ НЕЙРОННОЙ СЕТИ НА ЯДРАХ АРХИТЕКТУР ARM И CUDA

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Помимо различных датчиков для обнаружения человека в рабочей зоне робота, получило большое развитие применение технического зрения. В данной статье рассмотрено применение нейронной сети для определения человека, что может помочь коллаборативным роботам работать в одной зоне с людьми.

Ключевые слова: коллаборативный робот, нейронная сеть, TensorFlow, техническое зрение, Intel RealSense D435i.

According to the research, the collaborative robot market has a tendency to grow by 39.8 % by 2027. [1] In the future, cobots (collaborative robots) will be used as humans' assistants and colleagues. Cobots should be designed primarily to work together and ensure accurate performance of the task at hand in close proximity to humans. To ensure safety, it is important for a collaborative robot to know the location of objects directly in its working area, to take into account possible changes in human trajectories and to be able to rebuild its trajectory accordingly. [2]

The comparison of the work of human recognition by the MobileNet-v1 neural network was made. The network was written in the TensorFlow framework, through the use on the cores of the ARM CUDA architecture. Both programs are written in Python, the test was carried out using the Intel RealSense D435i camera. [3]

Figure 1 shows the operation of a neural network running on the cores of the ARM architecture. On the left there is a depth map, which is displayed automatically; on the right there is a photo of a person.

A person was identified by a neural network with the accuracy of 0.798 (79.8 %), while the frame refresh rate was 2 FPS. Next the operation of a neural network on the cores of the CUDA architecture is shown.

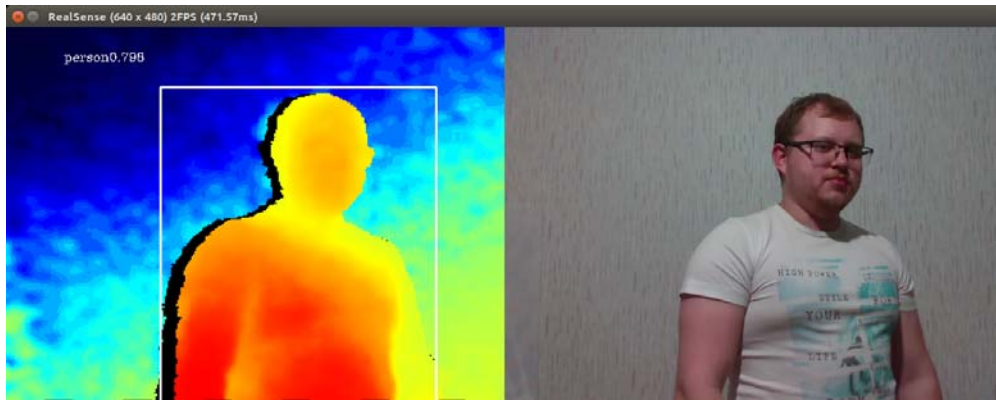


Fig. 1

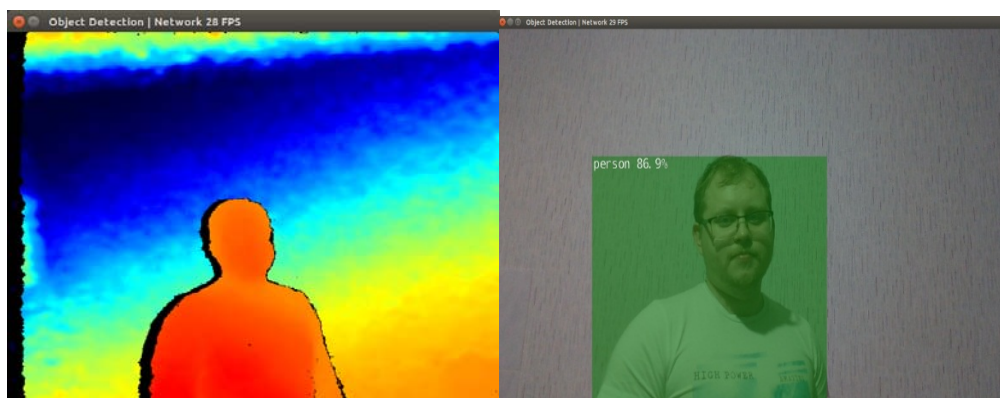


Fig. 2

Figure 2 shows that a person was identified with the accuracy of 86.9 percent, and the frame refresh rate was 29 FPS in average.

When processing the test results, we can see that the execution of the program on the cores of the CUDA architecture is more preferable than on the cores of the ARM architecture, since a person was identified with higher accuracy and the frame refresh rate was 15 times higher. That can ensure early detection of a person and accurate construction trajectories by a collaborative robot.

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ANALYSIS OF METHODS FOR PRODUCING WAFER BACKGROUND OF PARTS OF ROCKET AND SPACE EQUIPMENT

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The article analyzes the main methods for obtaining the wafer background of the parts of rocket and space equipment. The perspective method for production wafer background cells was proposed. This method is electrochemical machining.

Key words: wafer background, electrochemical machining, parts of rocket and space equipment.

АНАЛИЗ МЕТОДОВ ПОЛУЧЕНИЯ ВАФЕЛЬНОГО ФОНА ДЕТАЛЕЙ РАКЕТНО-КОСМИЧЕСКОЙ ТЕХНИКИ

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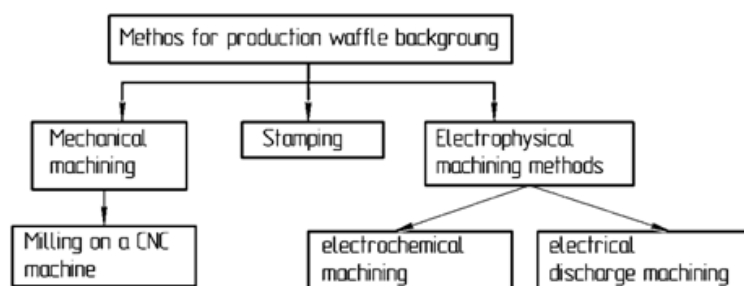
В данной работе проведен анализ основных методов получения вафельного фона деталей ракетно-космической техники. Предложен перспективный метод получения ячеек вафельного фона – электрохимическая обработка.

Ключевые слова: вафельный фон, электрохимическая обработка, детали ракетно-космической техники.

Production of parts with wafer structure has been widespread in the rocket and space industry. The wafer background is a thin-walled panel produced with longitudinal, transverse or diagonal ribs forming cells in cross-selection, made with a panel as a whole. Such a structure of parts allows us to keep strength at the required level with a sufficiently low part weight. The wafer structure is applied in the design of fuel tanks, strong frame structures. In most cases, aluminum or magnesium-based alloys are used as material. In the production specialists usually use the aluminum alloy AMg6 hardened by cold deformation in sheets during rolling.

Based on the results of the analysis of the literature, the methods for obtaining the wafer background of parts of rocket and space equipment are presented (see fig.).

The main method for production cells of wafer background from sheets is milling on special milling CNC machine [1]. This is a labor-intensive process, which can lead to deformation and defects in the sheet during machining. Therefore, this method doesn't allow us to increase production and reduce costs. In addition, when cutting a sheet, a large part of the hardened layer during rolling goes into chips, which leads to a decrease in the strength and rigidity of the structure.



Methods for production waffle background

Stamping the cells in the sheet is used rarely. With this method, defects emerge due to the large difference in compression and tensile stresses along the ribs and the panel wall. An alternative method for producing wafer background is cell formation on a rolling-mill with the exception of mechanical machining [2]. The method allows: reduce the complexity of production, reduce the time to obtain the wafer background, exclude possible defects arising from further folding of sheets with ready-made cells. Stamping is a difficult process. In addition, when using this method, it is necessary to produce mandrels, punches for the extrusion of wafer background cells of different unit sizes with the given accuracy, which increases the cost of production.

The promising method for production cells is electrochemical machining. The productivity of the process does not directly depend on the hardness, viscosity of the material being processed [3]. It is not necessary to use a tool made of a harder material than the material being processed. The process is carried out when there is no contact between a tool and a part. It means that this method is suitable for machining thin-walled and easily deformable parts. Since there is almost no tool wear, the productivity of the process and the accuracy of machining increase. The process of electrochemical machining will reduce the machining time, labor-intensity and cost for production.

In this regard, the issue of the prospects for the use of electrochemical processing to obtain a wafer background by electrochemical machining has been explored. In the future the issue of the realization and application of this machining on an industrial scale will be studied.

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REGULATING OUTPUT IMPEDANCE OF SPECIALIZED POWER SUPPLY IN A CONTROL CIRCUIT

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Specialized power supply (SPP) is an electrical characteristics simulator of spacecraft power supply systems (PSS). It is designed for ground tests of onboard equipment. Modern SPPs have fixed impedance frequency characteristics (IFC). Therefore, they cannot simulate the dynamics of different PSS. In this article, one of the methods for IFC regulation by a control circuit is considered.

Keywords: test equipment, electrical system, impedance regulation.

РЕГУЛИРОВАНИЕ ВЫХОДНОГО ИМПЕДАНСА СПЕЦИАЛИЗИРОВАННОГО ИСТОЧНИКА ПИТАНИЯ ПО ЦЕПИ УПРАВЛЕНИЯ

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Специализированный источник питания (СИП) представляет собой имитатор электрических характеристик систем электропитания (СЭП) космических аппаратов. Он предназначен для проведения наземных испытаний бортовой аппаратуры. Современные СИП обладают фиксированной импедансной частотной характеристикой (ИЧХ). Поэтому они не позволяют имитировать динамические свойства различных СЭП. В данной работе рассматривается один из методов регулирования выходной ИЧХ по цепи управления.

Ключевые слова: испытательное оборудование, система электропитания, регулирование импеданса.

There are many reasons why using onboard spacecraft PSS is not the best solution for testing [1]. Therefore, automated test complexes (ATC) are used for this. Their power supplies have fixed frequency characteristics and do not allow regulating the IFC, but it is necessary to simulate the dynamics of different onboard PSS.

The ATC is based on the considered SPP, which is a compensated voltage regulator and consists of a regulating element (RE), summing amplifier (SA), voltage amplifier (VA), correction and voltage divisor in feedback coupling. A cascade from a voltage amplifier with a regulating element is a power amplifier (PA). The functional diagram of the SPP is shown in Figure 1. The transfer function (TF) of the output impedance and open-loop system are calculated (1) using the functional diagram. The transfer function of each device is calculated using the simulation model by the method of approximation of frequency characteristics [2].

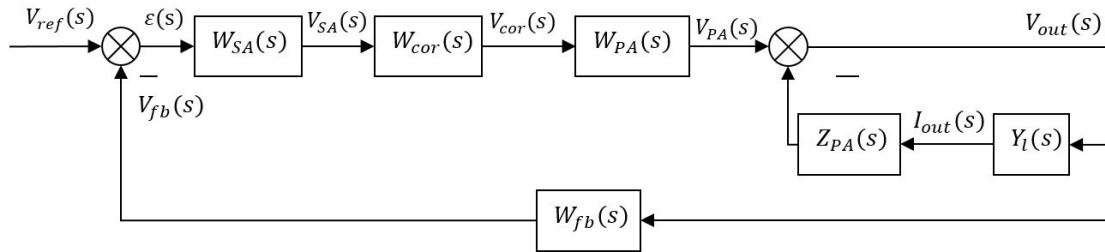


Figure 1 – Functional diagram of SPP

$V_{ref}(s)$ – reference voltage; $\varepsilon(s)$ – error signal; $W_{SA}(s)$ – TF of SA; $V_{SA}(s)$ – SA voltage; $W_{cor}(s)$ – TF of correction; $V_{cor}(s)$ – correction voltage; $W_{PA}(s)$ – TF of PA; $V_{PA}(s)$ – PA voltage; $V_{out}(s)$ – output voltage; $Y_l(s)$ – load conduction; $I_{out}(s)$ – output current; $Z_{PA}(s)$ – impedance of PA; $W_{fb}(s)$ – TF of feedback; $V_{fb}(s)$ – feedback voltage.

$$Z_{out}(s) = \frac{V_{out}(s)}{I_{out}(s)} = \frac{Z_{PA}(s)}{1+W_{OL}(s)}, \quad (1)$$

$$\text{where } W_{OL}(s) = W_{SA}(s)W_{cor}(s)W_{PA}(s) \frac{1}{1+Y_l(s)Z_{out}(s)} W_{fb}(s),$$

$Z_{out}(s)$ – TF of output impedance, $W_{OL}(s)$ – open-loop TF.

The simplified expression for IFC is the following:

$$Z_{out}(\omega) = |R_{out} + j\omega \cdot L_{out}| = \left| \frac{Z_{PA}(j\omega)}{1+W_{OL}(j\omega)} \right| \approx \left| \frac{Z_{PA}(j\omega)}{W_{OL}(j\omega)} \right| \quad (2)$$

at $\omega \rightarrow 0$, as $W_{OL}(j\omega) \gg 1$

The transfer function of the SA and correction for the low-frequency region:

$$W_{SA}(s) \approx K_{SA}, \quad W_{cor}(s) \approx \frac{1}{T_{cor} \cdot s + 1} \quad (3)$$

at $\omega \rightarrow 0$

Thus, when the frequency characteristics of the open-loop system change, the output impedance frequency characteristics change as well. Since the open-loop transfer function includes the expressions for SA and correction, the regulation of the SA gain and the time constant of correction changes the output resistance and reactance. For regulation of the output resistance, the gain of SA is used. For regulation of the output reactance, the time constant of correction is used. The relationship between the output impedance and the device parameters is shown in (4), (5). Wherein, the output reactance is changed, when the output resistance is regulated. Thus, the expression for the correction time constant includes the desired value of the output resistance.

$$T_{cor}(L_t, R_t) \propto \frac{L_t}{R_t} \quad (4)$$

$$K_{SA}(L_t, R_t) \propto \frac{1}{R_t} \quad (5)$$

where L_t – desired output inductance, R_t – desired output resistance, T_{cor} – correction time constant, K_{SA} – gain of SA.

The results of the regulation of IFC are shown in the Figures 2,3. These results were obtained from the simulation model. The relative errors of regulation are shown in the Figures 4,5.

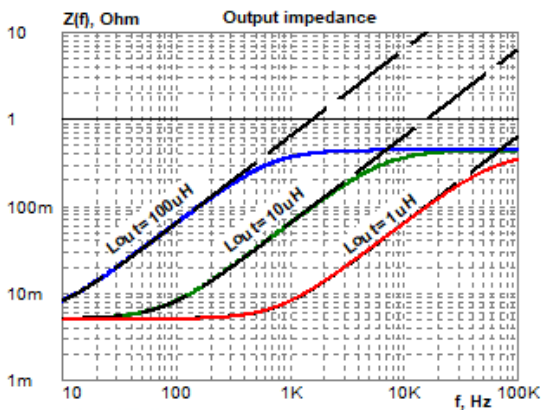


Figure 2 – Reactance regulation

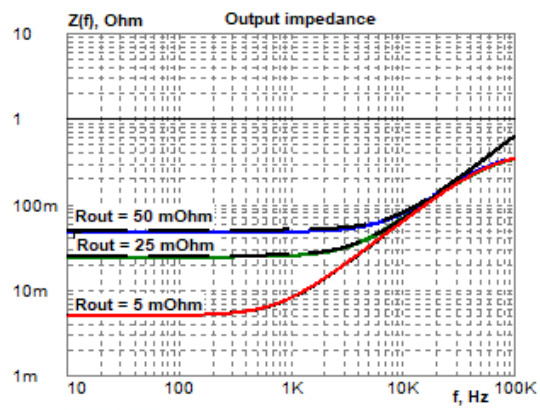


Figure 3 – Resistance regulation

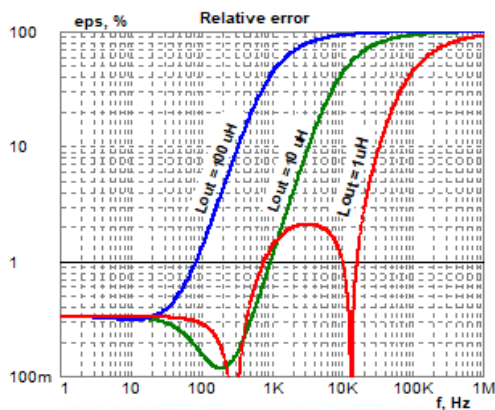


Figure 4 – Reactance regulation relative error

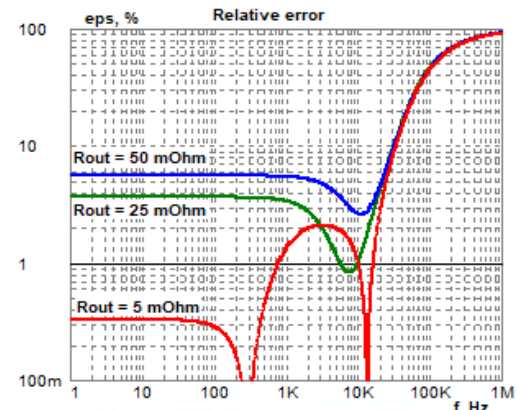


Figure 5 – Resistance regulation relative error

The features of this method are the possibility of active and reactive impedance regulation and the influence of the resistance regulation on the output reactance. Therewith, using this method, it is sufficient to change the resistance in the control circuit, which is an advantage over more complex methods of impedance regulation.

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INVESTIGATION OF THE POSSIBILITY OF USING SILICONE WACKER RTV-S 691 AS A BINDER FOR COMPOSITE MATERIALS

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Tests on the molding of composite material samples with the use of space-purpose silicone Wacker RTV-S 691 as a binder were carried out. The possibility of its application for the production of flexible membrane antennas was evaluated.

Keywords: silicone, Wacker RTV-S 691, vacuum infusion, CFRP.

ИССЛЕДОВАНИЕ ВОЗМОЖНОСТИ ПРИМЕНЕНИЯ СИЛИКОНА WACKER RTV-S 691 В КАЧЕСТВЕ СВЯЗУЮЩЕГО ДЛЯ КОМПОЗИЦИОННЫХ МАТЕРИАЛОВ

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Проведены испытания по формованию образцов композиционных материалов с использованием в качестве связующего силикона космического назначения Wacker RTV-S 691. Оценена возможность его применения для изготовления гибких мембранных антенн.

Ключевые слова: силикон, Wacker RTV-S 691, вакуумная инфузия, углепластики

The creation of ultra-flexible and elastic constructions of membrane antennas for the aerospace industry by using modified polymer composite materials (CFRP – carbon fiber reinforced polymers) with controlled thermal conductivity and electrical conductivity is one of the important directions in the production of transformable reflectors. The use of a shell (membrane) made of a thin composite material as a reflective surface makes it possible to reduce the total mass of the reflector in comparison with a metallized collecting mesh [1].

Increasing the flexibility of composite membranes can be achieved by using binders that are flexible when they are cured. An example of such flexible polymers are organosilicon polymers (silicones). Silicones are used as a matrix in composite materials owing to their flexibility, heat resistance, resistance to the influence of different chemicals (alkalis, acids, oils) and solvents, good weather resistance and weak burning property [2].

However, not every silicone can be used in outer space (these are large temperature ranges of operation, sharp jumps in temperature, exposure to vacuum, ultraviolet radiation (UV), etc.). Often, silicones of the Wacker company are used as a silicone binder for the production of composite materials, as well as for the manufacture of flexible membranes [3]. The research object was Wacker RTV-S 691 silicone. It is a two-component silicone rubber with low and high temperature

resistance, low outgassing, UV resistance and flexibility at low temperatures [4]. Due to its characteristics, this silicone is recommended for use in space, but it has not been used as a matrix of composite materials yet.

To determine the possibility of using Wacker RTV-S 691 as a binder for a composite membrane, experiments were made to form composite samples using various technologies with carbon reinforcing elements (carbon tapes and carbon fiber). During the experiment, a number of problems were identified. The relatively high viscosity of the silicone created difficulties in handling both when using it in the manual hand lay-up process and when performing vacuum infusion. The penetration power was insufficient to penetrate deeper than the first layer of fiber. The only one satisfactory result was obtained during the impregnation of fiberglass, however, its radio-reflective properties prevent the use as a reinforcing material for the production of membrane antennas.



Fig.1. Experiment showing the behavior of silicone.

Based on the obtained practical data, it was concluded that the Wacker RTV-S 691 silicone is not applicable as a binder for the production of CFRP using the method of hand lay-up process and vacuum infusion. Therefore, in order to definitely answer the question of the applicability of Wacker RTV-S 691, it is necessary to test completely different methods of production composite materials.

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DEVELOPMENT OF ULTRA-LIGHT DOUBLE CURVATURE SHELL STRUCTURES FOR SPACECRAFT

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This paper discusses the main ways to reduce the mass of spacecraft structures, presents the history of using such structures. The development of double curvature shell structures and their calculation are described.

Keywords: Antennas, shells, spacecraft.

РАЗРАБОТКА СВЕРХЛЕГКИХ ОБОЛОЧЕЧНЫХ КОНСТРУКЦИЙ ДВОЙНОЙ КРИВИЗНЫ ДЛЯ КОСМИЧЕСКИХ АППАРАТОВ

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В данной работе рассматриваются основные способы снижения массы конструкций космического аппарата, приводится история применения подобных конструкций. Описывается разработка оболочечных конструкций двойной кривизны и их расчет.

Ключевые слова: Антенна, оболочка, космический аппарат.

Currently, the issue of optimizing the mass of spacecraft is one of the most serious problems, since the cost of launching spacecraft into orbit (provided one type of orbits is considered) increases proportionally to its mass.

There are many ways to reduce the mass of a structure without severe damage to the overall rigidity and strength. One of the main ways is the use of mesh (anisogrid) structures, the example of this design is the payload adapter of the Proton-M launch vehicle. It is also worth highlighting the use of honeycomb structures, in which, due to the addition of honeycomb filler between the spaced plates, the building height of the panel increases and, therefore, its rigidity increases as well.

In addition, the most obvious way to optimize mass is to exclude from the design parts the material with a low (relative to its yield point) mechanical stress at given boundary conditions. Since when a homogeneous cylindrical body is bent about its longitudinal axis, the greatest stresses are concentrated at the surface layer, the removal of material near the longitudinal axis of the cylinder will not influence the rigidity, but will reduce the mass. Thus, it can be concluded that it is the shell of the structure that is of decisive importance for bending loads and beam vibration tones.

In addition to the beam tones of vibrations present in solid bars, the shells have vibration tones characteristic only for them, these vibrations can be eliminated in two ways: by increasing the thickness of the shell, and by giving the surface a double curvature. The structures with double

curvature of the surface have been known for a long time, they can be conveniently classified into bodies of positive and negative curvature of Gaussian. The most common bodies of positive Gaussian curvature are spheres, hemispheres and elliptical paraboloids; an example of implementation in technology and architecture is the nose fairings of launch vehicles and arched domes of buildings. As the most famous structure with negative Gaussian curvature, it is worth highlighting the Shukhov towers. Although they are anisogrid structures, it is the execution in the form of a single-strip hyperboloid that gives them stability.

To confirm the above, the frequency calculation of geometrically similar shell structures was performed. The calculation was carried out by numerical methods in the CATIA V5 program. The calculation models were a hollow cube with an edge length of 500 mm and a thick shell of 1.5 mm and a similar cube with a concave shell of the face; deflection of the face relative to the initial plane did not exceed 20 mm; the mechanical characteristics of the material coincide with the AMg6 alloy. For this design, the boundary conditions were not specified, the calculation was performed for natural vibrations. The calculation results are presented in Fig. 1

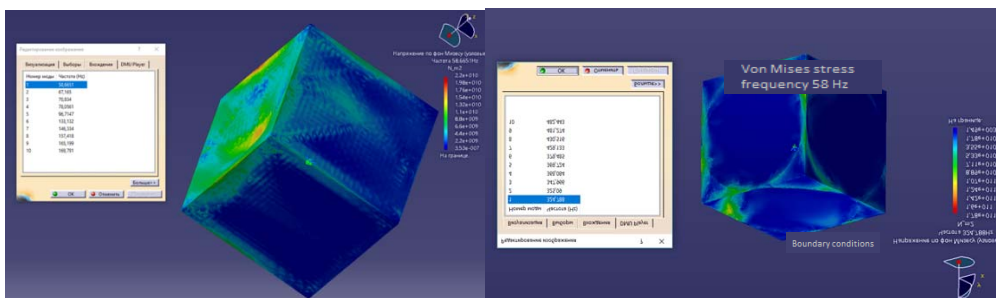


Fig. 1. Calculation of natural vibrations of structures.

The flat face design has the first facet tone of approximately 58 Hz, the concave face design has the first shell face tone of approximately 325 Hz. From this calculation it follows that even a slight change in the curvature of the surface significantly influences the natural frequency and, as a consequence, makes it possible to use the structures with a wide range of loads.

Further, we considered offset single-mirror antennas in a honeycomb design of a power frame and with a frame made in the form of a shell made of carbon fiber. These design schemes are shown in Fig. 2. For reliable frequency isolation of spacecraft, the first antenna vibration tone must be higher than 40 Hz. Each structural scheme meets the requirements for rigidity and strength, but these structural schemes contain many parts and fasteners connecting the structural elements, which leads to a significant increase in the mass of the structure and limits the possibilities for its optimization. As a possible solution to this problem, one can consider the formation of a reflector shell and a frame, using carbon fiber in one technological operation, or gluing the reflector into the frame shell without fasteners.

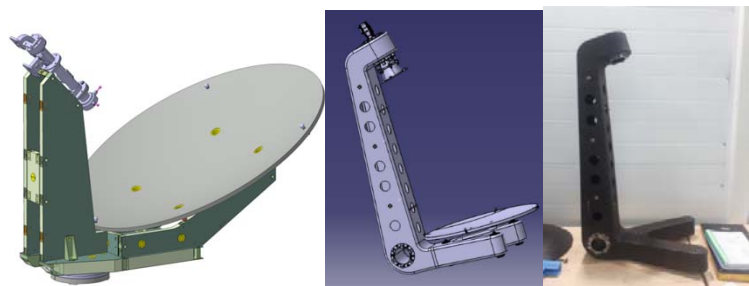


Fig. 2. Structural diagrams of offset single-mirror antennas.

To construct a mono-shell, the initial data of the antenna with a load-carrying frame in the form of a shell were used, including the irradiation system. The antenna was designed in such a way

that at each point of the surface there was a curvature in two directions. For this, after receiving an offset from the paraboloid and the location of the auxiliary geometry near the focus, twenty-four sketches were built in the form of a parabola, these sketches were located on planes perpendicular to the spline connecting the reflector to the feed. The thickness of the shell corresponds to four layers of high modulus CFRP. The irradiator in the design model is replaced by a point mass, which significantly simplifies the calculation but does not significantly influences the result. The calculation of the model presented in Fig. 3 showed that the first vibration tone is beam and is equal to 40 Hz, this indicator meets the requirements of the initial data. The mass of the mono-shell, taking into account the irradiator, was 1.5 kg, which is 3 times lighter than the analogue.

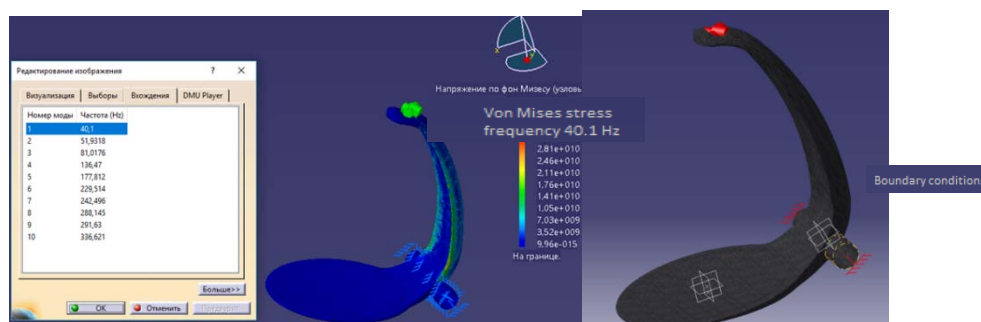


Fig. 3. Frequency analysis of an offset antenna mono-sheath.

In this work, the calculations and optimization of an offset single-mirror antenna for spacecraft were presented, a concept of a double curvature mono-shell is presented, as well as its comparison with existing flight samples.

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SIMULATION OF MECHANICAL STRESS WHEN MANUFACTURING SMALL PIPE SECTION

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The article considers mathematical modeling of the technological process of manufacturing pipes of small cross-section 4x3.8 with the accuracy of 0.02 mm from copper grade M1 using the technology of multilateral deformation and drawing. The calculation performed in the Mathcad software package using the methods of successive approximations is presented.

Keywords: small pipe, the multi-lateral deformation, successive approximation method.

МОДЕЛИРОВАНИЕ МЕХАНИЧЕСКИХ НАПРЯЖЕНИЙ ПРИ ИЗГОТОВЛЕНИИ ТРУБ МАЛОГО СЕЧЕНИЯ.

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Рассмотрено математическое моделирование технологического процесса изготовления труб малого сечением 4x3,8 с точностью 0,02 мм из меди марки М1 по технологии многостороннего деформирования и волочения. Представлен расчет, выполненный в программном пакете Mathcad с использованием методов последовательных приближений.

Ключевые слова: труба малого сечения, многосторонняя деформация, метод последовательного приближения.

Introduction: small section pipes are widely used in instrument making and in the manufacture of microwave energy transmission lines. For this product, manufacturing accuracy (± 0.02 mm) is extremely important. The most traditional method for making small pipes is to draw the billet through a roller die using a mandrel.

When carrying out broaches in places of deformation, there are some stresses that can lead to the defect or destruction of the product.

Description of the technological process: for the calculation, a copper pipe M1 with the size of 4x3.8 mm was taken, with compression by rollers (0.2 mm) [2].

The stages of operations for obtaining tubes of small section rectangular shape:

- sediment through the matrix along the outer diameter of the workpiece;
- calibration through a die and a spherical mandrel of inner and outer diameters;
- profiling a rectangular channel by deformation with rollers on four sides and a mandrel to a rectangular cross-section, with intermediate annealing to remove residual stresses in a protective environment, with reusable drawing;

- rolling by rolls of the obtained billet with a rectangular substrate.

In this case, we consider profiling a rectangular channel by drawing using rollers from four sides and a mandrel to obtain a rectangular channel.

A diagram of this technological process is shown in Figure 1 [3].

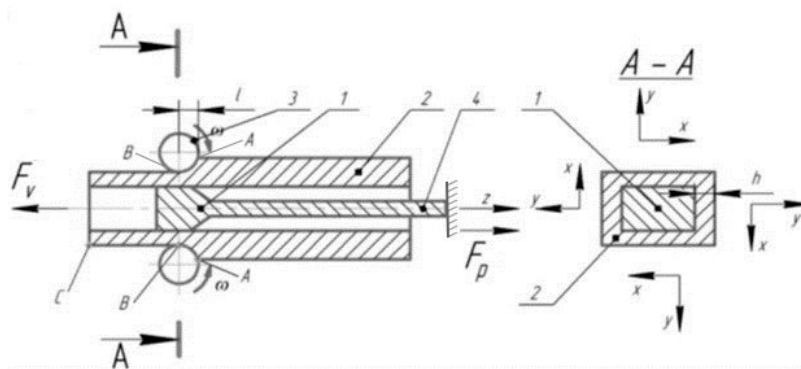


Figure: 1. Diagram of the manufacturing process for small rectangular pipes used to calculate stresses in the deformation zone: 1 – mandrel tool, 2 – pipe billet, 3 – rollers of an adjustable four-roller die, 4 – mandrel tool stem. Fv – pulling force, Fp – force acting from the mandrel.

Calculation method: The calculation was performed in Mathcad, widely used for many tasks. For calculations in Mathcad, the minimum computing power of a computer is consumed, which allows calculations to be performed in seconds, in contrast to finite element software packages, not all of which are capable of simulating technological processes.

The method of successive approximations was used for the calculation. This method allows you to get approximate results that are close to real. If necessary, it is possible to increase the accuracy of the calculation by increasing the number of steps. The algorithm is shown in Figure 2.

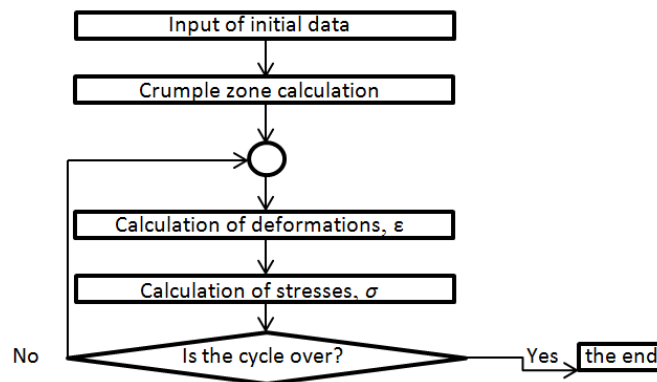


Figure: 2. Calculation algorithm

The z-axis stress was determined by the formula [3]:

$$\sigma_{z_i} = \frac{\left[f_i \cdot \alpha_i \cdot (\varepsilon_{z_i} - \varepsilon_{r_i}) - \sigma_{z_{i+1}} \cdot \left[\frac{h_{i+1}}{\lambda} + 0.5 \cdot (dh dz_i + \alpha_i) \right] \right]}{\left[0.5 \cdot (dh dz_i + \alpha_i) - \frac{h_{i+1}}{\lambda} \right]}$$

The calculation result is shown in Figure 3.

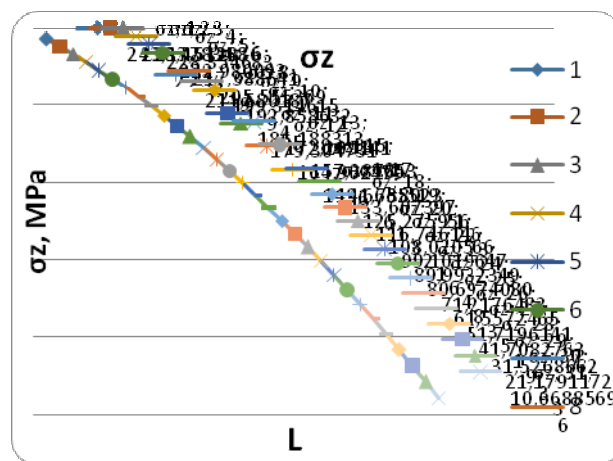


Figure: 3. Stresses arising along the z-axis,
L – the arc of deformation by the roller of the tubular billet (A-B)

As we can see from the graph in Figure 3, during the implementation of the production process, stresses (σ_z) along the z axis increase along the deformation arc from point A to B. The maximum value is observed at point B.

Conclusion: The graph of stress distribution along the arc of deformation, which may arise during the manufacture of pipes of small cross-section, was obtained. The calculation method can be used to develop the technological process for manufacturing rectangular pipes of various cross-sections and from various materials.

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APPLYING QUEUING THEORY TO CALCULATE THE BANDWIDTH AND SUBSCRIBER CAPACITY OF THE ADVANCED PERSONAL SATELLITE COMMUNICATION SYSTEM

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The article presents the calculation results of the potential bandwidth and subscriber capacity of the advanced system of personal satellite communications, designed on the basis of a combined orbital constellation.

Keywords: Personal satellite communications, system analysis, queuing theory, bandwidth.

ПРИМЕНЕНИЕ ТЕОРИИ МАССОВОГО ОБСЛУЖИВАНИЯ ДЛЯ РАСЧЁТА ПОТЕНЦИАЛЬНОЙ ПРОПУСКНОЙ СПОСОБНОСТИ И АБОНЕНТСКОЙ ЁМКОСТИ ПЕРСПЕКТИВНОЙ СИСТЕМЫ ПЕРСОНАЛЬНОЙ СПУТНИКОВОЙ СВЯЗИ

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В статье представлены результаты расчётов потенциальной пропускной способности и абонентской ёмкости перспективной системы персональной спутниковой связи, построенной на базе комбинированной орбитальной группировки.

Ключевые слова: Персональная спутниковая связь, системный анализ, теория массового обслуживания, пропускная способность.

The detailed view of the advanced personal satellite communications system is described in previous publications [1 – 5]. The main characteristics of the system are the following:

- the orbital constellation of the system includes two satellites in geostationary orbit (GEO) and three satellites in highly elliptical orbit of Tundra type (HEO) [1,2];
- antenna-feeder system of a GEO satellite forms 61 – 63 narrow beams with 1.5° beam width, HEO satellite – 121 same beams [5];
- relay complexes of a satellite designed on digital signal processing principle, which allows 31.25 kHz width frequency bands switch between different customers (one customer can be allocated up to 10 such frequency bands simultaneously) [4];

– The bandwidth of each beam is 1.5 MHz, which can be reallocated between adjacent beams [5].

To calculate the potential maximal achievable information speed and the maximum number of customers in the system, the queuing theory elements [6] and statistical information about potential customers (such as a distribution by groups, busy hours) were used.

First, the potential maximal information speed was calculated for one channel with 31.25 kHz fixed bandwidth, taking into account that a protection interval against symbol-to-symbol interference equals 31.25 kHz as well, Forward Error Correction Code Ratio is 3/4 and one customer occupies one channel to receive and to transmit information. The fixed channel bandwidth allows us to use the formula to express maximal information speed for different modulations – BPSK, QPSK, 8PSK, 16PSK:

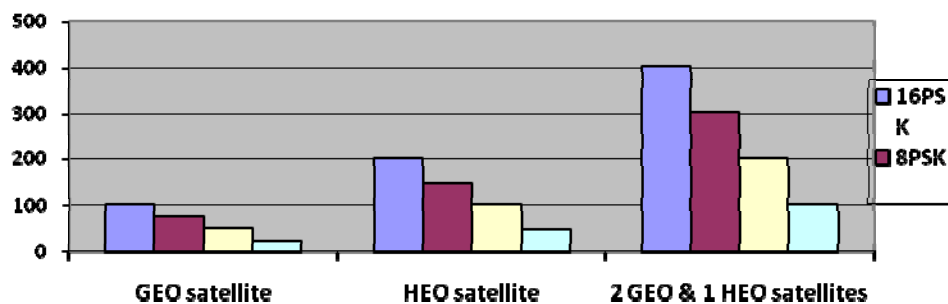
$$B_{ch} = \frac{R \cdot \alpha}{\log_2 M \cdot FEC} \Rightarrow R = \frac{B_{ch} \cdot \log_2 M \cdot FEC}{\alpha} = \frac{31,25 \cdot \log_2 8 \cdot 3}{1,35 \cdot 4} = 52,08 \text{ Kbps};$$

When allocating up to 10 channels:

$$52.08 \cdot 10 = 520.8 \text{ Kbps.}$$

According to GMR-1 3G protocol specification, maximal information speed is 592 Kbps, which means that allocation of 10 channels will be possible if it is necessary.

For clarity, all the calculated data are combined into one graph:



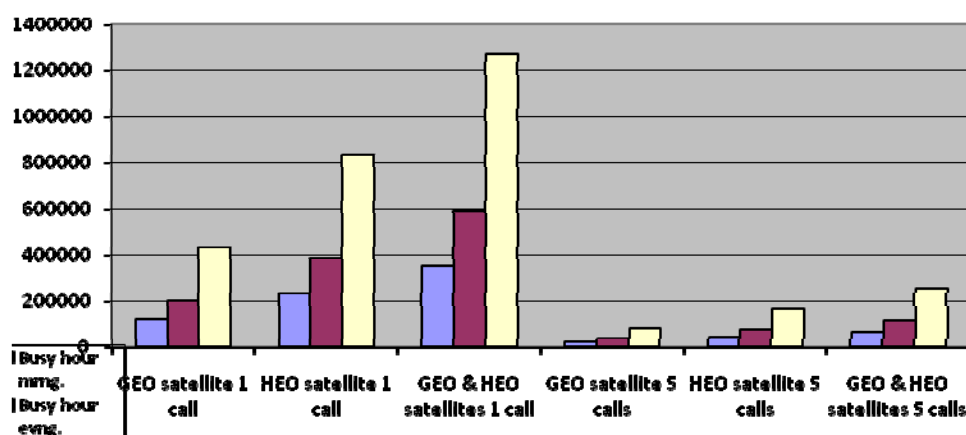
Pic. 1. The potential maximal achievable information speed, Mbps

In order to find the maximal number of customers served by the system per day, the number of customers' calls must be found. The communication statement data analysis led us to the decision of choosing two scenarios: each customer makes 1 to 5 calls per day that last 5 minutes.

According to the traffic intensity theorem, using the data described above, the following values can be computed: number of incoming calls $\alpha(t)$ and average call delay time $T(t)$ in the system during time period $(0, t)$. These values are related to total time calls spent in system, which is related to traffic intensity. Measured in Erlangs, quantitatively it represents the number of simultaneously off-hook channels. Thus, the equation of traffic intensity and system variations' channels will show maximal number of served customers during time period. Usually it is a daily number that is calculated.

The computed values however will show daily even load. That means that customers make a call one after another, which is not likely what will happen in real system. Multiple working system analyses detected busy hours – one-hour period with peak load. For the corporate customers group it is morning, and for the private customers group it is evening. They correlate with busy hour-to-day ratio; the higher the value, the higher the peak and the lower the total daily load.

Taking into account this uneven system load, the maximal number of served customers computed before must be divided by 24, making it load per hour. Let us assign the morning ratio to $k_{bh1} = 0.15$ and the evening ratio to $k_{bh2} = 0.09$. The total system load for different scenarios is evaluated and shown in the following graph:



Pic. 2. Daily maximal number of served customers

The results of calculations showed that the aggregate throughput of the system (depending on the energy budget in the radio link and the signal-code structures being used) with a fully deployed orbital constellation is from 101.2 to 405 Mbit / s, while the maximum achievable potential number of subscribers in the system is from 94080 to 338688

The further work is aimed at building a model of the system's subscriber load with reference to the different regions of the Russian Federation (taking into account the uneven distribution of subscribers across the territory), taking into account different time zones.

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УДК 004.932

FAKE FACE IMAGE DETECTION BASED ON CONVOLUTIONAL NEURAL NETWORK LOCAL ESTIMATE

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This article proves the relevance of biometric authentication through facial recognition. It describes an effective method of recognition system protection from traditional and adversarial examples attacks.

Keywords: Authentication, facial recognition, convolutional neural networks, fake images, presentation attacks.

ОБНАРУЖЕНИЕ ПОДДЕЛЬНЫХ ИЗОБРАЖЕНИЙ ЛИЦ НА ОСНОВЕ ЛОКАЛЬНЫХ ОЦЕНОК СВЕРТОЧНОЙ НЕЙРОННОЙ СЕТИ

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Обоснована актуальность биометрической аутентификации в виде распознавания лиц. Разработан эффективный метод защиты системы распознавания от традиционных атак и атак, на основе составительных примеров.

Ключевые слова: Аутентификация, распознавание лиц, сверточные нейронные сети, поддельные изображения, внешние атаки.

Authentication is a verification procedure and one of the stages of the access control system's operation. This is a key stage and it always holds paramount significance.

Currently, biometric authentication or biometrics is considered to be the most secure and reliable method of authentication. Biological, physiological, or behavioral characteristics and features associated with a certain person serve as proof of biometric authentication.

There are certain criteria for selecting some biometric characteristic such as: ubiquity, unicity, continuity, assemblability, acceptability, and performance. A number of biometric characteristics correspond to these criteria. These characteristics are the following : fingerprints, faces, irises, hand veins, palm prints, voice, and gait. They are successfully used for user authentication.

The benefit of facial recognition is nonintrusive and passive data acquisition. During this process the waiting period is minimal and the place has almost no requirements. Moreover, facial recognition is natural, instinctive and socially acceptable for humans. Other aforementioned biometric characteristics do not possess the same benefits.

Facial recognition is a real-world application of pattern recognition whose objectives include automated face location on an image or a video frame and, if necessary, identification of a person

using their face. Facial recognition does not require specialized hardware – a simple camera will suffice [1].

A facial recognition system without a specialized anti-spoofing detection module is susceptible to presentation attacks and is unable to tell a fake image from a real one. Convolutional neural networks (CNN) provide not only high accuracy detection but also high accuracy facial recognition. However, the base CNN configuration does not include the solution to the problem of anti-spoofing detection.

In [2] the vulnerabilities of a biometric authentication system are analyzed, where the unauthorized face replacement in the form of a 2D (printed photo, image on a smartphone screen, or a high-resolution video) or a 3D artifact (3D mask, face painting, and makeup) are the most widespread types of attacks. Such attacks are considered to be traditional and their detection is based on the thorough analysis of input images [4]. Lately, more sophisticated types of attacks based on adversarial examples [3] aimed at CNNs have emerged.

Most generative methods in machine learning are based on the concept of a gradient. The presentation attack detection (PAD) classifier's gradient is focused on a local area which makes the classifier vulnerable to adversarial examples attacks. It is advisable to build local classifiers instead of a similarity-based classifier, with a beforehand overlay of $n \times n$ grid on top of the face to get an authenticity map of an image. In this case, the binary classification problem is being solved (the image of a face is either fake or real). Loss function was chosen as an estimating function and has the form of

$$L_{i,j} = - \sum_{k=0}^1 p_{i,j}(k) \log q_{i,j}(k)$$

where $p_{i,j}(k) \in \{0, 1\}$ – a priori probability, $q_{i,j}(k)$ – prediction probability, k – correct class.

The summarized loss function is defined as a sum of local loss functions on the grid. To implement such a classifier, one must modify base CNN architecture by deleting a fully-connected output layer. As a result, CNN builds a $2 \times n \times n$ probability map and after summarizing values of each $n \times n$ map we get a 1×2 vector for class prediction. In this case, the final decision is made with each local area prediction taken into consideration and not based on a dominating area.

An OULU-NPU [5] database, which includes 4950 videos collected from 6 smartphones was used for experiments. The dataset was divided into a training set and a testing set with 70 to 30 ratio. The results of the experiments show that the suggested method is more resistant to traditional attacks as well as adversarial examples attacks.

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RESISTIVE SWITCHING IN ALD ZINC OXIDE THIN FILMS

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The research describes methods of producing resistive devices for using in Resistive Random Access Memory (ReRAM). The devices is based on zinc oxide thin films (ZnO), obtained by thermal atomic layer deposition method (T-ALD), plasma enhances atomic layer deposition method (PE-ALD) and thermal atomic layer deposition with plasma assisted during films growth process (PET-ALD).

Keywords: resistive devices, zinc oxide, T-ALD, PE-ALD, PET-ALD.

РЕЗИСТИВНОЕ ПЕРЕКЛЮЧЕНИЕ В ТОНКИХ ALD ПЛЕНКАХ ОКСИДА ЦИНКА

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Исследование описывает методы изготовления резистивных устройств для применения их в резистивной памяти с произвольным доступом (ReRAM). Устройства основаны на тонких пленках оксида цинка (ZnO), полученного методом термического атомно-слоевого осаждения (T-ALD), плазмостимулированного атомно-слоевого осаждения (PE-ALD), а также с применением плазменной обработки во время роста пленки (PET-ALD).

Ключевые слова: резистивные устройства, оксид цинка, T-ALD, PE-ALD, PET-ALD.

At the present time, zinc oxide (ZnO) is widely researched as perspective material for producing resistive devices (memristors) that are the base of resistive random access memory (ReRAM). Resistive switching (RS) behavior was discovered in zinc oxide thin films. RS behavior is abrupt transition from high resistance state (HRS) to low resistance state (LRS) under applied outer electric field. In binary terms, these states represent one and zero. This behavior in oxide thin films is due to formation of conductivity filaments in volume of active insulator layer forming by oxygen vacancies or metal ions. The electrical properties of ZnO films vary widely depending on the method of obtaining oxide thin films [1]. Atomic layer deposition (ALD) is a very perspective method of deposition of thin films for producing resistive devices because of atomic thickness control and high degree films uniformity on large areas [2].

Thermal atomic layer deposition (T-ALD) is one of the simplest, cheapest and most widespread methods of atomic layer deposition, which uses the standard process of alternately supplying precursors into a reactor with following self-limiting chemical reaction on the substrate surface with further film growth. Zhang et al. obtained samples of zinc oxide thin films for study of the mechanism of resistive switching [3]. Manufactured device had a simple metal-insulator-metal (MIM) structure and consisted of two flat metal electrodes (platinum bottom electrode and

aluminum top electrode) and 35 nm of zinc oxide between them obtained by thermal atomic layer deposition (T-ALD). Growth of ZnO film produced by standard diethylzinc (DEZ) and deionized water precursors at the 150 °C. Measurement of current-voltage characteristics showed linear ohmic behavior of the obtaining structure. This is explained by formation of hydrogen-oxygen (O-H) bonds in volume and on surface of ZnO thin film in each halfcycles of growth for standard T-ALD process. Involvement of H⁺ ions in crystal structure provide n-type of conductivity of film [4,5].

Along with this, the research [4] reports about investigation of obtaining method of ZnO thin film with resistance switching mechanism. Thermal atomic layer deposition with oxygen plasma treatment during the film growth process (PET-ALD OPT) method was used. Substrate surface with ZnO films was treated in oxygen inductively coupled plasma (ICP) after each ALD deposition cycle that lead to the breaking of O-H bonds in the bulk and on the surface of the ZnO film, and then to the effective removal of hydrogen inclusions with the formation of oxygen vacancies in the ZnO film. Investigations of current-voltage characteristics showed the presence of a switching process from a high resistance state (HRS) to a low resistance state (LRS).

In addition, plasma enhanced atomic layer deposition (PE-ALD) applied for obtaining ZnO thin films with a resistive switching mechanism. The difference between this method and the above is that source of oxygen is oxygen plasma using as reactant in each ALD growth cycles instead of water to form of metal oxides structure. This method of thin films growth allows to interact oxygen plasma with O-H bonds directly, formed by decomposition of diethylzinc on surface substrate. This phenomena lead to effective formation of oxygen vacancies [6] that provide filamentary resistive switching mechanism in ZnO film.

Methods of plasma treatment in ALD process of ZnO thin films growth provide resistive switching mechanism. These methods are applicable for producing memristor devices. However, PET-ALD OPT method is more expensive and labour intensive because of more growth time in process. That fact makes PE-ALD method more suitable for high volume production.

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