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Факультет української й іноземної філології та мистецтвознавства
Кафедра іноземних мов для інженерно-технічних та природничих спеціальностей

До 100-річчя ДНУ імені Олеся Гончара

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FORMATION OF α- AND β-MODIFICATIONS OF PBO_2 ON PLATINUM ELECTRODES IN THE SOLUTIONS OF LEAD (II) NITRATE

Lead dioxide exists in the form of two modifications: black, dense and rhombic α-PbO_2 and brown, highly dispersed, tetragonal β-PbO_2. Under normal conditions, β-PbO_2 is stable. The transition of β-PbO_2 to α-PbO_2 occurs at a temperature of 300 ° C and a pressure of more than 1300 MPa. In the published papers [1; 2] it was noted that the relationship between the number of modifications that are formed on the electrode depends on the over-voltage of the precipitation of PbO_2 and the acidity of the solution.

In acid solutions, the process of electrocrystallization of lead dioxide begins with the formation of an adsorbed oxygen-containing fraction of radical nature [1; 2]:

$$H_2O \rightarrow OH^{\cdot}_{ads} + H^+ + \bar{e}. \quad (1)$$

The successive stages are the following [2]:

$$Pb^{2+} + OH^{\cdot} \rightarrow Pb(OH)^{2+}; \quad (2)$$

$$Pb(OH)^{2+} + H_2O \rightarrow Pb(OH)_2{}^{2+} + H^+ + \bar{e}; \quad (3)$$

$$Pb(OH)_2{}^{2+} \rightarrow PbO_2 + 2H^+. \quad (4)$$

The resulting stage is the reaction (3) according to [2]. In addition, the process of electrocrystallization of the plumbum dioxide can be controlled by the diffusion of Pb^{2+} ions till the increasing particles of its dioxide. In the same paper [2] it is indicated that the character of control (diffusion or kinetic) depends on the potential of deposition in the first place.

The modification of the PbO_2 precipitate occurs according to these reaction equations [2]:

$$Pb^{2+} + 2H_2O \rightarrow PbO_{2\ vol.} + 4H^+ + 2\bar{e}; \quad (5)$$

$$PbO_{2\ vol.} + R \leftrightarrow (PbO_2\text{-}R_{ads\cdot})_{vol.}; \quad (6)$$

$$(PbO_2\text{-}R_{\ ads.})_{vol.} \rightarrow (PbO_2\text{-}R_{vol.})_{\ surf.} \quad (7)$$

We carried out the precipitation of PbO_2 on a platinum electrode from a solution of 0.02 M $Pb(NO_3)_2$, 1M $NaNO_3$ was used as a background electrolyte.

After carrying out a series of experiments, it was determined that at the potential of 1.75V black precipitate appeared on the electrolyte 1.3V and at 1.5V – dark brown.

The obtained data allows us to conclude that at the potentials smaller than 1.75V, the electrodes form a highly dispersed β-modification of PbO_2, and at the potentials equal to or greater than this value, a dense α-modification is formed.

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INVENTORY OF MACROMYCETES OF DNIPROPETROVSK REGION

Preservation of biodiversity of the Right Bank of the Dnipro river is one of the priority directions of environmental protection activity of the man. This is especially relevant for Ukraine because it is seeking the membership in the European Union and therefore must support All-European strategy of saving biodiversity and landscape diversity (Rio de Janeiro Conference, 1992, «Agenda XXI Century»).

Biodiversity reservation is impossible without its study and monitoring of the state of the species composition of local biota. One of the most actual problems in mycology is reliable information about the presence of representatives of the microbiota in certain specific regions. Such information is an essential basis for the regional lists and study of local micobiota, studying the biodiversity of the region as a whole. For most regions of Ukraine, the data about the species composition of the microbiota have unsystematic character, particularly for steppe zone regions. The growth of Micromycetes in the steppe zone is largely limited by rainfall, which is seasonal. Dnipropetrovsk region is not an exception. The micoflora of Dnypro-Oryl Nature Reserve and Samara forest are investigated fully and systematically enough. For the rest of the territory of the region only individual data is available that have a popular character, historical interest or no documentation.

The aim of work is studying macromycetes of Dnipropetrovsk region. The paper has provided a brief overview of the literature concerning the natural environment of the study area, namely physical and geographic characteristics,

soil, water, forest resources of Dnipropetrovsk region, climatic conditions and so on.

To accomplish the goal, the following tasks were set: to gather field mycological material in various districts; to determine the species belonging to macromycetes detected; to create the inventory list of defined macromycetes; to conduct analysis of taxonomic inventory list; to detect rare fungi and fungi that require protection; to assess possibility of economic use of macromyceta.

The hypothesis to be proved was that up-to-date condition of microbiota of Dnipropetrovsk region has a strong potential for biodiversity reservation.

The work was based on materials of research of field expeditions from 2010 till 2015. The base method of the microflora study was making up the inventory list of species. The collected material was created by photographing various species of fungi in various ways. Species were determined using literature and online determinants. We were also advised by the relevant experts of General Ecology and Water Bioresources of Oles Honchar Dnipro National University. The taxonomic analysis was conducted according to modern research and requirements of the Institute of Botany National Academy of Sciences of Ukraine named after M. Kholodnyy.

As a result of research, we identified 146 species of macromycetes. For each species, the following data were presented: Russian name of the species, Ukrainian name of the species, the name of Family in Latin, the name of order in Latin, the number of seat findings according to Supplement A, the presence of the species in the Red Book of Ukraine, the species with medical properties, the species of edible value .Dated of 01.01.2018, our inventory list includes 144 species of Micromycetes of Subkingdom of Authentic mushrooms (Mycota) and 2 types of Subkingdom of Slime mold (Myxomycota). 144 species of true fungi belong to 81 species of 48 families of 15 orders of 5 classes (Pezizomycetes, Sordariomycetes, Agaricomycetes, Dacrymycetes and Tremellomycetes), 2 parts (Ascomycota and Basidiomycota). The largest number of species were Agaricales (80 species from 38 genera), Boletales (19 species from 11 genera), Russulales (11 species from three genera), Pezizales (10 species from 8 genera), Polyporales (10 species from 9 genera). Statistical analysis of the data will not give a reliable range of species, but they can serve as a complement to the general mycological outline of the area. Out of 144 species of macromycetes found, 3 species are listed in the Red Book of Ukraine. Exploring the economic value of mushrooms and studying the species composition, we noted 75 species of edible mushrooms, 12 poisonous and 59 inedible of uncertain edible value. Among 146 species of macromycetes 16 species have medical properties.

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REGIONAL FACTORS AFFECTING EMPLOYMENT OF THE POPULATION

Introduction. Development of the sphere of employment of the population, improvement of its qualitative characteristics and alignment with the requirements of the time is important for ensuring economic growth. Employment of the population is not only the possibility of obtaining a stable income, but also the comprehensive development of a person, which allows them to grow professionally, improve their skills. Particular importance of the problems of employment is conditioned by need for economic growth in the country and the achievement of social progress.

Famous scientists Bandur S. I., Bondar I. K., Zayats T. A., Libanova E. M., Onikienko V. V., Petrova T. P., Petrova I. L. are engaged in scientific development of problems of ensuring employment of the population. and others [2; 3]. However, the regional aspects of employment security remain the least investigated.

The purpose of the work is to determine the factors that are most conducive to the growth of the level of employment of the population and improvement of its qualitative characteristics.

Among the many regional factors contributing to employment, the most influential are those that determine the capacity of this area, that is, its ability to provide employment for the largest possible number of people is the availability of investment resources and financial flows directed towards this sphere. However, for this purpose, certain macroeconomic conditions are required, such as stability of the regulatory legal field; leveling inflationary pressures; stimulating job creation; Flexible wage regulation. The theoretically proved the relationship between the main proportions characterizing the structure of the economy of the region, changes in the volumes of industrial and agricultural production and the structural characteristics of employment and productivity of the population. In Ukraine, the volumes of registered labor supply far outstrip demand; as shown by the results of statistical surveys of labor movement in the Ukrainian labor market, a certain number of industrial enterprises has an excess labor force [1].

Developed regional economic systems with strong domestic markets and strong positions in international commodity markets have significant opportunities for the development of the employment sector. A significant number of new jobs are

created by small enterprises, whose development is oriented to the high productivity of labor activity.

Regional disproportions cause such deformations in the employment system as unregulated employment, the spread of unemployment among people with a high educational-professional level, the formation of territorially localized centers of high unemployment. At the regional level, the main constraints on the development of the employment sector are due to the imperfect structure of the economy, the slow pace of modernization of production, and unfavorable working conditions. For today, institutional changes are becoming a priority, which should ensure the formation of a competitive environment, especially in rural areas.

During 2005–2006, the share of wage workers in rural areas declined by almost 2 times more intensively than in the economy as a whole due to an increase in the share of persons employed in private peasant farms (in the first half of 2006 it was 81.8% number in rural areas – 56.2%). At the same time, the unemployment rate of the working-age population almost 2 times exceeded its level relative to the economically active population. Rural inhabitants of working age, even if low-income employment is required, require state social assistance. It should be noted that the level of registered unemployment does not reflect the real situation in the labor market of rural areas, since employment services do not record all job seekers for various reasons [3].

In modern conditions, the importance of the regions for ensuring employment of the population is constantly increasing, which depends to a large extent on their ability to pay, local budget expenditures on education, social protection, and financial support for the unemployed. At the same time, the system of regional regulators should ensure optimal correlation between different forms of influence on this sphere. Generally, highly productive employment is provided by highly competitive enterprises that have resources and sales markets, and therefore have opportunities to expand the scope of employment [1; 3].

At the regional level, factors contributing to the employment of the population are formed, which directly depend on the effectiveness of budgetary and financial levers, which ensures the integrity of the country's economic space and stimulates the development of any territory. In Ukraine, the negative tendency of discrepancy between GDP dynamics and budget revenues remains; the problem of intergovernmental interdependence remains unresolved the worn between the center and the administrative-territorial entities – the share of local taxes and fees is low in local budget revenues. In recent years, revenues from taxes and other mandatory payments to the local budget have increased somewhat; The highest per capita figures were observed in Kyiv at the Poltava region.

The main tasks regarding the provision of employment at the regional level are:

- achievement of a uniform distribution of tax burdens on subjects of regional economic activity with the purpose of strengthening their interest in expanding the sphere of employment;
- working out flexible mechanism of taxation of small and medium-sized enterprises, granting of tax privileges in cases of creation of new productive workplaces;
- promoting the accumulation of capital in the sphere of producing entrepreneurship as the most adapted to changes in market conditions;
- strengthening the financial support of innovative small and medium-sized businesses as a source of high-tech jobs.

Conclusions. An effective stimulus for employment growth is the increase in domestic consumption, and for this, it is necessary to revive productive demand, radically revise the monetary policy. It is necessary to mobilize regional factors of economic growth. Promising direction should be considered as active involvement of domestic and foreign investments in creation of new workplaces in high-tech and exportable industries, branches of social infrastructure, as well as the formation of reliable sources of replenishment of investment resources.

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GLUCOAMYLASE PRODUCTION TECHNOLOGY

Production of enzymes is relevant in modern biotechnology, because they are non-toxic, highly active biocatalysts of protein nature. Without enzymes, it is impossible to carry out many biochemical processes.

In the food industry, enzyme glucoamylase is actively used (Fig. 1). It is used for production of alcohol, beer, as well as in bakery and starch-treacle industry.

Satisfying the demand of consumers is possible through implementation of the creation of a new technology for production of this enzyme.

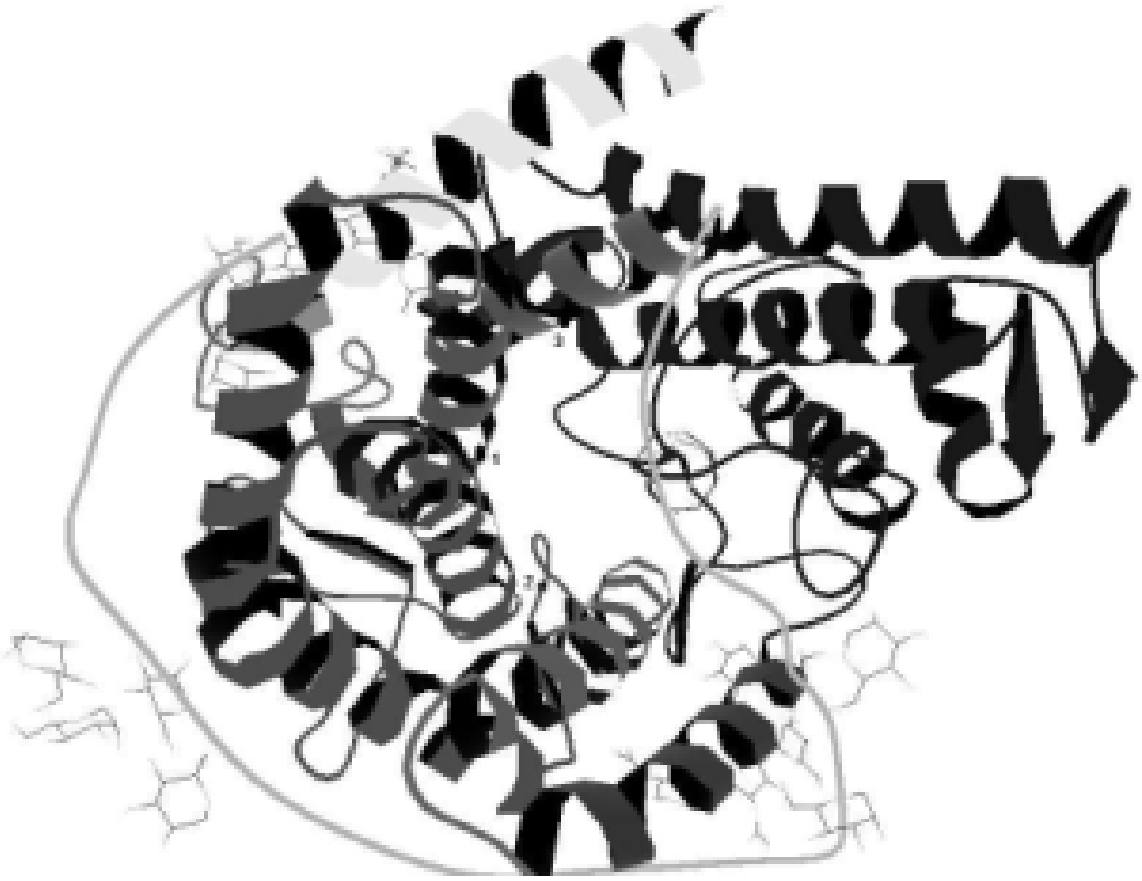

Fig. 1. Spatial structure of the macromolecule of glucoamylase

As a result of research, fungus Aspergillus awamori IGD genetics 120/177 was chosen as a producer. It has a high glucoamylase activity. It was proposed to produce the enzyme by means of deep cultivation, which makes it possible to automate the process, reduce the amount of waste and obtain a highly purified product. Production technology includes the following stages:

– substrate preparation;

– preparation of inoculum;

– stage of cultivation in a fermenter;

– stages of isolation, purification and concentration of the enzyme.

During the research, the parameters of the technological equipment and the material balance of production were calculated. Based on the data obtained, a technical and economic analysis of the production of glucoamylase was carried out and profitability of the technology was determined.

As a result of the work carried out, it was possible to introduce the developed technology in production of the enzyme for actual production with observation of

engineering rules. This technology will help increase the production of glucoamylase and satisfy the demand for the enzyme.

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USING CRISPR Cas9 TECHNOLOGY FOR CURING GENETIC DISEASES

CRISPR/Cas9 (CRISPR — Clustered Regularly Interspaced Short Palindromic Repeats) is a new genetic editing technology based on immune system of bacteria [1]. CRISPR/Cas9 system consists of 2 main parts: CRISPR RNA and Cas9 protein that “cuts” targeted DNA. CRISPR/Cas9 is a family of DNA sequences in bacteria. These sequences contain fragments of DNA from viruses that have attacked the bacterium before. Bacterium uses these fragments to detect and destroy DNA from similar viruses. So basically, this technology is a kind of “scissors” that scientists can use to cut and paste genes into genome.

Humans are diploids. This means that we have a double set of chromosomes – one from the father and mother. If one of the parental chromosomes is "wrong", it means that the DNA sequence in some important gene has been changed. In this case the state of carriage of the genetic disease may arise, and if both copies are incorrect, a genetic disease will develop. A classic example is hemophilia (inherited genetic disorder that impairs the body’s ability to make blood clots, a process needed to stop bleeding) [2]. For example, there is a man who inherited the wrong copy of the gene on the X chromosome from his mother, although she herself did not suffer from hemophilia, because she had two X-chromosomes one of which was healthy, not defective one. So, this man is suffering from hemophilia, because he only has one X chromosome. To treat genetic disorder we have to change the exact

part of genetic code that has mutation. Hemophilia, like many genetic disorders, is caused by only one mutated nucleotide. There are more than 6 billion nucleotides in the human genome [3]. The hard part is that scientists have to change “wrong” nucleotide without changing everything else. Here's where it comes to CRISPR. To fix the “wrong” gene, we need tiny molecular scissors that can find the mutated sequence and “cut it out”. By using guide RNA, the sequences of which are complemented, as the part that we want to find, it can make the “cut” in needed part of genome. Recognition of targeted DNA occurs on the sequence that contains 20 to 30 nucleotides. These sequences occur in human genome. It ensures accuracy of CRISPR/Cas9 system. The cell will not die from “cutting” DNA, as it will be corrected by a healthy copy of the pair chromosome due to the natural process of DNA repair. If the pair chromosome is not present, as in the case of hemophilia, it is possible to insert a "right" gene site into the cell simultaneously with Cas9 and RNA guide and use it to heal “the cut”.

In general, the described mechanism functions due to the principle of complementarity, which was first proposed by J. Watson and F. Crick in their famous model of double-stranded DNA. The chains of the double helix of DNA “recognize” each other according to the rules of complementarity [4]. CRISPR RNA recognizes its targets in double-stranded DNA in the same way, creating an unusual structure. This structure contains a double-stranded region of complementary RNA and one of the targeted DNA strands. The other DNA strand is “supplanted”. By using CRISPR/Cas9 we can treat “easy” monogenic disorders such as hemophilia, leukemia and cystic fibrosis. In these cases, it is easy to understand what sequence we need to edit. There are complex disorders that scientists can not treat due to the complicated nature of polygenic diseases. After all, CRISPR/Cas9 is a very promising and powerful genetic editing technology that can save many lives and the way we treat genetic disorders.

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INFLUENCE OF MICROWAVE FIELD ON THE PROPERTIES OF COLLAGEN

Presently, collagen is increasingly being used as a functional food product, recommended for athletes and aged people. Collagen is the main structural protein of the intercellular matrix, which is necessary for normal functioning of the motor system of the body.

Collagen is an almost tasteless, white or greyish powder, which resembles flour or milk powder in texture. It practically does not dissolve in water, but it swells well. Collagen fibers include fibrils of different sizes and have a transverse structure.

In industry, collagen is obtained by purifying protein raw materials, adding water and ice, grinding the mixture and subsequent hydrolysis. After drying, a thin layer of pellicle is obtained, which is subsequently milled.

It is known that the application of microwave radiation can significantly reduce the time for the process of drying of a number of food products. In this work we considered the possibility of applying microwave radiation in the production of collagen to accelerate its drying. The optimal parameters of the microwave effect were selected experimentally: power – 800 W, total time – 13 min (technological scheme – 2 stages with an interval of 3 min).

It is known that during microwave drying there occurs non-uniform heating, associated with different ability of substances to absorb microwave radiation, which should be considered when processing products, characterized by a significant interval of water content.

The influence of the microwave exposure on the degree of swelling of the obtained collagen samples was analyzed. The degree of swelling of the biopolymer depends on the flexibility of its polymer chains.

Therefore, the influence of microwave impact on the kinetics of swelling and its dependence on time was investigated for two collagen samples – control and obtained, using microwave exposure. The maximum swelling of all collagen samples was observed at the 10^{th} minute. It has been found out experimentally that the degree of swelling of collagen increased by 60% during microwave processing.

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PHAGE DISPLAY – A TECHNIQUE FOR IMMUNOTHERAPY

One of the most effective molecular diversity techniques is phage display. Phage display is a laboratory technique for the study of protein–protein, protein–peptide, and protein–DNA interactions that uses bacteriophages (viruses that infect bacteria) to connect proteins with the genetic information that encodes them [1]. Generating monoclonal antibodies and improving their affinity, cloning antibodies from unstable hybridoma cells and identifying epitopes, mimotopes and functional or accessible sites from antigens are also important advantages of this technology. Techniques originating from phage display have been applied to transfusion medicine, neurological disorders, mapping vascular addresses and tissue homing of peptides. Phages have been applicable to immunization therapies, which may lead to development of new tools used for treating autoimmune and cancer diseases. This review describes the phage display technology and presents the recent advancements in therapeutic applications of phage display.

In this technique, a gene encoding a protein of interest is inserted into a phage coat protein gene, causing the phage to “display” the protein on its outside while containing the gene for the protein on its inside, resulting in a connection between genotype and phenotype. The phage display library is then built up by assembling millions of genetically modified phages, which can be used for further screening and selection. This platform can contribute to mimic natural molecules within the cellular process and detect their interaction with other molecules [1; 3].

Phage display is based on genetic manipulation of genes of surface proteins of filamentous phages like M13 and Fd. Foreign DNA inter into the genome of filamentous phage (for example gene III) and foreign peptide encoded as a fusion protein with a surface coating protein [1; 2].

In general, filamentous bacteriophages (e.g. M13) are the most popular vehicle choice for phage display and extensively used in many types of research. The usage of T7 is an alternative for M13 display [4]. T7 phage display system has been widely used due to its extreme robustness and stability in conditions that inactivate other phages. These advantages of using T7 over M13 display techniques is connected with the fact that the capsid is not involved in the phage to host adsorption and also with the possibility to obviate the need of secretion of displayed peptides through the periplasm and the cell membrane.

Phage display has been well-recognized as a pivotal tool in immunological and cellular biological research due to its remarkable contribution to the development of new drugs and vaccines. This technology has been widely used as phage display library to select or isolate proteins, peptides or antibodies with high affinity and specificity for interested targets.

As one of the most successful applications, phage display technology has proved its safety and efficiency in the research and development of specific antibodies. Furthermore, take advantage of phage display platform based on human antibody sequences makes it available to produce fully human antibodies without the ethical and moral issues. In addition, this platform is also a wide choice for in vitro protein evolution [3].

The phage display technology is a valuable tool in biomedical applications which offers rapid, efficient and relatively inexpensive methods for investigating protein-protein interactions, receptor binding sites, identifying epitopes, mimotopes, functional and accessible sites from antigens. Epitope mapping can be improving immunological understanding, analysis the interaction site of antigen–antibody as well as vaccine design. Antibody phage library and peptide phage library played critical roles in development of potential diagnostic and therapeutic tools in various studies.

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ELECTROCHEMICAL REDUCTION OF THE COBALT (II) AQUACOMPLEX IN THE PRESENCE OF ACRYLIC AND BORIC ACIDS

Cobalt is of great interest from the point of view of the use of alloys, sensors, heterogeneous catalysts, magneto-optical carriers in its production. It is one of the most typical ferromagnets, and the microelectronic industry is a consumer of many types of magnetic thin films and nanostructures [1–3].

The processes of electroreduction of cobalt are widely used in galvanotechnics, hydroelectrometallurgy and in electroanalytical analysis. Therefore, the establishment of regularities and mechanisms of these processes is very important for the selection of optimal conditions for the solution of a number of practical problems. The effect of acrylic and boric acids on the kinetic features was studied.

The academicians established that at one of the intermediate stages of the electroreduction process of cobalt (II) cations, there appears a structure that inhibits the electroreduction process and leads to the additional formation of cobalt hydro compounds [4]. In such a structure, the introduced electric charge is concentrated on the water molecules of the inner coordination sphere of the aqua complex. Applying the method of quantum chemical modeling, we showed that the introduction of the acrylate ion into the internal coordination sphere of the cobalt (II) aquacomplex leads to the fact that the entire negative charge, which is sequentially introduced into the complex, is centered only on the metal atom.

Kinetic studies of the process of electroreduction of cobalt (II) aquacomplexes made it possible to establish that acrylic acid exhibits electrochemical activity and increases the rate of the electroreduction process of Co^{2+} cations.

It was suggested that acrylic acid behaves as a buffer additive, similar to boric acid. Volt-ampere dependencies were measured in a perchlorate solution with the addition of boric acid in the ratio of concentrations of boric acid and cobalt perchlorate of 1: 1. It was found out that the nature of the polarization curve differs significantly from a similar dependence, measured in the presence of acrylic acid. In the range of potentials, in which Co ions are reduced, three characteristic waves were observed in the presence of boric acid, whereas in the electrolyte with the addition of acrylic acid, only one wave was detected in this potential range. In order to determine the cause of such discrepancies in the nature of voltammetric dependencies and to establish a mechanism for the electroreduction of cobalt cations in the presence of acrylic and boric acid, further investigations are required.

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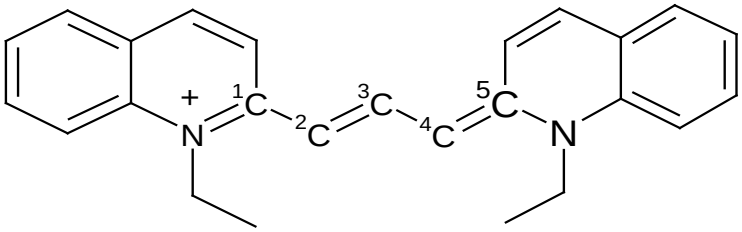
QUANTUM-CHEMICAL STUDY OF THE STRUCTURE OF PINACYANOL

Pinacyanol (1,1-diethyl-2,2'-carbocyanine) iodide (PCYN) – an organic substance, which was the first from the range of polymethine dyes to be used as a sensitizer in photography [1]. It is also frequently used in analytical chemistry as an optical probe in the study of solvents, micellar systems, membranes, proteins, amyloid fibrils and for determination of surfactants [2]. The aqueous solution of pinacyanol is blue, and in the presence of surfactants, the absorption maximum of the two main peaks of its spectrum undergoes bathochromic shifts [3]. It occurs at very low concentrations (under 10^{-6} mol/l) of the surfactant [4], due to which pinacyanol becomes a highly sensitive and efficient indicator for identifying these substances.

In this research, a quantum-chemical study of the geometry and energy of the various isomers of pinacyanol was conducted. Calculations are performed in approximation M062X/6-311++G**. The structure of all localized isomers, values of relative energies, torsion angles, as well as population, are shown (Fig. 1-2). There is a possibility of different arrangement of the substituents near the bonds of the conjugated acyclic fragment. The presence of four such bonds between sp^2-hybrid carbon atoms makes possible the existence of sixteen isomers. Due to the symmetry of the molecule, the number of unique isomers decreases to ten (Fig. 2).

It has been determined during the calculation that the first structure is the most stable, its population is 99.93% (Fig. 1). This isomer is characterized by the flat structure and the transoid arrangement of the substituents.



1
Total Energy= -1076.89 kcal/mol
φ 2345 = -179.80°
Population = 99.93%

Fig. 1

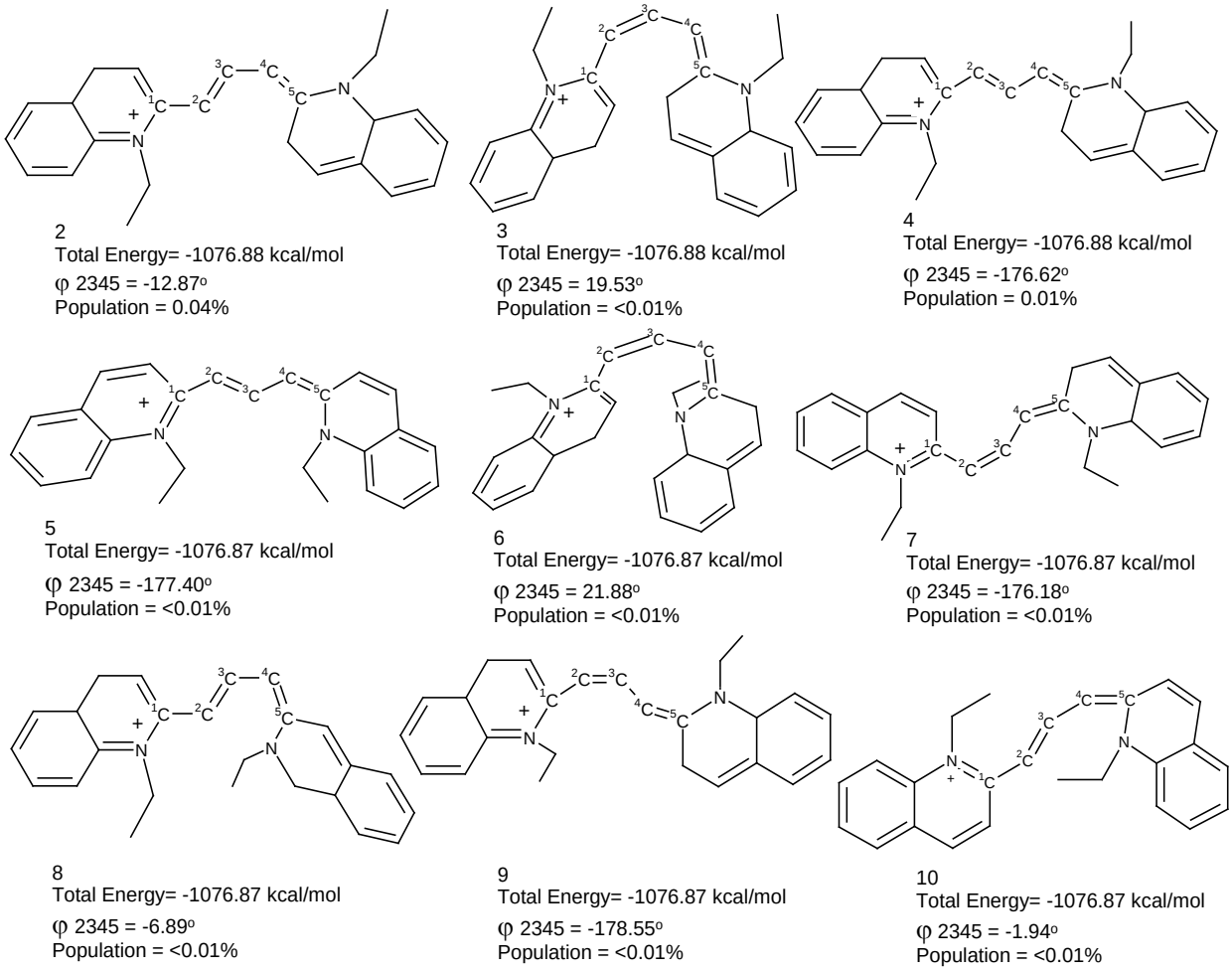


Fig. 2

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INFLUENCE OF AGEING ON ELECTROCHEMICAL BEHAVIOR OF ALLOYS FOR LEAD ACCUMULATORS

Despite permanent progress in the development of alloys for the grates of lead accumulators, they still need perfection. Usually for the increase of resource of batteries, thick (to 2mm) lead grates are used, made by casting technology, which results in the considerable use of lead. One of the progressive technologies of casting, which allows to get thin fine-textured ribbons, is tempering from the liquid state. In this process fusion cools down in the speed-up mode, which results in the formation of more shallow and homogeneous structure, contributes to the improvement of durability, as well as of physical and chemical properties of the material. The use of this method for obtaining ribbons causes the necessity of research not only of their structure and mechanical properties, but also of corrosive and electrochemical properties.

Storage-battery alloys of the system Pb – Ca – Sn are subject to the ageing process, during which the decomposition of sosoloid, supersaturated with calcium and tin, takes place, along with the formation of Pb_3Ca and Sn_3Ca compounds. This results in strengthening of alloy, as well as in the change of its physical and chemical properties. The aim of the work was to study electrochemical behavior of alloys for negative terminal of the lead accumulator ($PbCa_{0,1}Sn_{0,3}$), which were prepared by the method of tempering from the liquid state, depending on time of their ageing and the content of alloying element Barium. The method of cyclic voltammetry was applied. It has been found out that the zone of electrochemical passivity of the tested samples in the process of ageing does not change and extends from -0,4 V to 1,7 V. It was revealed that the behaviour of such cathode processes, as well as the electroreduction of $PbSO_4$ to Pb and the liberation of hydrogen, does not depend on the ageing time of the alloy. It is shown that for the samples with large ageing time anodic processes are accelerated, which may be caused by the recrystallization of alloy.

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QUANTUM-CHEMICAL MODELING OF CHEMISORPTION AND ELECTROCHEMICAL OXIDATION OF SUCCINIC ACID ON THE SURFACE OF A COPPER ELECTRODE

Surfactant additives, in particular carboxylic acids, are widely used in electrochemistry to regulate the rate of electroreduction reaction and electroporation of metal ions in order to form galvanic coatings with predetermined properties [1]. Such processes have a stadial character, along with the formation of unstable intermediate compounds. One of the possible ways of investigating stadial processes is the use of quantum-chemical modeling.

In previous works [2; 3], the effect of maleic and acrylic acids on electrochemical processes, involving copper ions, was investigated. As a result, it was established that a double bond affects electrochemical processes. However, for correct understanding of the boundary of influence of multiple bonds on such processes, it is necessary to compare the influence of the latter with the effect of their saturated analogs – succinic and propionic acids. Therefore, the aim of this work was to carry out a theoretical study on the effect of succinic acid on chemisorption, as well as on further electro-oxidation of copper electrodes.

Modeling of possible structures has been performed using B3LYP functional. Solvation effects have been taken into account using polarization continuum model. Wachters+f basis set has been used for copper atoms and 6-311G(d,p) basis set has been used for hydrogen and oxygen atoms. Calculations were made using the Gaussian program.

The results of quantum-chemical modeling have shown that succinic acid can probably be adsorbed on the electrode surface and accelerate the anodic process. The succinic acid molecule (SA), which is dissociated behind the first stage, is more energetically advantageous as a ligand of the inner coordination shell of copper than in the molecular form. Moreover, its dissociation in an aqueous solution is unlikely (1), which is indicated by the energy of the process:

$SA + H_2O = SA^- + H_3O^+$ 205.22 kJ/mol (1)

$SA + Cu^0(H_2O) = Cu^0SA^- + H_3O^+$, 151.13 kJ/mol (2)

$Cu^0(H_2O) + SA = Cu^0SA + H_2O$, 9.21 kJ/mol (3)

$Cu^0(H_2O) + SA^- = Cu^0SA^- + H_2O$, −54.09 kJ/mol (4)

$Cu^0(H_2O) + SA^{2-} = Cu^0SA^{2-} + H_2O$, −65.28 kJ/mol (5)

It should be noted, that the complexes of copper atoms with succinic acid can be formed under different degrees of oxidation. An AIM-analysis was conducted to determine the nature and energy of binding of succinic acid on a copper surface. It has been established that succinic acid does not form bidentate copper complexes in contrast to maleic acid [2]. A probable scheme of electro-oxidation of copper ions with the participation of succinic acid has been proposed.

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GitHub IN THE MODERN PROGRAMMER WORLD

GitHub (originally known as **Logical Awesome LLC**) is a web-based hosting service for version control using git (a version control system for tracking changes in computer files and coordinating work on those files among multiple people). It is mostly used for computer code. It offers all of the distributed version control and source code management (SCM) functionality of Git as well as adding its own features. It provides access control and several collaboration features such as bug tracking, feature requests, task management, and wikis for every project.

GitHub offers plans for both private repositories and free accounts which are commonly used to host open-source software projects. By the time of April 2017, GitHub reports having almost 20 million users and 57 million repositories (on-disk data structure which stores metadata for a set of files or directory structure), making it the largest host of source code in the world [1].

GitHub has a mascot, an “Octocat” called Mona, a cat with five tentacles and a human-like face. GitHub is a kind of social network for developers, allowing them

to view each other's code, leave comments, and also help in the development. Having got briefly acquainted with the service and having learnt what GitHub is, let’s move on to the terms and features of the system's operation.

The GitHub is based on the Git version control system. The version control system is a set of tools for convenient work with documents or files that can be change with time, that is, their version can be changed. The version change is especially relevant for software and code. Programs are constantly updated by their developers and their versions (and code!) are changing. VCS allows you to track changes in code and highlight areas of program text that have been added or modified. VCS stores all previous versions of documents, thereby allowing protecting developers from the fact that they will break the program and the project – there is always the possibility to roll back to any of the previous stable versions. Basic terms of VCS are commits, conflicts, branches [2].

The commit is saving of changes in the project. It must necessarily be accompanied by a developer’s text commentary on what work was done, and what is changed, or written. The commit will help other developers to understand the foreign code easier. In addition, the commit rolls back to the previous version of the project, if something has been done incorrectly, or with fatal errors. The commit is fixed in the local repository.

Conflicts occur during the push operation, when it turns out that two developers have been working on the same code. The conflict must necessarily be resolved manually by the chief developer, or by the person in charge. This person should choose which of the commits and code texts to save in the project.

Branch is the creation of a copy of the current repository. Further development within the framework of the new branch will not affect the initial main branch of the project (which is called master). Development within the new branch is identical to the development of the main branch. When the work is completed, you must merge the secondary branch with the primary branch.

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TRANSPARENT WEIGHTLESSNESS, OR AEROGEL

In March 2017 numerous technical media published a sensational news: scientists from the University of Hangzhou received the easiest material in the world – aerogel based on graphene, the cubic centimeter of which weighs only 0.16 mg. And it is seven and a half times lighter than air. Its properties are so unusual that you can hardly believe in them. Only while holding a bar of aerogel in your hands or at least watching videos, where anyone else does it, you begin to realize that it is true.

As a solid material, it is 99.8% composed of air and at the same time it is able to withstand a weight exceeding its own 4000 times, which is the evidence of great strength. Aerogels are fireproof and breathable, they can absorb water or oil, and depending on the material manufacture, serve as an electrical conductor or an equally effective insulating material [1].

After the investigation it was found out that aerogel feels like hard foam, but it is very light and strong. The thermal conductivity of quartz aerogels is about 0,017 W / (m • K). They successfully withstand heating up to 500° C, practically without changing their properties. Aerogel begins to melt at 1200° C [2].

In general, many modern engineers and scientists believe that in the near future aerogel will find dozens of applications on the Earth. In recent years experiments have been conducted on space shuttles in order to obtain aerogel in weightlessness. Nowadays, the scientists face a number of tasks- how to make the material cheaper and stronger, as well as to secure its production.

The main drawback of aerogel until recently was its fragility, as it cracked under repeated loads. All the aerogels, obtained at that time from quartz, metals oxides and carbon, had this drawback. However, as the scientists point out, when new carbon materials – graphene and carbon nanotubes – were invented, the problem of obtaining elastic and destructible aerogel was solved. As we see, aerogel has unique properties which can hardly be found in other materials [3].

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WIND POWER INDUSTRY OF UKRAINE: POTENTIAL AND PROSPECTS OF DEVELOPMENT

According to the adjusted “Energy strategy of Ukraine for the period of up to 2030”, not less than 30% of all electric power from renewable power sources (RPS), such as the sun, the wind, river water, etc. must be generated in our country in 2030.

Before considering how this strategy with regard to wind power industry is implemented in Ukraine, we will examine briefly the worldwide and European achievements in wind power exploration.

Total wind power potential of the Earth is huge: according to a range of expert estimations, it makes up about 1200 TW. However, actual use of this potential faces a lot of difficulties, caused by non-uniformity of its distribution in different regions of the Earth and great losses at its transformation into other kinds of energy. By a range of expert predictions, the needs of humanity for power, making currently 13 TW, will increase by the middle of this century up to 30 TW, and by its end – up to 46 TW. Such needs for power can be satisfied due to prevailing development of WPE and, first of all, due to greater generation of solar and wind power that has accelerated recently [1].

In December, 2008, The European Parliament obliged all EU countries to bring the level of renewable energy use to 20% in the total generation of electricity by 2020, and by 2040 – to 40%.

There are some mechanisms of stimulation of the use of renewable energy sources in the countries of the European Union. Putting new RES-based generating capacities in operation is much more expensive in comparison with the introduction of capacities, using fossil fuel resources. Due to these facts, renewable power industry is not able to develop successfully without a powerful state support. That is why in the countries in the European Union, everything that leads to a decrease in consumption of fossil fuel resources rather than to an increase in their consumption is subsidized from the state budget.

To stimulate the use of renewable energy in the EU countries, the following main mechanisms are used:

1. Market and often even administrative (that is, inflated due to an additional tax that raises the cost of fossil energy resources) mechanisms for stimulation of the use of renewable energy.

2. “Green” (special, increased) tariffs for generation of electrical power from RES, stimulating the introduction of new generating capacities based on the use of RES at the expense of:

– guaranteeing connection newly introduced generating capacities to the distribution electrical network;

– making a long-term contract for purchasing all electric power, generated by newly introduced generating capacities;

– extra charge to the costs of generated electric power that is paid within 10–25 years, and thus guarantees returning иinvestments in the project and gaining profits [2].

Ukraine has considerable resources of wind power and due to its natural and climatic characteristics, it can take one of the leading places in the world in using wind power. Analysis of monitoring of meteorological stations for many years prove that wind flows with average annual wind velocities from 5 m/s (at the height of the weathercock equal to 10 m/s) prevail in Ukraine. Besides, by the scientific research, conducted by meteorologists of the Central geo-physical observatory of Ukraine, it was established that we can expect a gradual increase in average wind velocity by 1–2 m/s on the territory of Ukraine. No doubt, that this will influence an increase in prognostic potential of RES [3].

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COMPLEX FORMATION OF GELATIN WITH METAL CATIONS

Proteins are the main plastic material which is used for building cells, tissues and organs of the human body. One of these proteins is gelatine. It is widely used in the food and pharmaceutical industry, it has a long shelf life and is easy to use. Complexation processes of gelatin with various ligands constantly draw the attention of specialists in the food industry, polymer and physical chemistry, medicine.

We know that microwave drying is used to accelerate the production of a number of food products. The earlier studies showed the possibility of using the action of the microwave field, when gelatin is produced. It helps to reduce significantly the time of its production, but it may result in changes in its chemical properties. In the paper an analysis of the application of microwave drying to the physical and chemical properties of gelatin has been examined. In particular, we determined the influence of the microwave field on one of the main properties for the use of gelatin – the degree of binding to metal cations. Two samples of gelatin have been studied: industrial P-11 and the sample of gelatin after its microwave drying. It is known that an extra action of physical fields, in particular, an ultra-wave, accompanied by changes in the conformation of proteins molecules, can lead to the increase of binding in the system “protein- metal cation”.

The aim of our work was to study the influence of the ultra-wave field on the complexation of gelatin with Cu2+ cations.

Protein molecules, in particular, gelatin, contain a significant amount of active functional groups (carboxyl-, amino-, guanidine-, imidazole-, hydroxyl-, peptide-). These functional groups cause the reactivity of gelatin in complexation with metal cations in the side chains of amino acids. An additional treatment of gelatin solutions by ultra-waves allows influencing the conformation of the protein molecules and affects binding in the system “protein- Cu^{2+} cation”. It should be noted that the pH of the medium plays an important role in the processes of complexation in the systems "metal ion-protein". When the pH of the medium changes, the conformation of the protein molecule occurs, in which a potential place of accession of metal cations could be blocked. Experimental data show that the action of ultra-waves leads to the increase of pH in the solutions of gelatin, which is accompanied by the change in the conformation of protein molecules.

The dependence of binding degree of the examined samples of gelatin on the time of UW – irradiation was investigated. The irradiation time was varied and the change in the degree of binding of irradiated and non-irradiated gelatin solutions with Cu^{2+} cations was determined. Accordingly, the strongest gelatin binding with Cu^{2+} cations is observed with ultra-wave irradiation of the investigated gelatin solutions for 3-4 minutes.

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STONE FOREST

Stone Forest is all composed of stone blocks. It is located in the provinces Yunnan, at 130 kilometres from Kunming (the capital of the province), China. It is called Shilin, which in Chinese means “Stone Forest”.

Stone forest is a set of karst formations, which are located in the Shilin Yi Autonomous Region. The rocks are very high, thin and resemble fossilized trees. It looks like it’s really a stone forest.

As shown by research, “Stone Forest” appeared about 250 million years ago. At that time there was a sea at this place, at the bottom of which the layers of limestone were found for centuries. But then the sea began to dry out and high limestone stones appeared on the surface. The sea undermined them, and the wind and time completed the rest of the work and now stone pillars of various shapes are adorned in this place, which remind of both trees and animals, birds and even people.

The stone forest is divided into seven parts: the small and large stone forest, the Naigu stone forest, the Kwifeng cave and the Zhiyun cave, the long lake and the lunar lake, and the Da Dieshui waterfall. Shilin is also divided into aboveground and underground parts.

In the Great Stone Forest, most are large blocks of stone and in some places they are so close to each other that it is difficult to pass between them. Among these blocks there are lakes, arches and cliffs. Here, you can easily get lost. In a small stone forest, there are fewer stone formations and more vegetation. There are also flower glades, beautiful flowering trees and bamboo thickets.

In the underground part of the stone forest there is a karst cave Zhiyun. It occupies an area of 3 square kilometers.

Since 2007 two parts of the Naigu and Suogeyi Village Stone Forest Park have been inscribed on the UNESCO World Heritage List.

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PHENOLIC AND EPOXY PHENOLIC RESINS FOR PROTECTIVE COATINGS

All metals in contact with air oxygen, moisture and various aggressive media are to some extent susceptible to corrosion. Protection of metal surfaces from corrosion is one of the primary scientific and technical problems. In solving this problem, a special role is assigned to protective paint coatings. Among a wide variety of protective compositions, a special place is occupied by systems based on phenolic and epoxy phenolic resins.

Phenolic resins, mainly represented by phenol-formaldehyde resins, are thermoplastic (novolac) or thermoset (resol) oligomers, depending on the synthesis conditions. Despite the fact that the industrial production of phenolic resins began more than 100 years ago (in 1906), the importance of these products does not decrease and they continue to occupy a leading position in the polymer industry. Currently, phenolic resins are used in various areas of practice. The features of their application are determined by their chemical structure. Systems based on novolac phenolic resins are stable thermoplastic solid masses, which are processed into non-melting products in the presence of special additives – cross-linking agents. Resol resins are thermosetting, viscous or plastic, thickening and flow-losing masses that are cured thermally or in the presence of acid catalysts. Polymeric materials based on phenolic resins (phenoplasts) have a set of valuable properties: high physical and mechanical, thermal and electrical characteristics, chemical and abrasion resistance, reduced combustibility [2, p. 35].

Typical properties of phenoplasts are also inherent in protective coatings based on phenolic resins. In addition, these coatings are distinguished by high adhesion to metals, low diffusion rate of water vapor and oxygen, chemical inertness and resistance to temperatures. Coatings based on phenolic resins have high resistance to the action of chemical reagents, in particular to acids and sulfur-containing compounds. Therefore, they are used to cover industrial tanks, equipment, pipes, aerosol cans, internal and external lining of food containers [3, p. 87].

At the same time, coatings based on resins, obtained by condensing phenol with formaldehyde, have inherent disadvantages: dark color and increased brittleness, which limits the field of their application. To eliminate this disadvantage, modified phenolic resins are used, and their property is combined with other film-

forming compounds. Many scientific publications, monographs and patents are devoted to the problems of chemical modification of phenolic resins.

Depending on the chemical nature, phenolic resins have different solubility and compatibility with other compounds. As for paint and varnish materials, oil-soluble phenolic resins, which are able to dissolve in many hydrocarbons and combine with vegetable oils, are of particular interest. Such resins have been known since the middle of the twentieth century and are widely used in car primer compositions, metal container coatings, anticorrosive paints for marine vessels, printing inks, and their utilization capacity is constantly increasing. Oil-soluble resins are prepared on the basis of substituted phenols, typically para-tert-butylphenol and some other alkylphenols. The methods of chemical modification of phenolic resins for protective coatings include epoxidation to produce epoxy phenolic resins. Epoxy-phenolic resins include systems containing compatible phenolic and epoxy resins. It is these systems that make it possible to obtain high-quality multi-purpose coatings on their basis. Coatings based on phenolic and epoxy phenolic resins are characterized by strength at the break of 0.6–1.0 MPa, compressive strength of 20–30 MPa and relative elongation at the break of 1-3% [2, p. 37].

It is known that the creation of a high-quality protective coating with high adhesion requires careful preparation of the surface. Typically, this is a costly procedure, including chemical or electrochemical etching, as well as shot-blasting or sandblasting. In addition, the required protective properties depend on the thickness of the coating, which is provided by applying protective composition in several layers, and after applying each layer the coating is subjected to cold or hot drying. However, paint and varnish materials are known, the use of which does not require such thorough preparation of the surface. In particular, they are protective compositions based on epoxy phenolic resins modified with vegetable oils, which can be applied to the surface with rust and moisture residues, while having high protective properties of the coating.

Coatings based on epoxy phenolic resins provide high wear resistance of products, for example, pipes regularly subjected to intensive loads and operated in an aggressive environment. Epoxy-phenolic resins have good heat resistance and resistance to solutions of mineral salts. This is the reason for the effectiveness of using coatings on their basis to protect drilling and tubing pipes that are exposed to corrosive effects of reservoir water, drill muds and aggressive chemicals, accelerated by the impact of high cyclic loads. Also, such coatings are used to insulate the inner surface of pipes in hot water systems.

The use of phenolic oligomers modified with oils is becoming increasingly important for anticorrosive primers used in painting ships and boats. Similar multilayer coatings are used for painting other vehicles. For example, paint coatings for railway cars may consist of a primer based on epoxy resin, an intermediate layer of phenolic resin (modified with a mixture of urethane oil and alkyd resin) and a top layer based on a mixture of urethane oil and alkyd resin. The phenolic resin content of the composition (depending on the reactivity) is from 25 (resol) to 100% (novolacs) [3, p. 82].

Among the advantages of using coatings based on phenolic resins for the protection of metal surfaces, mention should be made of resistance to high temperatures, acidic environments and hydrogen sulfide, and as well as to carbon dioxide, petroleum products, sea water and mineral brines. Using these resins allows us to extend several times the life of products and equipment, reduce material and energy costs. In addition to extending useful life, epoxy phenol coating can significantly reduce energy costs.

Based on the above, phenolic and epoxy phenolic resins, as well as paint and varnish materials, will not lose their relevance in the foreseeable future.

Coatings based on phenolic resins have high resistance to the action of chemical reagents, in particular, to sulfur-containing compounds that cause stains. Therefore, they are used to cover buckets, cylindrical boxes, collapsible pipes, aerosol cans, internal and external lining of food containers.

The dark color inherent in these resins and the fragility of the produced coatings limit to a certain extent their field of application, but the ability to modify with various compounds makes it possible to use them in combination with other film-forming materials.

Phenolic resins, soluble in hydrocarbon solvents, belong to one of the oldest classes of synthetic resins, they are widely used mainly for the production of car primers, coatings for metal containers, anticorrosion paints for marine vessels and printing inks, and the use of phenolic coatings in the automotive industry is dramatically increasing [1, p. 38].

Phenolic resins remain a universal resin system containing a stable, thermoplastic web composition or a thermoset and perishable rubber composition that cures thermally or under acidic or special basic conditions. They are characterized by high heat resistance and strength, as well as by fire-resistant properties. Phenol-formaldehyde resins were recognized as a cornerstone in the plastics industry in the early twentieth century, and phenolic resins continue to thrive even nowadays.

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VANTABLACK

A team of scientists from the UK was pleased with the new scientific discovery, presenting a new kind of matter to the general public. Until recently, this kind of black shade has not been known to anyone. The discovered substance is called vantablack and, in the opinion of the British pioneers, it can once and for all change the representation of people about the universe.

Ultra-black material has the ability to absorb successfully 99, 96% of light, and in this case we are talking only about radiation which is distinguishable for the human eye. If you shine on a substance with a laser pointer, the stain simply disappears, as if in a black hole. The team of researchers of the original scientific phenomenon included scientists from Britain under the leadership of Ben Jenson [1].

According to one of the scientists, the material is made of a set of carbon nanotubes. This phenomenon can be reliably compared with a human hair, cut into 8–10 thousand layers – one such layer is the size of a carbon nanotube. The technology of creating these kinds of tubes cannot be called innovative, however, Ben Jenson and his associates managed to find worthy ways of using it. They invented a method of connecting carbon nanotubes with materials, used in modern telescopes and satellites. An example of such a material is aluminum foil. This fact means that photos of the Earth and the universe from space can be made more precise [2].

If we take into account the laws of physics, creating a material that absorbs 100% of light is almost impossible. For only this reason, Jenson's invention today can be called a breakthrough on the brink of fantasy.

A new kind of material is already of interest to the US military. After all, it can be used in "Stell"-technologies, to reduce the visibility of aircraft for radars or to create photographs during special intelligence missions. In addition, scientists are confident that with time more opportunities will be opened for the use of vantablack.

Now the British have perfected the material, but it has not yet been possible to measure its characteristics: the ultra-black vantablack 2 simply cannot be measured by any spectrometer. No folds are visible on the super-black matter, if the material is tried to crumble like a foil – it will remain the same black hole for eyes.

Vantablack is included into the Guinness Book of Records as the blackest substance ever made by man [1].

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WEGE ZU EINER MODERNEN KLIMA- UND ENERGIEPOLITIK

Der Schutz von Umwelt und Klima zählt zu den globalen Herausforderungen des 21. Jahrhunderts und genießt in der deutschen Politik, in Publizistik und Zivilgesellschaft einen hohen Stellenwert. Wichtige Gegenstände des Naturschutzes sind Naturlandschaften und Kulturlandschaften, Naturdenkmäler u. a. Schutzgebiete und Landschaftsbestandteile, sowie seltene, in ihrem Bestand gefährdete Pflanzen, Tiere, und Biotope, in ihren Ökosystemen und mit ihren Standorten. Der Naturschutz beschäftigt sich daher auch mit den Standortfaktoren: Bodenschutz, Mikroklima, Luftreinhaltung und Lärmschutz sowie anderen potenziell schädlichen Einflüssen wie zum Beispiel Licht, Bewegung, Zerschneidung und Isolation von Lebensräumen [2].

Deutschland gilt international als eine der Vorreiternationen beim Klimaschutz und als Pionier beim Ausbau erneuerbarer Energien. Auch im globalen Rahmen setzt sich die Bundesregierung aktiv für den Umweltschutz, für klimafreundliche Entwicklungsstrategien und Energie- Kooperationen ein. Seit 2000 hat Deutschland seine Treibhausgas-Emissionen um fast 20 Prozent vermindert und kommt damit seinen aus dem Kyoto-Protokoll erwachsenen Verpflichtungen einer Verminderung von 21 Prozent bis 2012 bereits sehr nahe. Im globalen Klimaschutzindex 2010 der unabhängigen Umweltschutzorganisation „Germanwatch“ liegt Deutschland auf

Platz zwei. Schon seit vielen Jahren verfolgt Deutschland einen Weg, der Klima und Umweltschutz im Sinne nachhaltigen Wirtschaftens zusammenführt. Der Schlüssel dazu ist eine Doppelstrategie zur Steigerung der Energie- und Ressourceneffizienz sowie zum Ausbau erneuerbarer Energien und nachwachsender Rohstoffe. Dies fördert die Entwicklung innovativer Energietechnologien sowohl auf der Angebotsseite, bei Kraftwerken sowie den erneuerbaren Energien, als auch auf der Nachfrageseite, dort, wo Energie verbraucht wird, zum Beispiel bei Haushaltsgeräten, Autos oder Gebäuden.

Der Naturschutz („Schutz der natürlichen Lebensgrundlagen“) ist seit 1994 als Staatsziel im Artikel 20a des Grundgesetzes verankert. Eine intakte Natur, reine Luft und saubere Gewässer sind Voraussetzungen für eine hohe Lebens- und Umweltqualität in Deutschland. Bei Luft- und Gewässerreinhaltung zeigen die Umweltindikatoren in eine positive Richtung, weil viele Emissionen in den vergangenen Jahren deutlich reduziert wurden. Die Treibhausgas-Emissionen des Straßenverkehrs lagen 2013 – trotz erheblich gestiegenen Verkehrsaufkommens – etwa auf dem Niveau von 2000. Für die etwa 50-prozentige Reduzierung der Stickoxid-Emissionen ist unter anderem die Ausstattung der Kfz mit Fahrzeugkatalysatoren verantwortlich. Die Schwefeldioxid-Emissionen der Stein- und Braunkohlekraftwerke konnten durch die gesetzlich vorgeschriebene Rauchgasentschwefelung um 90 Prozent entscheidend gemindert werden. Gesunken ist in den vergangenen Jahren auch der tägliche Pro-Kopf-Verbrauch an Trinkwasser von 144 Liter je Einwohner auf 126 Liter, das entspricht dem zweitniedrigsten Verbrauch aller Industriestaaten[1].

Sowohl in den Privathaushalten als auch bei Verkehr und Industrie bilden fossile Energien nach wie vor das Rückgrat des Energiemix: Mit einem Anteil von 36 Prozent ist das Mineralöl der wichtigste Primärenergieträger, gefolgt von Erdgas, Steinkohle, Kernenergie und Braunkohle. Die nur im Stromsektor genutzte Atomenergie (Anteil: rund 25 Prozent) läuft nach einem im Jahr 2011 zwischen der Bundesregierung und den Elektrizitätsversorgern geschlossenen „Atomkonsens“ schrittweise aus.

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STUDIES ON THE SYNTHESIS OF CYCLOPENTADIENE ALKYL DERIVATIVES

Patents are the main source of information on the synthesis of cyclopentadiene (CPD) alkyl derivatives (methylcyclopentadiene, ethylcyclopentadiene, propylcyclopentadiene, isopropylcyclopentadiene) [1-4]. Such a source can be unreliable and the number of articles about cyclopentadiene alkylation is relatively small [5]. We started a research, the aim of which is the determination of optimal method for ethylcyclopentadiene synthesis.

The above-mentioned synthesis can be accomplished by two ways:

1. Alkylation of cyclopentadiene salt by ethyl bromide (Fig. 1):

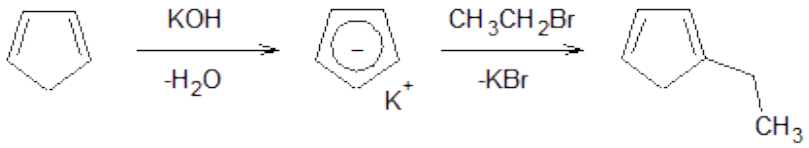

Fig. 1

An analysis of the possibilities of this method was carried out in our work.

We investigated two variations of CPD salt alkylation. The first one is solvent-free alkylation. It has an advantage that there is no stage of dedimerization of dicyclopentadiene (DCPD). The reaction is performed in DCPD excess, the minor part of which is dedimerized, while the major part acts as reaction media. The second variation is alkylation in polar media, provided by DMSO solvent.

2. Synthesis and alkylation of cyclopentadienylmagnesium bromide (Fig. 2):

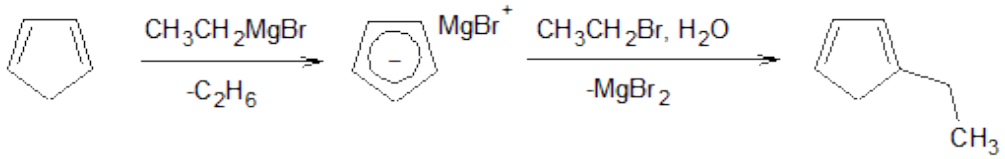

Fig. 2

Two variations of cyclopentadienylmagnesium bromide synthesis were investigated in diethyl ether and tetrahydrofuran media. The features of both methods were shown in application to ethylcyclopentadiene preparation.

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ALUMINUM AS THE MAIN TOXICANT FOR HYDROBIONTS

Ions of certain metals are considered as one of the most important risk factors. Even a slight increase in the concentration of these ions can lead to irreversible violations in the cells and tissues of living organisms. Aluminum is the most common metal in the Earth's crust. It ranks third after oxygen and silicon and the first among metals. It is found in the surface reservoirs due to the partial dissolution of clays and aluminosilicates, along with atmospheric precipitation, with sewage of metallurgical, textile, ceramic and other industries.

For a long time, aluminum was considered as an inert element in relation to living organisms, however, since the 1980's and 1990's of the last century, many adverse effects of aluminum salts have been actively studied. The neurotoxic impact of aluminum on the human body and its influence on the origin of Alzheimer's disease have been proved. In this regard, the European Union and WHO have stated the Al_3^+ threshold limit value for drinking water – 200 mcg / dm^3, the recommended concentration is 50 mcg / dm^3. It is believed that Al_3^+ ions are primarily determined by the ability to induce oxidative stress in various cell types.

Excessive intake of aluminum compounds leads to disturbance of the oxidative-reducing balance in the brain tissue of animals. Oxidative stress is considered to be one of the main inducers of structural and functional disorders in the cells of central nervous system (CNS). The toxicity of hydrobionts with free ions of aluminum, primarily in surface waters with a lower pH and low content of organic compounds, has been established.

Due to the influence of Al_3^+ on fish, the osmoregulatory balance and respiratory processes are disturbed due to coagulation of mucus on gills. Therefore, in the reservoirs of fishery management, the free ion content of aluminum (36.0 mcg / dm^3) is limited. Violation of the life processes of animal and plant aquatic organisms as a result of the action of Al_3^+ leads to a decrease in biological productivity of water bodies, degradation of hydro ecosystems. The study of the mechanisms of negative influence on various classes of hydrobionts, the search and characterization of species-indicators and universal metabolic markers, which will allow assessing the degree of adverse effects of technogenic pollution of the environment in the modern world is of extremely high relevance.

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STONES IN A LIVING ORGANISM

Stones are pieces of dead nature. But the formation of a stone is often related to life or death of living organisms. Typical stones, with properties of mineral of crystal, are found in plants and organisms of animals. For example, in the cells, from which plants are built, one can find perfectly created crystals, splices and marbles, especially from oxalic acid or calcium carbonate. In the potato cells, there are crystals of protein substances, in some algae – gypsum crystals. Often, large stones are formed in the living body: both in a healthy body and in a diseased one. In the first case, these are the stones that are formed in the choroid of the eyes of some animals, in dead cells of bones, milk stones – in the mammary glands. But much more serious are those stones that are formed in diseased organisms from sparingly soluble salts – mainly calcium salts – and deposited in tissues, cavities, excretory ducts, gallstones in the liver and urinary stones in the bladder. But the most remarkable stones, which are deposited in a living organism, are shells of various mollusks, needles and skeletons of radiolarians, complex bulkheads and walls of polyps – corals, pearl formation. Pearls are produced by those types of mollusks that are capable of depositing pearl matter. The substance of nacre and pearls is one and the same. The pearl is nacre that is created under special

circumstances. Under normal conditions, the outer layer of the skin of the mollusk produces nacre, deposited on the inner surface of the shell. Pearls are formed when any foreign matter penetrates into the shell, whether it is a parasite or a grain of sand around which as around the core, pearly layers begin to be deposited. For a long time the reason for the formation of pearls was seen in penetration into the shell of an alien body and in this way they tried to artificially obtain pearls. In China, such attempts were made back in the 13th century. In the 18th century, the experiments of Linnaeus, who injected various bodies into the shells, became known. In China, up to the present time shells are collected in the spring, then various small creations of bone wood or metal are put in them, then these objects remain in the shell of a living organism. A few years later they are extracted and sold. Curious experiments taught humanity to use a living organism to grow stones with its help. This idea is very tempting, and it is possible that scientists will be able to find more ways to use the animal world for their purposes in the future. Breeding the right bacteria, you can receive natural sulfur and iron from brine. In lakes, breeding diatoms will result in the accumulation of pure opal on the bottom and the purest aluminum ores in solutions.

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DISTRIBUTED CALCULATIONS ON THE BOINC PLATFORM

To solve time-consuming computing tasks, you can use several computers that are integrated into a parallel computing system. This method is called distributed computing [1].

There is a software package for the rapid organization of distributed computing – BOINC. It consists of the server and client parts. Initially BOINC was developed for the largest voluntary computing project – SETI@home, but subsequently developers from the University of California made the platform accessible to third-party projects. To date, BOINC is a universal platform for projects in mathematics, molecular biology, medicine, astrophysics and climatology.

The bottom line is that this program allows different research, academic institutions or simply scientific enthusiasts to attract people who are ready to share

their CPU time with them. A task that requires considerable processing power is broken down into simpler parts and sent to different people if the solution is true for its part – the project server charges a certain number of points to the participant. Many participants are organized into teams and organize competitions among themselves in various projects.

The user receives instructions and downloads job files from the project server. After that, the process of solving the problem goes on, and then the user sends the solution to the project server and receives the result of the work done by him [3].

These are several projects worthy of your attention:

Rosetta@home. The Rosetta @ home project is designed to calculate the three-dimensional structure of proteins. Such studies can lead to the creation of drugs for diseases such as HIV, malaria, cancer and Alzheimer's disease.

WorldCommunityGrid. This project was launched by IBM to calculate in various fields of science: decoding the human genome, developing a drug against the Ebola virus, mapping chemical markers of various types of cancer and research in the field of renewable energy.

Climate Prediction. The project calculates various simulations of climate models, which allows to predict how the weather on the Earth will change in the future.

MilkyWay@Home. The project is aimed at creating high-precision 3D models of Stream of Sagittarius, which provide information on how the Milky Way formed and how tidal arms form during the collision of galaxies.

Asteroids@home. The project aims to increase the amount of information about the physical characteristics of asteroids. The study of the shape and other parameters of asteroids will allow us to learn more about their real size, whether they represent a real threat, and in the future will help determine the appropriate goals for research missions.

POEM@Home. The project is aimed at modeling the folding of proteins, which in the future will help to determine more accurately the function of proteins by their structure. Such knowledge can help in medical research [2].

I want to say that thanks to distributed computing we simplify the work of scientists in the field of developing or in research that will lead us to an optimal standard of living in the future.

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BIOLOGICAL CHARACTERISTICS OF CERTAIN FISH SPECIES OF THE ZAPORIZHIA RESERVOIR IN CONDITIONS OF ANTHROPOGENIC INFLUENCE

The main problem of the Zaporizhia reservoir, as well as of other reservoirs of the Dnipro cascade, is low level of reproduction of valuable industrial species of fish. This happens due to the inadequate ecological status of seals and shallow areas, where the sting of young fish takes place. In addition, spawning populations of some species of fish, being common in ecologically unsuccessful zones, have certain deviations in physical and biochemical parameters, which affect negatively the quality of their reproductive processes.

Today there is a decrease in industrial catches of valuable species of fish in the Zaporizhia reservoir, which caused the need to study the current state of their populations, as well as to find ways to increase the efficiency of their use in the fisheries sector.

The purpose of the work was to study the present state of industrial stocks of fish species of the Zaporizhia reservoir in the conditions of anthropogenic influence and economic exploitation, as well as to analyze biological and ecological indicators, features of composition and the number of fish populations of Zaporizhia reservoir.

The research of morphometric indicators of fish makes it possible to show how environmental factors can affect the structure and adaptation of fish. Differences in the morphometric indices of one-year-old sexually transmitted individuals, sequestered in different waters, may indicate a certain ecological factor, which requires further in-depth research.

The main task of the analysis of industrial catches is to establish their actual species and size, so that for certain specialized catches it would be possible to define with sufficient certainty the qualitative composition of industrial catches in the reservoir as a whole.

In analyzing the species and the size of the catch sample, the latter should be taken in all industrial seasons and, if possible, from all major types of fishing projectiles in each season.

With the systematic accumulation of such materials in a number of years it will be possible to determine the legality of fluctuations of the number of species studied, to find out the exact amount of their stocks, as well as the size of possible catches.

Such studies provide an opportunity to create a database of quantitative and qualitative indicators of fish development in the studied waters, on the basis of which the modes of rational use of fish resources and measures for the reproduction of industrial stocks of fish will be developed and adjusted.

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THE INFLUENCE OF GAME DEPENDENCE ON A PERSON'S PSYCHOLOGICAL STATE

At present, due to the wide spread of computer technology, the computer dependence of people all over the world has appeared and very quickly spread. This pernicious habit took almost the entire time of a person and tore him out of a living social society.

The relevance of the study of the problem of computer addiction is becoming increasingly important due to the growing number of computer and Internet users around the world. This is due to the discrepancy between the rapid pace of Internet development and the scientific analysis of the negative consequences of this development and active Internet adoption.

Computer addiction has two directions: computer games and the Internet. In turn, dependence on the Internet includes dependence on social networks, online casinos, views of movies, online stores, and online games. All this is very dangerous for our psyche. This kind of dependence becomes a special barrier between live communication and the virtual world. In this case, it looks as if a person was falling into a trap, out of which it is rather difficult to get without the help of other people. Unfortunately, the contribution of society to solving this problem can be useless, if a person does not realize it.

The psyche of young people is not yet fully formed, so complex life situations can dislodge them, and cause feelings of anxiety, resentment, dissatisfaction with the living world, which will make them turn to another, virtual, world. And the reasons for this can include different: problems in the family or with health, lack of understanding between parents and children, peers, inflated social demands, low self-esteem, loneliness and many others. In this regard, people may have such addictions as alcoholism, drug addiction, sect or computer

Computer games are useful only as a change of some kind of activity that would be a little distraction from hard work, physical work or reading. It is very good, if they favorably influence the development of thinking, intellect, and logic. With fairly serious hobbies, it is worthwhile thinking about possible further consequences and limit or completely abandon them [3, p. 26].

Firstly, computer games can attractive due to brightness, interesting music, story, entertainment, unusual characters and advertising. A person begins to like this atmosphere. He is fascinated by this new world, where he can feel like a winner, realize his plans, ideas for which no one will condemn, and feel more confident. Playing a computer, a person experiences a feeling of satisfaction. At this point, there is an adrenaline rush, so you want to experience such feelings again. During the game, a person can sit for hours, and its absence can cause a lot of stress, hysterics. This already indicates the presence of addiction to games. In this case, it is necessary to save a person. There – are various symptoms that are characteristic of human computer dependence:

– a long time at the computer;

– often changing mood;

– well-being, euphoria while sitting at the computer;

– nervousness, depression, stress without internet or computer;

– inadequate response to comments, advice from other people;

– impossibility to stop;

– lies and alertness to family members, friends [1, p. 58].

There are the following stages in the formation of computer dependence.

At the stage of easy enthusiasm, the following occurs. In the beginning people start to play for the sake of interest, rest. Gradually, they are becoming more interested because they like computer graphics, sounds, fictional original characters, fantastic stories, and the very essence of imitation of real life fascinates the mind. People get great pleasure, positive emotions. Over time, they want more and more, and then they already play purposefully.

The same happens when a person starts to communicate in social networks.

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THE PROBLEM OF SOCIAL REFLECTIVE AWARENESS DEVELOPMENT

Nowadays it is very important to promote the development of a person's reflexive skills within the modern society. Because of the increasing financial dependence, technological progress a person's individuality is not taken into account. There is a lot of stress and psychological disruption around. The statistics are surprising, 25% of the world's population either searched for a psychologist, or applied for services.

At the same time people's ability to adapt to the new social demands is very low, and there are some certain reasons for this. First of all this is the Soviet past of the most population of Ukraine. In that period the main aim was to create obedient, disciplined and average citizens.

If we talk about the problems of society, we should talk about the problems of each person separately. And if we talk about the problems of each individual we should take into account his ability to reflect to the changes of society and to react in a proper way.

Reflection in a social psychology is determined as a process of person's awareness of the internal psychic acts and states through their perception by other people. This is not just self-knowledge, but an attempt to find out how others evaluate and understand the features of other personality. In everyday life the social reflection allows a person to experience some event or phenomenon, to realize it through his "inner world".

We would like to offer some ways of the reflective awareness development: work within the society aimed at people's understanding of the reflexive skills' role; mastering the techniques which help to control the emotional state during the professional activities; development of communicative and organizational skills; increasing readiness for innovations and creativity; awareness of individual mental qualities; formation of positive self-concept; providing opportunities for a person's self-expression in communication.

One of the most effective means to form the capacity of reflection is a psychological training (professional or self-training), as it helps to implement the following tasks: formation of internal motivation for professional self-improvement, overcoming some difficulties in the process of communicative interaction; self-acceptance. There are offered some exercises which help to develop people's

communicative and organizational skills, analytical skills, culture and outlook, empathic listening, perception of verbal and non-verbal signals, positive self-concept. These exercises can be implemented in a form of psychological support at a workplace, tendency in social nets or part of a psychological course at school or university. It would be very useful for people's social well-being, especially the young.

Methodological tools used during the training are the following: group discussion (if it's organized within a group), analysis of situations, role play, instruction, keeping diaries.

We can draw the conclusion that social reflection is a mechanism that determines a person's desire of being active and independent in the process of studying, working experience, in relationships with people, etc. The lack of reflection blocks the opportunity to make a free choice, to master norms and values of the society we live in.

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KONZEPTUELLE METAPHERN IN LITERARISCHEN WERKEN VON J. GALSWORTHY, D. H. LAWRENCE UND T. HARDY

Heutzutage kann man ein wachsendes Interesse der neueren Literatur-und Sprachwissenschaft an der Metapher konstatieren. Die Forschung auf dem Gebiet der konzeptuellen Metapher wird seit den 80er Jahren des 20. Jahrhunderts unternommen.

Die Theorie der konzeptuellen Metapher wurde zum ersten Mal von amerikanischem Linguisten J. Lacoff in seinem Buch *"Metaphors We Live By"* dargelegt [1]. Seit dieser Zeit befassten sich viele Linguisten mit der Ergänzung und Präzisierung der von J. Lacoff dargelegten Ideen.

Unter den konzeptuellen metaphorischen Modellen unterscheidet man universelle Metaphern «Mensch ist ein Tier», «Mensch ist eine Pflanze», «Mensch ist ein Gegenstand» und spezifisch-kulturelle «Mensch ist ein übernatürliches Geschöpf» Metaphern.

Der Analyse haben wir in dieser Hinsicht die Werke von J. Galsworthy, D. H. Lawrence und T. Hardy unterworfen. Die Ergebnisse unserer Forschung belegen wir mit nachstehenden Beispielen.

«Theresa was quick, and golden as a *panther*» (Lawrence, The *Mortal Coil*) [2]. Hier beobachten wir ein konzeptuelles metaphorisches Modell «Mensch ist ein Tier» – Theresa ist ein Panther.

Und im nächsten Beispiel sehen wir das konzeptuelle Modell «Mensch ist ein Gegenstand» *(horse-shoe – das Hufeisen):*

«He's a *horse-shoe* round your neck…» (Lawrence, The *Mortal Coil*) [2].

Das konzeptuelle Modell «Mensch ist eine Pflanze» kann eine kulturologische Konnotation enthalten: **«It was like watching a starved *plant* draw up water, to see her drink in his companionship»** (*Galsworthy, In Chancery*) [3].

In der englischen Literatur kann man oft das konzeptuelle Modell «Mensch ist ein übernatürliches Geschöpf» treffen. Dieses metaphorische Modell sieht den Vergleich des Menschen mit phantastischen Geschöpfen, Trollen, Feen usw. vor. Ein Beispiel dafür wäre: **«…from the grim gentleman in the midst, whom some of them seemed to take for the *Prince of Darkness* himself…» (Hardy, The *Three Strangers*)** [4].

Also, die konzeptuellen metaphorischen Modelle treffen sich in Texten von englischen Schriftstellern Ende des XIX. – Anfang des XX. Jahrhunderts ziemlich oft. Dabei sind zwei Typen von Metaphern – die universelle und die spezifisch-kulturelle zu verzeichnen. Die wesentlichen konzeptuellen Modelle in der englischen Literatur zu kennen, ist für die Englischlerner, sehr wichtig.

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ZENTRALVERWALTUNGSWIRTSCHAFT: VORTEILE UND NACHTEILE

Die sozialen Nachteile des kapitalistischen Wirtschaftssystems im 19. Jahrhundert waren Anlaß, nach neuen Wegen und Ordnungen der Wirtschaft zu suchen. Karl Marx entwickelte in zahlreichen Schriften seine Gedanken zur Änderung der wirtschaftlichen und gesellschaftlichen Verhältnisse. Die in seinem Hauptwerk „Das Kapital" erhobene Forderung nach Sozialisierung oder Verstaatlichung des Grundbesitzers und der Produktionsmittel wurde Grundlage jener sich als Gegenströmung zur freien Marktwirtschaft des kapitalistischen Systems gebildeten Wirtschaftsordnung [1].

Die Zentralverwaltungswirtschaft verhindert soziale Ungerechtigkeiten des kapitalistischen Wirtschaftssystems. Rücksichtloses Gewinnstreben, Erwirtschaftung von Millionenvermögen, Ausnutzung wirtschaftlicher Märkte für politische Zwecke durch einzelne Großunternehmen sind weitgehend ausgeschlossen. [2] Die Stabilität von Wirtschaft und Währung sowie die Vollbeschäftigung können für längere Zeit gesichert werden. Der Staat kann seine wirtschaftlichen Anstrengungen auf ganz bestimmte Ziele konzentrieren und so auf bestimmten Gebiete erzielen (z.B. Weltraumforschung in der ehemaligen UdSSR).

Der Zentralverwaltungswirtschaft fehlt einer der wichtigsten Antriebe der freien Marktwirtschaft: die Aussicht auf Gewinn. Der Wettbewerb als Motor der Wirtschaft ist nicht gestattet. Mangelhafte Qualität der produzierten Güter, schlechter Kundendienst und lange Lieferfristen sind oft die Folgen. Einheitsware wird zu den vom Staat diktierten Einheitspreisen angeboten. [1] Der Verbraucher hat nur die Wahl, die staatlich hergestellten Güter zu kaufen oder ganz auf den Kauf verzichten. Die Praxis beweist ständig, dass die Güterversorgung in diesem Wirtschaftssystem schlechter ist als in der Marktwirtschaftsordnung. Die Löhne werden nicht zwischen gleichberechtigten Tarifpartnern ausgehandelt, sondern ebenfalls vom Staat diktiert. Menge und Art der Produktion werden nicht durch die Nachfrage der Verbraucher bestimmt, sondern von den staatlichen Planungsbehörden im Voraus festgelegt. Die Bedürfnisse der Verbraucher werden dabei nicht berücksichtigt. Deshalb kommt es dazu, dass die Güter, die dringend gebraucht werden, fehlen, andere Waren, die kaum gefragt sind, stehen in jeder Menge zur Verfügung. Der Verbraucher kann oft nicht kaufen, was er gerne möchte, sondern muss kaufen, was es gerade da ist. In der Zentralverwaltungssystem steht der

Mensch hilflos dem Staat entgegen. Der Weg von der wirtschaftlichen Bevormundung führt auch zur politischen Knechtschaft. Zur Durchführung dieser Wirtschaft ist ein riesiger Verwaltungsapparat mit viel Personal notwendig. [2] Dadurch entstanden hohe Kosten, die sich in den Preisen niederschlagen. Verschiedene Zweige der Volkswirtschaft werden vom Staat unterschiedlich gefördert. Häufig wird die Produktion in der Verbrauchsgüterindustrie (z.B. Fernsehgeräte, Autos, elektrische Hausgeräte) zurückgedrängt und die Schwer- und Rüstungsindustrie (z.B. Stahlindustrie, Raketen- und Atomtechnik) vom Staat bevorzugt.

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THE 360-DEGREE CAMERAS

In 2016, there was a real boom of cameras 360 – over a dozen fully-fledged devices that can take "photo 360" or "video 360" with the click of a button! These cameras can make spherical images. They have opened a new era in photography and have changed the way people share stories.

Thanks to a 360-degree camera, people can see more than a simple video from one angle; on the computer they can use the mouse pointer and on the smartphone or tablet can use the finger to pan the image in a circle or scroll up to view, for example, the sky and down to see the ground. If they look at the image through a virtual reality headset, they can rotate the photo, moving their head,

The pictures show that you can change the view angle while watching the video

reinforcing the illusion that they are in some place in real. In the "video 360" format everything is removed: from rock concerts to church services, from museums and excursions to technological processes.

Now, apparently, the demand for "video 360" is increasing – many sites and video hosting companies already support the panoramic mode – YouTube, Facebook, LittleStar, Kolor, a number of others. Many fans began to shoot panoramic video without waiting for the cameras to exit – with the help of special rigs, into which a large number of GoPro cameras, Xiaomi cameras, etc. are inserted. Subsequently, the video from these cameras is stitched in special software.

The largest IT-giants and manufacturers of photo and video equipment, having felt the trend, developed their solutions. It interestingly that in terms of optics, electronics, video processing, they are completely different. The number of lenses varies from 2 to 16, and the processing of "video 360" is carried out both in the camera itself and can be made "out". In addition to the famous brands – Google, Samsung, LG, Nokia, GoPro, Nikon, Kodak, Ricoh – the startups – Giroptic, Bublcam, Vuze, etc. – also joined the competition.

All the claimed cameras can be divided into several segments (however, in accordance with the market segments of conventional cameras): consumer, semi-professional, professional, as well as video surveillance. The price, characteristics and purpose of the devices are accordingly different.

Cameras in 360 degrees are a very useful invention; the demand for them will eventually grow and grow. According to research of the firm Futuresource Consulting, in 2016 spherical cameras accounted for 1 percent of the world's consumer camera supplies and in 2017 reached 4 percent. The popularity of these devices will benefit the virtual reality industry, as well as camera manufacturers.

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"HYPERION" VON F. HÖLDERLIN UND "HYPERION" von J. Keats: ÄHNLICHKEIT UND UNTERSCHIEDE EINER INTERPRETATION DES ANTIKEN MYTHOS VON HYPERION EUROPÄISCHEN ROMANTIK

Frederick Hölderlin war der erste, der eine literarische Interpretation des Hyperion-Mythos schuf. Literaturwissenschaftler schreiben über den möglichen Einfluss von Hölderlin auf John Keats, aber es gibt keinen Beweis, dass Keats die Arbeit von Hölderlin kannte [1, 91]. Das kulturelle Erbe des antiken Griechenlands wurden für beide Autoren das Ideal des Schaffens und der Kultur [3, 6; 1, 93]. Der Einfluss der alten griechischen Kultur auf die Autoren war sehr bedeutsam. Aber Hölderlins Verständnis für die Antike war dunkel und von Ideen des Leidens durchdrungen [2], während Keats die antike Welt als schöne Utopie sah [1, 92].

Hölderlin beschrieb in "Hyperion" die Probleme seines zeitgenössischen Deutschlands durch die Ereignisse Ende des XVIII. Jahrhunderts in Griechenland. Am Anfang sehen wir einen Versuch die Griechen 1770 gegen die Türken zu revoltieren. Das ist eine direkte Parallele mit dem Mythos. Die mythologische Idee, die Götter durch die neuen Generationen zu ersetzen , die in Hölderlins Roman durch den Gedanken über die Notwendigkeit einer Revolution in Deutschland bedingt war, ist im Roman in Bildern des Aufstandes des griechischen Volkes dargestellt. Im Zentrum des Romans ist ein aufrichtiger und heller Junge Hyperion. Um den Protagonisten zu charakterisieren, ist das wichtigste Ding, dass er ein Kämpfer für das persönliche Glück und das Glück Griechenlands ist. Darum ist er eine Projektion der mythologischen Titanen auf die Gegenwart des Autors, als Deutschland im Niedergang war. Die moralische Entwicklung des Protagonisten zeigt den Prozess, mit dem die alten Ideale durch die neuen ersetzt werden, obwohl sie den traditionellen Mythos nicht wiederholen. Hyperion ist, wie Hölderlin selbst, enttäuscht von seinen Träumen, vom revolutionären Kampf, und für ihn wird das Leben selbst, die Selbstverbesserung und die Einheit mit der Natur die höchste Priorität. Am Ende kommt der Autor jedoch auf die Idee der Liebe, die wichtiger als die umgebende Realität und der wirkliche Kampf ist.

Im Gedicht "Hyperion" überdenkt J. Keats den traditionellen Mythos auch in der romantischen Tradition und setzt in sein Zentrum Hyperion – einen ideologischen und aktiven Führer der Titanen, der sie zum Kampf inspiriert. Der Wechsel des Alten zum Neuen ist das zentrale Motiv des Gedichts, und der Kampf der Titanen wird eine Illustration der grandiosen Idee des historischen Fortschritts. Keats glaubt

an die Notwendigkeit der menschlichen Evolution, um das Ideal absoluter Schönheit und Harmonie zu erreichen. Er glaubt, dass Dichter diesem Ideal am nächsten sind. Keats wiederholt mythologisches Sujet über den Aufstand der Titanen, setzt aber neue Akzente. Der Dichter stellt die Figur von Hyperion in die Mitte und betont die Bedeutung einer Person, die die umgebende Realität verändern kann.

Wie Hölderlin, unterstreicht Keats rebellischen Charakter von Hyperion, seine Kampfbereitschaft, Selbstaufopferung und Kraft des Geistes. Der Autor betont die Notwendigkeit der Veränderung und schafft eine Hymne der Evolution. Für Keats ist der Sturz der Titanen kein tragisches Ende des Kampfes, sondern der Beginn einer neuen Ära, die besser sein wird. Anders als Hölderlin, der sich nach der Vergangenheit sehnt, glaubt Keats, dass die Zukunft glücklich ist. Das heißt, für Hölderlin und für Keats war die Verwendung des antiken Mythos notwendig, um die symbolische Figur von Hyperion – Kämpfer, Revolutionär, starke Persönlichkeit – zu interpretieren. Die Autoren kamen jedoch zu unterschiedlichen Schlussfolgerungen über die Notwendigkeit weiterer Kämpfe.

Daraus können wir schließen, dass die beiden Autoren ihre eigenen Mythen über Hyperion geschaffen haben. Romantische Interpretationen des Mythos wiederholen die mythologische Handlung, betonen die Rolle eines starken Menschen in der Geschichte und verlagern den Fokus der Geschichte auf den Protagonisten.

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DEVELOPMENT OF 3 D OBJECTS OF THE GAME WORLD

Objects in the three-dimensional system of coordinates of the game world are represented by a set of points (so-called vertices) that describe a geometric object. These sets of points are called geometric figures or polygons, and the implementation of the data of these sets is called grids. Working with these grids (loading, managing and converting) is a key process for developing 3D graphics.

After the grids of objects that define the model are loaded, they are converted into memory into coordinates of the game world. To control the grids, vertex texture

builders are created (microprograms are written in the shader programming language). At this stage, coordinates are calculated for the application of texture fragments – raster images, containing information at the pixel level, which will need to be applied to the surfaces defined by the vertices. After that, the geometry of the scene is tuned and it is determined, what gets in the camera's field of vision, and what's left out of it. Rasterization is the process of compressing a three-dimensional scene into a two-dimensional projection of this scene, transforming the coordinates of the game world into two-dimensional coordinates of the screen, the graphics are determined by pixels, not vertices. Surfaces that are not visible in the two-dimensional projection are deleted.

Texturing allows you to apply raster images to the surface fragments and display visual details with less loss of productivity. Multitexturing allows you to show even more details and stylistics by overlaying textures one on top of another, getting the effects of a primer or warm lighting. You can also use shaders for fragments, expanding the illusion to the smallest details, simulating complex lighting effects or adding stylistic visual properties to your 3D objects.

After loading the grid, converting it, rasterizing and texturing, you can apply detailed textures and shadowing effects to the fragments, use the final processing effects in the frame buffer to transfer even more details or stylistic elements, including motion blur caused by object movement, filters and full-frame lighting effects. Often, this converts the frame buffer into a single texture and applies shading to it.

Finally, you can take a frame that is rebuilt in the back buffer or chain of buffers, and send it to the front buffer for display. It appears on the monitor as a single frame of the game, after which the next stage of the drawing cycle begins.

Applications that use Direct2D for graphics can provide higher visual quality than what can be achieved with GDI. Direct2D uses “per-primitive antialiasing” to produce smoother looking curves and lines in rendered content. There is also full support for transparency and alpha blending when rendering 2-D primitives. The integration of rendering on the basis of Direct2D is simplified for developers by interacting with GDI and Direct3D. Applications that render content primarily with GDI, GDI+, or Direct3D, can begin by using Direct2D to render specific areas of their application, and eventually move to a model where rendering is performed primarily via Direct2D, using GDI primarily for plug-ins or legacy extensibility.

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PARONOMASIE IN DEN DEUTCSCHEN UND ENGLISCHEN SPRACHEN

Deutsch und Englisch sind sehr stammverwandt und diese Tatsache kann man auch durch das Wortspiel zurückverfolgen. Da wir in den stammverwandten Sprachen einige umfassende lexikalische Einheiten und Phänomene finden können, ist es klar, dass in einigen Aspekten die Wortspielarten auch interferieren. Gerade dieser Fakt erklärt das Vorhandensein eines solchen Konstruktes wie Paronomasie.

Wenn wir die Studien von Henrik Gottlieb und D. Delabastita [1], die sich mit Einordnung der englischen Paronomasie befassten, und die von Thomas Hartung [2] mit der deutschen Paronomasie, erlauben wir uns die Schlussfolgerung ziehen, dass die Paronomasie in diesen beiden Sprachen die gleiche Struktur hat. Ihre grundlegenden lexikalischen Mittel sind Homonyme (absolute oder Homoformen), Homographe, Homophone und Paronyme. In den beiden Sprachen, nicht nur in der Publizistik sondern auch in der schönen Literatur, begegnen wir der Einspielung der Homophone. Wo *„Meer und Mehr“* ist der Slogan des Bundeslandes Schleswig-Holstein; *„Menschlichkeit kann man nicht in **Kuh**bigmetern messen“*[2, c.24] ist der Slogan einer Farm, *„**Huhn**glaublich lecker“*[2, c. 25] ist der Slogan einer Fastfood-Kette. Hier können wir ein Wort, bestehend aus Homophon, im Deutschen und *„the just**ass** to say“*, *„admiral stratty**jam** and my singlar self-dev**ocean**“* [3] im Englischen (die Aussagen von W. Thackeray´s Buchheld, wo wir auch die Wörter, bestehend aus Homophonen, finden), sehen.

Ebenso aktiv nehmen die Homographe am Wortspiel teil. Zum Beispiel in der Werbung der Nahrungsmittel, wie *„**Inn**iger Genuss“* (Anspielung des Wortes ***Inn**ereien*) und in der Witz wie *„I love you **still** – said a quiet husband to a quarrelling wife“* (*still* kann man wie „bis jetzt“ und „beruhigt“ gleichzeitig übersetzen). Nebenan gehen auch die Homoformen: *„Gar schöne Spiele spiele ich mit dir“* [2, c. 23] im

Deutschen und *„Waiter! What's this? – It's bean soup, sir. – No matter what it's been. What's it now?"* (ein Beispiel, in dem durchspielte Wörter zugleich Homoformen und Homophone sind).

Nicht zahlreich aber nicht weniger interessant sind die Beispiele mit der Teilnahme von Paronymen, die sowohl wie üblich als auch situativ gebildet werden. Z. B., Zu den ersten können wir zum Beispiel folgende zurechnen: *„mehr gunst- als kunstbeflissen"* [2, c. 24] im Deutschen und *„he would be anythink or nothink, to get provisions"* [3] im Englischen (hier ist ein grammatischer Fehler unter Teilnahme von die Paronymen *thing – think*). Und zur gleichen Zeit ein Beispiel des zweiten Typs spielt nicht nur die Wortforme, sondern auch die Bedeutung *„Ich bin doch Zimmermann, aber in die Vorzimmer kann ich mich nicht finden. Ein **Vorzimmer**mann ist halt eine eigene Profession"* [2, c. 24] und *„a bottle of something **extra**ordinary"* (Anspielung des Wortes *ordinary*).

Die Anwendung der einfachen gleichklingenden Wörter zusätzlich zu Homohymen und Paronymen ist auch sehr oft vorhanden: z. B. eine bilinguale Redensart *„Moods sind dufte Beifahrer"* [2, c. 27], wo wir die gleichklingenden Wörter *Duft* deut. – *doof* eng. finden. Die gereimten Wörter sind im Slogan *„Eile mit Weile"*, die auch ein Oxymoron bilden, und im Englischen machen ein Wortspiel selbst die gereimten Konzepte – *Pun is fun.* Manchmal ist das Spiel im situativen Gleichklang: *„Mann, cee'd der gut aus"* (Automodell *KIA Ceed* und Verb *sieht*) oder *„…glaring at him with his i's"* aus den frühen Thackeray (grammatische Fehler *i´s* und Substantiv *eyes*). Situative gleichklingende Wörter finden wir auch in *„WIR GRIECHEN EUCH ALLE"* [2, c. 25] (Slogan vom griechische Fest mit Anspielung auf das Wortes *kriegen*) und *„Looking at this chocolate map of Eastern Europe makes me Hungary"* (Spiel mit *hungry – Hungary*).

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SMART GLASSES – VAUNT

The subject of our interest is the latest technology – smart glasses from the famous company – Intel. It looks like usual corrective glasses without any additional components, such as cameras, displays, controls, microphones or speakers, which can be found in other versions of smart glasses.

All electronic stuffing is concentrated in two small modules in the arch, while the rest of glasses are flexible. In the process of wearing Intel Vaunt, the user sees a stream of information that looks like screened content. But in fact, there is no screen and the information is projected directly onto the retina using a low-power laser. For now, this device can display only simple messages or notifications from smartphones based on Android or iOS devices. The information is transmitted via a Bluetooth wireless connection.

Smart glasses use the technological decision – a low-power VCSEL laser, which outputs a monochrome image with a resolution of 400x150 pixels on the holographic reflective surface on the right lens. The image is reflected from the lens and falls directly onto the retina of our eye. As noted by the developers, users can not be afraid of the fact that the laser will damage their eyes. This is a low-power first-class laser, which does not even need certification. Because the laser is displayed on the retina, the image will always be in focus, even if in normal life the user needs corrective glasses or contact lenses. To start using Intel Vaunt smart glasses, you need to go through a simple procedure. This is necessary in order to display the image in the right place of the eye.

Also it is used an economical Intel processor and several sensors, including an accelerometer and a digital compass. They are needed in order to be able to identify some gestures of the head and the direction of the user's view. In the current version of the glasses there is no microphone, but in the future, it is possible to integrate it, which will allow you to interact with the virtual assistant.

To conclude, we'd like to add that the era of smart glasses has just started and in the future this device will be available to everyone. Meantime, we should only wait for the official presentation of smart glasses that is called Intel Vaunt.

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DEEP LEARNING ALGORITHM DOES AS WELL AS DERMATOLOGISTS IN IDENTIFYING SKIN CANCER

Every year there are about 5.4 million new cases of skin cancer in the world, and the five-year survival rate for melanoma detected in its earliest states is around 97 percent, that drops to approximately 14 percent if it's detected in its latest stages. Early detection could likely have an enormous impact on skin cancer outcomes. In hopes of creating better access to medical care, Stanford researchers have trained an algorithm to diagnose skin cancer [2].

Diagnosing skin cancer begins with a visual examination: a dermatologist looks at the suspicious lesion with the naked eye and with the aid of a dermatoscope, that provides low-level magnification of the skin. If these methods are inconclusive or lead the dermatologist to believe the lesion is cancerous, a biopsy is the next step.

Deep learning has a decades-long history in computer science but it only recently has been applied to visual processing tasks, with great success. The essence of machine learning, including deep learning, is that a computer is trained to figure out a problem rather than having the answers programmed into it.

"We made a very powerful machine learning algorithm that learns from data", said Andre Esteva, co-lead author of the paper and a graduate student in the Thrun lab. "Instead of writing into computer code exactly what to look for, you let the algorithm figure it out" [1].

The algorithm was fed each image as raw pixels with an associated disease label. Compared to other methods for training algorithms, this one requires very little processing or sorting of the images.

The researchers began with an algorithm developed by Google that was already trained to identify 1.28 million images from 1,000 object categories. While it was primed to be able to differentiate cats from dogs, the researchers needed it to know a malignant carcinoma from a benign seborrheic keratosis.

"There's no huge dataset of skin cancer that we can just train our algorithms on, so we had to make our own", said Brett Kuprel, a graduate student in the Thrun lab. "We gathered images from the internet and worked with the medical school to create a nice taxonomy" [1].

Researchers collaborated with dermatologists at Stanford Medicine. Together, this interdisciplinary team worked to classify the hodgepodge of internet images. In

the end, they amassed about 130,000 images of skin lesions representing over 2,000 different diseases.

The algorithm performance was measured through the creation of a sensitivity-specificity curve, where sensitivity represented its ability to identify correctly malignant lesions. It was assessed through three key diagnostic tasks: carcinoma classification, melanoma classification, and melanoma classification when viewed using dermoscopy. In all three tasks, the algorithm matched the performance of the dermatologists with the area under the sensitivity-specificity curve amounting to at least 91 percent of the total area of the graph.

The added advantage of the algorithm is that, unlike a person, the algorithm can be made more or less sensitive, allowing the researchers to tune its response depending on what they want it to assess.

Also, the new technology is being developed by researchers at the University of Waterloo and the Sunnybrook Research Institute, using artificial intelligence (AI) to help to detect melanoma skin cancer.

The AI system – trained using tens of thousands of skin images and their corresponding eumelanin and hemoglobin levels – could initially reduce the number of unnecessary biopsies, a significant health-care cost. It gives doctors objective information on lesion characteristics to help them rule out melanoma. The new system deciphers the levels of biomarker substances in lesions, adding consistent, quantitative information to assessments currently based on appearance alone.

The technology could be available to doctors in the nearest future.

"This could be a very powerful tool for skin cancer clinical decision support", said Alexander Wong, a professor of systems design engineering at Waterloo. "The more interpretable information is, the better the decisions are" [2].

"There can be a huge lag time before doctors even figure out what is going on with the patient", said Wong who is also the Canada Research Chair in Medical Imaging Systems. "Our goal is to shorten that process" [2].

The researchers are hopeful that deep learning could someday contribute to visual diagnosis in many medical fields.

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ACTUAL DEVELOPMENT PROBLEMS OF MODERN INFORMATION TECHNOLOGIES

It is hard to imagine our modern life without information technologies (IT). They surround us everywhere: at home, at work, outdoors. IT do not stand still and, like everything in our world, move on, developing and improving.

Nowadays there are quite a lot of problems in the development of modern information technologies, which invariably affects the level of economic progress of our country.

The first important problem is the training of personnel engaged in IT. In order to obtain qualified specialists, the educational process must be properly organized, centralized, and should be applied using modern technologies. And here we again have a problem – the quality of educational IT [1, p. 50].

Secondly, the actual problems of modern IT include the prevalence of foreign information technologies in this field and a low percentage of our own.

Also it should be noted, that in our country different regions have different degrees of informativeness. And this is the main deterrent to the development of information technology, because a high level of informatization of citizens is a necessary component of social progress.

The next serious problem in the IT is the problem of data insecurity. Today information is considered as a commodity, and this commodity is very easy to steal, modify or destroy [3, p. 49-50]. Modification of information is the most serious crime in the IT field. This entails the changing of the existing information, that causes appreciable damage.

Finally, the lack of personal computers and uneven access to the Internet in various social and economic spheres of our country is one of the most important factors hindering the development of IT. This is due to a lack of funding in this area, as well as a lack of a well-defined organization of general access to the Internet.

All things considered, there are many solutions to all the problems. Information technologies require investments to develop and bring a good economic effect. First, IT sphere should be financed by the state and public and commercial programs for

the effective development of information technology must be established. Second, we must develop our electronic activities using the latest scientific achievements in this field. Another useful suggestion would be to educate highly qualified IT specialists. Also it would be a good idea to toughen legislation in the field of intellectual property security.

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ROBOTS AS AN INTEGRAL PART OF FUTURE EDUCATION

The modern period of the development of our society is characterized by strong influence of computer technologies, which penetrate into all spheres of human activity, especially in education. Today we can see the formation of a new educational system, oriented to entering in the world informational space. This process is accompanied by significant changes in the pedagogical theory and practice, which must be in line with modern technical capabilities and facilitate the harmonious entry of our young generation into the information-oriented society. Computer technologies are intended to become not an additional "make-weight" in education, but an integral part of a holistic educational process, which greatly increases its efficiency.

Until recently robotics was the domain of heavy industry. Today robots replace people in heavy and harmful industries and are popular in areas requiring the most accurate work with micro details. For example, it is robots that assemble Apple hardware. But this world is changing, and in the so-called digital countries (Japan, China, Singapore) robots quite successfully replace human labor in the service sector; the results of experimenters in the field of education are particularly interesting. Thus, a robot- humanoid named Saya teaches children in one primary school in Tokyo [1].

Right from the beginning, NAO**, the new teachers' ally,** has won the hearts of classes and teachers from infant schools through to universities. Like a new learning

tool, he helps students to learn about programming as well as assisting the teachers in holding their students' attention while teaching. Creating a dance or piloting NAO to make him catch objects while analysing his environment makes learning code all the more stimulating, attractive and concrete. Learning to count, tell a story or even to write while having fun becomes all the more fascinating and enthralling with NAO.

Pepper, another well-known robot, released by the same Japanese company as the NAO, is already in use in a variety of industries, and now it also helps teachers of several elementary schools in Singapore within a six-month experiment. Pepper is a human-shaped robot, whose number one quality is his ability to perceive emotions. He is kindly, endearing and surprising. Pepper is the first humanoid robot capable of recognising the principal human emotions and adapting his behaviour to the mood of his interlocutor [2].

The report introduces and compares the use of current robotics kits developed by different companies in Japan for educational purposes (Saya, NAO, Pepper).

My results allow inferring the following advantages of using robots in the educational process:

– robot’s qualities that are extremely well-adapted to the context of special education: he is engaging, predictable, tireless, but also multi-interactive;

– humanoid technological interface which naturally attracts children; it helps to create communication bridges between the child and the people around him;

– robot never tires of repeating instructions; this helps to win the child's trust who will be happy to pursue his efforts;

– transparency and objectivity of the result during the evaluation of acquired knowledge;

– robot is devoid of emotional instability, inherent for a human teacher, protected from the consequences of "emotional burnout syndrome";

– through touch, voice or vision, robot offers an extremely wide range of possible interactions.

Particular attention should be paid to the fact that work with special software for robots has the qualities that are extremely well-adapted to the context of special education for children and adolescents with disabilities: it is easy to interpret, how these robots provide information, what helps to reduce the children's anxiety and minimises the risks of over-stimulation.

In addition, robots are especially effective when we speak about individual learning. I can convince that distance learning will become more popular in the coming years, because people, especially teens, are already used to do everything online.

So, education has changed enough in the past few years that we all know how little we can predict how it will look like in five or ten. We do know that we can expect many of technologies that are starting to trickle now to become more affordable and potentially become larger components of everyday education.

In Ukraine at the moment robots work in companies with foreign investments, such as Henkel, Phillip Morris, Procter&Gamble, but we can definitely say that in the next 10 years robots will be used in Ukraine not only in the "heavy" sectors. They will do their job in customer service quite successfully, too!

Undoubtedly, robots would not replace teachers completely (there is no point in it), but the benefits, which they bring, and the potential damage, which they may cause, have already become the reality of progressive educational systems in the world.

Robots have already made their mark in education and will continue to do so.

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NEW-OLD ELECTRIC VEHICLES

Electric car is a real paradox on the wheels. With the efforts of advertisers it acquired a cult status. The ability to charge your car from outlet is perceived by people, as an invention of a perpetual motion machine announcing the close of the gasoline era. Actually, a battery-powered car is a really ancient development. It makes a conventional internal combustion engine looks new. The first electric vehicle was created in 1841. In the early twentieth century the heyday of this technology happened, but almost immediately it went out. The reason was that the electrical engine was not able to reach energy density what normal engine produced. The deterioration of the environment pushed people to invest money in the electric engine development. And now we can say confidently that the situation is changing.

Electric vehicles began to fill up the automotive market all over the world. Firstly, invested money helped inventors to make batteries, which can be compared with gasoline tanks. Secondly, the simple construction of electric cars gives you

the opportunity to make the repair cheaper and easier. The other advantages are the reduce of noise of these cars and the ability to drive easier. And the main advantage for people is that electric vehicles do not pollute the atmosphere.

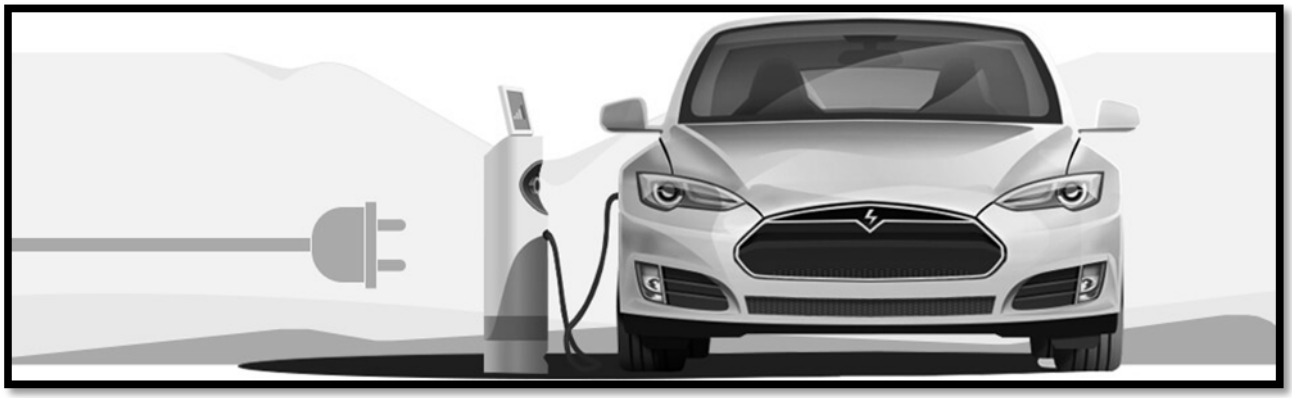

Fig. 1. Electric car on charge

Also there are some disadvanteges of electric cars: they cost much more than normal vehicles. Mileage on one charge is bounded and it is usually less than common car rides, but it is not the main problem. The charging time of electric cars is unrealistically large. Without fast charges it can be 8 hours or even more, but even with fast charges it takes about 30 minutes. One more problem is the poorly developed infrastructure of charges which will put limits for the range of trips.

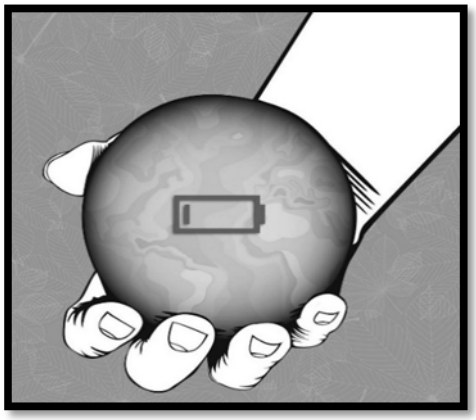

Fig. 2. Agitation poster «Save the planet!»

Despite this, electric vehicles are rapidly gaining popularity. The governments of many countries encourage people to buy electric vehicles by giving them privileges.

Now it is fashionable to own an electric car. It is becoming a trend, but we do not need to fall in electric vehicles. We need to remember how electricity is produced. Together with the transitions to electric vehicles we must also switch to safe alternative sourses of energy to save our planet and people from extinction.

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FEATURES OF THE DEVELOPMENT SITE WITH ASP.NET MVC FRAMEWORK

ASP.NET MVC is an alternative to Web Forms technology, which uses a different approach to the problem of structuring Web applications. The basis of technology is the definition of controllers, actions and views.

Model.

• the model is the business logic of the application;

• the model has knowledge about itself and does not know about controllers and views;

• for some projects, the model is just a data layer (DAO, database, XML file);

•for other projects, the model is a database manager, a set of objects, or just application logic.

View.

The duty of the view is to display the data received from the model. However, the view cannot directly affect the model.

• in the view display of data that obtained from the model in any way realized;

• the view, in some cases, can have code that implements some kind of business logic.

View examples: HTML page, WPF form, Windows Form.

Controller.

The controller converts the user's actions (in this context, the user-not necessarily the person) to the incoming parameters for the model and transfers control to the model:

• loads environment variables (POST / GET variables, command line parameters, URL parameters, etc.);

• performs initial processing of environment variables (checking the types of variables, their presence, setting the default values, etc.);

• implements mechanisms of control over extraordinary situations;

• implements logging mechanisms (not authentication, but journaling).

The sequence of development of the site using MVC technology.

The architecture of the product defined; the general scheme of interaction of the program layers is developed.

1. A layer of a server that contains the interfaces of user and administrative forms, their controllers.

2. Repository, which contains an interface with a set of common CRUD operations and a class with their implementation.

3. The DAL layer in which the database created, through the Entity Framework.

4. A layer of business logic that implements the basic functionality for the model layer.

5. Layer of models, which are an intermediate layer between the database and business logic.

The MVC template allows you to separate the responsibilities and each developer can write one separate component, thanks to this logic, the flexibility of this design pattern created.

To develop an application, you need to install a set of tools needed for development: EntityFramework, jQuery,

Microsoft.AspNet.Identity.EntityFramework, Microsoft.Owin.

A class created. The model is an ordinary class. As already mentioned above, all basic logic work takes place in the model, ready-made data transferred to the views through the controllers.

A controller class created. Controller is a class that has methods that respond to HTTP requests sent to the website. Controller's name and method's name are parts of the web address, for example: http: // domen / home (controller) / index (method).

As representations are files with the extension .cshtml with the Razor handler, which allows to harmoniously embed .NET language code in the html code. The Razor syntax is based on the @ sign, followed by the code transition in C #. It is also possible to use third-party engines for submissions. The .cshtml files in the process of generating a response by the controller compiled into classes, from which a page with a clean html code then created.

The ASP.NET MVC platform allows you to create sites with loosely coupled layers. This makes it possible to program each layer independently from each other, thus facilitating the work of developers, allowing you to concentrate on a specific task.

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TOPICAL CYBERSECURITY PROBLEMS IN UKRAINE

In the past few years, the problem of cybersecurity in Ukraine has become urgent. From May 2014 to January 2016, there were 3 cyberattacks on infrastructure power facilities of Ukraine [1]. As a result of cyberattacks, on December 23, 2015, in Prykarpattya, Kyiv and Chernivtsi regions 220,000 consumers had been without electricity (about 1% of the total energy consumption of the country).

Insufficient level of cyber security of Ukraine's infrastructure energy facilities was caused by the lack of separation of authorization, the physical connection of critical systems to the Internet, insufficient information security monitoring, outdated vulnerable software, weakness of the used password systems [2].

Every day cybersecurity specialists are becoming more demanded in Ukraine. The prerequisite for the violation of the information system protection was the lack of a single statewide system for countering cybercrime and a single normative document that would clearly define the basic concepts and differentiates the areas of responsibility of state structures in the field of cybersecurity [3]. Changes in software technologies and the complexity of algorithms have led to the emergence of cyber threats of a new level [4]. Developing guidelines for confronting and responding to cyberattacks and providing assistance from state in eliminating offenders from networks [5] are the main stages of the subsequent work with the results of a security breach of the system.

From the technological side one of the solutions of the cybersecurity problem in Ukraine can be the information security monitoring and the introduction of the necessary separation of networks, which isolates critical systems from the Internet.

Non-technical solutions of the cybersecurity problem can be the introduction of international standards for the data protection to replace an inefficient integrated system, training of students in accordance with professional standards, the recognition of international professional certification, assistance between the authorities, the professional community and business on cybersecurity.

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ON SPECIFIC OF FUNCTIONAL PROGRAMMING FOR ANDROID APPLICATIONS

Software applications keep getting more complicated. And developers face the challenge to build, test, maintain, and scale complex systems more rapidly. Despite several variations, the method to resolve the complex problem is as follows: breaking the problem down into a set of smaller sub-tasks, solving them using functional blocks, and finally combine them together getting the end result. There are different ways and metaphors used to make the method work: structural and objective-oriented analysis and programming, aspect oriented, functional and logical approaches. The use of the paradigm or metaphor depends on the specific of mapping the task onto the set of structures and flows the paradigm provides. For example, once we have a task of building IT-infrastructure for a complex real-life domain, it is easier to map the task into a set of objects communicating with each other, thinking about the solution as a simulator of the real-life process. But when we have a data flow with a set of data transformers worked concurrently, we will find that it is difficult to apply OOA effectively. Of course, we are sure that the complex problem (e.g. distributed information system) can only be solved by the combination of paradigms using different tools.

Today, as usual the developer of mobile applications has the tasks which can be easily represented as a network of functional blocks (data-flow model with many concurrent flows), and, accordingly, the use of functional programming paradigm regarded as inevitable. Another cause made functional programming so popular is the CPU cores speed, the processors are not getting faster every year like they used to (Moore’s law [1]) and it also makes programmers to develop concurrent programs taking the advantages of multi-core architectures. The paradigm is focused on: declarative code (high-level description of coarsegrained tasks letting the compiler and/or runtime worry about how to perform the code effectively);

explicitness – the code should be as obvious as possible; data flow and error handling are explicitly defined avoiding GOTO and Exceptions statements; concurrency – most functional code is concurrent by default because of a concept known as functional purity. Next, using higher order functions that is the functions are first class members just like all the other language primitives. Developer can pass functions around just like you would a string or an integer number; immutability – variables are not to be modified once they're initialized. Once a thing is created, it is that thing forever. If you want it to change, you create a new thing. This is another aspect of explicitness and avoiding side effects. If you know that a thing cannot change, you have much more confidence about its state when you use it.

The most popular and widely used language for Android Development is Java. Of course, it is possible to build Java-applications using functional programming paradigm, but it has some disadvantages for Android developers: null-ability issues, inability to add methods to platform API's and plenty of boilerplate. The tech industry is focused on building of development new languages and tools that can support more complex solutions and can be scaled easily. Over the last few years we have seen a surge in new programming languages. One of them is Kotlin. Kotlin is a new programming language targeting JVM, Android and even JavaScript from JetBrains. Kotlin has many useful features that make development process more effective [2].

Kotlin comes with null-safety system which helps to catch null pointer exceptions during compile time. By default, every variable is treated as non-null unless we tell the compiler that it is a null variable using a special operator "?" at the end of the variable type. Using this null variable in further code will also cause the compile-time error. The compiler is smart enough to understand that we are using an object which can be null-able hence it shows compile time error. Functions can exist outside of classes, and there is no need to stuff your functions as static members of classes.

Adding data annotation (attributes in .NET platform) to a class triggers auto generation of a boilerplate like equals, hashCode, to String etc., providing convenient immutable classes without using of external mechanisms such as builders etc.

Kotlin assumes that all exceptions are unchecked which means there is no need to add exceptions declaration to method signature (as in Java). For example, NullPointerException, which can be thrown anywhere. If it was a checked exception, literally every function would need to declare it. In Kotlin, since all

exceptions are unchecked, they never declared within function signature. Real properties mechanism allows generating getFoo/setFoo methods without their explicit declaration.

Functional programming supports lambda expressions [3] with ability to do mapping and folding with standard Java collections. The Kotlin type system distinguishes between mutable and immutable views over collections. Extension functions let you add methods to classes without modifying their source code, letting build powerful language extensions and integrate existing Java APIs with other Kotlin features. Operators overriding mechanism reduces the complexity of code, mapping existed operators, including function invocation, to special method names.

Considering the ever-growing complexity of software applications, this approach allows to make source code simpler and understandable, increase reusability and maintainability of components, reduce the development time of applications development.

Kotlin is provided as a multi-paradigm language designed to be easy to use and extremely productive (e.g. 50 lines of POJO Java class can be automatically converted into single line of code in Kotlin). It brings to the Java world a plenty of features making the development and maintenance of mobile applications easier.

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STIRLING ENGINE IN THE HEATING SYSTEMS

At present, the gravitational circuit for supplying the heat carrier (*heating system with natural circulation*) is widely used in the heating systems of private houses. However, it is extremely inconvenient, cumbersome and difficult to build. Gradually, this type of system displaces a more convenient and less complicated construction scheme, using a circulating pump for transferring the coolant in the circuit (*forced circulation system*). The advantages of such a system include the fact that its operation requires a smaller volume of coolant and, accordingly, pipelines of smaller diameter, too [1].

The power of circulating pumps, which are used in modern boilers, is about 100 W. To operate the pump, it is necessary to expend electrical energy. In most boilers, the circulation pump receives power from the 220 W network. This leads to additional costs, which are related to the power consumption. In order to abandon the power supply, it is proposed to use the Stirling engine as a circulation pump drive.

In the course of the calculations, two possible schemes for switching on the Stirling engine are considered.

The first scheme involves placing the Stirling engine heater in the area of supply of the heat carrier heated in the boiler, and the cooler in the return region of the heat carrier. The efficiency of the Stirling engine can be determined by the efficiency formula (1) for the Carnot cycle [2]:

$$\dot{\eta} = \frac{T_1 - T_2}{T_1}, \quad (1)$$

where T_1 is the temperature of the heater, T_2 is the refrigerator temperature, ή is the engine efficiency.

The flow temperature of the coolant in modern solid fuel boilers ranges from 343K to 363K. The return temperature should be at least 333K, to avoid condensation. ΔT is usually set within 15K. We take T_1= 353K, T_2 = 338K. Then, (2):

$$\dot{\eta} = \frac{T_1 - T_2}{T_1} = \frac{353 - 338}{353} = 0{,}04 = 4\%$$

the second scheme of the engine installation assumes placing the engine heater in the furnace area, and the refrigerator in the return area of the coolant.

The temperature in the furnace of a solid fuel boiler depends on many factors, such as the type of fuel, the technical characteristics of the boiler, etc. For calculations, the average temperature (T_1= 1073K, T_2 = 338K) has been taken. Then, (3):

$$\dot{\eta} = \frac{T_1 - T_2}{T_1} = \frac{1073 - 338}{1073} = 0{,}68 = 68\%.$$

From the foregoing description, it can be concluded that the second scheme for switching the Stirling engine into the solid fuel boiler is much more efficient than the first one.

Thus, the use of the Stirling engine increases the energy efficiency of the solid fuel boiler, allowing the electric circulating pump to be abandoned. This solution can be used in the design of heating systems.

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ANALYSIS OF EFFICIENCY OF THE MLAT SYSTEM USE FOR AIR SPACE CONTROL IN AIRPORTS

The airspace control services are responsible not only for the safe airspace, they are to the constantly expand the air traffic network. As the result, a radar can not keep up with the growing demand [1–3].

In order to increase efficiency, rationalize operations, minimize infrastructure costs and, most importantly, increase security, modern world tries to escape from deviated from traditional radars and looks towards new technologies: MLAT and ADS-B.

At some airports around the world there are some problems with air traffic control around the terminal due to obstacles caused by difficult terrain that can block signals from aircraft objects. This problem faced the authorities, for example, in Innsbruck, Austria and the Czech Republic [4].

Installation, maintenance and use of the MLAT system will be not only cheaper, but will also ensure optimal coverage of the terminal and will be able to increase speed and accuracy necessary data processing for air traffic control.

For example, Airservices Australia wanted to provide air traffic control over Tasmania. The area of the island is about 23,000 square kilometers, ranging from sea level to mountainous terrain. Economic calculations have shown that in order to ensure reliable and efficient airspace control, the need for funds is about $ 3 million, including equipment, land acquisition, installation and maintenance.

The analysis demonstrated that one and the same coverage can be obtained from 19 strategically located MLAT modules, which work out from solar-powered batteries. The total cost of equipment using MLAT was significantly lower than with standard radar. The installation and commissioning of this equipment is in process [4].

Multilateration systems are successfully used for surveillance at airports for a long time. Such system is a multi-position passive (or passively active) radar, which consists of several receiving devices, processing devices and controlling responder. Multilateration or hyperbolic positioning is a process of determining

the position based on the difference in time of arrival (Time Difference of Arrival (TDOA)) of the signal emitted by the object towards three or more receivers [1].

The subject of the research is 4 MLAT- devices located at Zhulyany airport.

It should be noted that in the general requirements for the system, only the mean square error of the determination of the horizontal position was set, which in the Zhulyany airport zone should not be more than 25 m.

The conducted analysis demonstrated, that to achieve the geometric component of the error in the operation of the system in a passive mode, without the use of the function of measuring range of the target did not exceed 25 m is possible only with the accuracy of synchronization of more than 0.04 ns. Such precision of synchronization of stacks is hardly achievable.

But the system has the other, effective way to improve the accuracy of the air object location. This is an active mode when the receiver determines the distance to the target in the same way as the secondary surveillance radar (SSR) does.

MLAT systems can be divided into active and passive. The passive system includes only receivers, and the active system has one or more transmitting antennas for the request of the onboard transponder. The main advantage of the active system is that it does not depend on other sources of data transfer from the aircraft. Its main disadvantage is due to the fact that it creates additional obstacles on the channels of 1030 MHz and 1090 MHz.

The results of calculating the accuracy circuits under the active mode of operation of the MLAT system from the four receiving devices indicate that the error does not exceed the value of the mean square error of the determination of the horizontal position = 20 m, that is, the system requirements are more than enough fulfilled.

The conducted analysis of the efficiency of the MLAT system use installed at the airport Zhulyany (Kiev) proved that to ensure the specified accuracy, it is necessary to use the active mode of operation of the system, that is, an additional determination of range.

Automatic Dependent Surveillance in Radio Broadcasting (ADS-B) will be one of the key elements of the future air traffic management system. However, widespread implementation should not be expected till 2020-2025.

One of the main reasons not to use these systems is the significant cost of aircraft equipment with all the necessary aeronautical equipment for the transmission and reception of ADS-B information. Moreover, the slow transition period is complicated by the fact that ADS-B and Radar Systems use very different technologies.

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COMPUTER SIMULATING AND PROCESSING OF RADIO-IMAGES FOR MICROWAVE INTROSCOPY PROBLEMS

The development and implementation of information technologies for solving the problems of introscopy are sufficiently relevant. Recently, there have been promising prospects in the development of instrument-computer systems for introscopy. Particularly successful is their implementation for the introduction of non-invasive methods of remote introscopy, based on remote sensing with waves of different nature. The use of digital processing of primary transducers data promotes sufficient improvements in sensitivity, resolution and transition to the new ranges, which were not used before [1]. The use of remote sensing methods in the microwave range, which gives significant advantages over other ranges of electromagnetic waves, has been implemented [2].

For registration of the reflection signal from detected inclusion in the object under test, a waveguide reflectometric measuring transducer, connected to a probing antenna, can be used. As previous examinations have shown, performing spatial scanning and conducting broadband measurements with such a probe, using appropriate digital processing, make possible to realize microwave visualization of the internal structure of the analyzed objects. Wherein, it was found out that the resolution of such visualization in depth is limited by the measurement bandwidth. This factor is determined by the frequency characteristics of the measuring tract, the key element of which is a probing antenna. To analyze the influence of this factor, computer simulation of the measuring tract has been made and radio-images for the considered problems of microwave introscopy have been simulated.

This simulation was carried out in the HFSS software environment, while it was controlled from the MATLAB software environment. Based on the model of

the measuring tract, created in the HFSS, the simulating of radio-images for several test objects was made. The radio-image has been obtained by transverse scanning of the object under test in the form of the set of frequency dependencies of the reflection coefficient for several fixed antenna locations, relative to the object. Further processing was performed in the MATLAB software environment and was concluded in the synthesis of the longitudinal reflection profile from the object by using the Fourier transform. Using this focused radio-image, the conclusions about the internal structure of the object and the defects or inclusions in this object have been made.

To manage HFSS from MATLAB, we used cross-platform app communication technology COM-automation, which is implemented as a corresponding interface of HFSS, supporting script engine in software environment. In this case, MATLAB acted as an OLE automation controller, and HFSS – as an OLE automation server (external, because it runs in a separate address space, and sometimes on another computer in the network). For realization of this approach the OLE-automation was used. OLE-automation is a COM-based technology, which allows the application server program (HFSS) to make its services available for application by other client programs (MATLAB) by using dispinterfaces. The HFSS software environment publishes an interface through which the client program (MATLAB) can configure the desired properties of the object. Since the COM standard is based on a single format for the table which describes references to object methods, this interface is available for compiling languages and can also be used with MATLAB software. To support the interpreter (like MATLAB), OLE Automation technology, which allows applications to make their functionality accessible to a larger number of clients, was used.

Using the created software, several designs of the measuring tract were simulated, and for each case radio-images of the test object were obtained. As a result of the conducted examinations, it was possible to find a design of the probe with the help of which the reflection from it in the wide frequency band was significantly diminished, providing the possibility to enlarge the resolution of the microwave introscopy in depth.

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BLIZZARD INTERNSHIPS

Nowadays, lots of students are strongly concerned about their future. Almost no one knows what to do after you graduate from university. Thankfully, lots of companies offer internships and Blizzard is one of them.

Blizzard Internship allows students to work directly with development teams and business operations departments to gain hands-on experience. For 12 paid weeks every summer, interns embed themselves with Blizzard teams to learn, collaborate, and contribute to the intensity and fun of creating epic entertainment.

To become a Blizzard Intern, you must be:

- Currently studying in a college or university,
- Returning to school upon completion of the internship,
- Eligible to work in the US.

You can still apply if you are an international student. Blizzard will consider international students under the F-1 visa with the necessary work authorization documents.

Blizzard offers you different kinds of internships such as:

- 3D art,
- Programming,
- Animation,
- Quality assurance,
- Design,
- Finance,
- Business intelligence,
- Community sphere.

Nevertheless, kinds of internships vary from year to year.

Blizzard offers internships in Irvine, California and Austin. Also, company provides housing for non-local interns including foreigners.

Applying to multiple roles is not only allowed, it is strongly recommended. Applying to each role that you are interested in is possible. Increase your chances by adding your application for each position you apply to [1].

Blizzard is interested in students who have been using their educational opportunities and networks to develop creative content related to the internship role they are applying to. Be sure to include your personal projects, involvement in student

group projects, and/or any other creative ways you have demonstrated your ability to produce quality content.

For business operations interns, Blizzard looks for individuals with a strong understanding and a passion for the discipline, and the ability to apply it in a fast-paced entertainment industry. Blizzard are looking for students who are highly organized, possess excellent communication skills, and have strong business acumen.

Historically, the majority of Blizzard interns have been juniors in college; however, company would never turn away a talented freshman or sophomore. Company also welcomes Masters and PhD students into the program.

After you submit an application, you have to wait patiently while Blizzard reviews every single application. You may have to hang tight for several weeks. In the meantime, you can connect with Blizzard on LinkedIn and follow company on Twitter (@BlizzardCareers) to stay on top of the latest updates.[2]

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DEEP LEARNING IN TRANSLATIONS

Over the last few years, data-intensive machine-learning techniques have made dramatic strides in recognition of speech and image analyzing. Now these methods are making significant advances on another long-standing challenge: translation of written text between languages.

Every day we use different technologies without even knowing how exactly they work. In fact, it’s not very easy to understand engines powered by machine learning.

Years ago, it was very time consuming to translate the text from an unknown language. Using simple vocabularies with word-for-word translation was hard for two reasons: 1) the reader had to know the grammar rules and 2) needed to keep in mind all language versions while translating the whole sentence [1].

Modern translators alongside with Google Translate, as the more popular one, are all about Deep Learning, which isn't a technology we have completely mastered. Multiple layers of simple elements are used by the system. They are extensively interconnected like ones in the brain, which is the reason they are called "neural networks". Individual elements typically combine the outputs of many other elements that have variable weights, and then determine their own output.

In analyzing an image, for example, initial layers might compare nearby pixels to identify lines or other primitive features, while deeper layers flag progressively more complex combinations of features, until the final object is classified as, say, a cat. The challenge is to set the parameters for a particular task by exposing the system to a large series of inputs whose desired outputs are known, and sequentially adjusting the parameters to reduce any discrepancies. After such "training" with known examples, the network can quickly extract high-level information from a novel low-level representation. With a large enough set of examples, this training can be done without even specifying which exact features are required for classification.

Most implementations of translation employ two neural networks. The first, called the encoder, processes input text from one language to create an evolving fixed-length vector representation of the evolving input. A second "decoder" network monitors this vector to produce text in a different language. Typically, the encoder and decoder are trained as a pair for each choice of source and target language [2].

The separation of the encoder for one language from the decoder for the other language raises an intriguing question about the vector that passes information between the two ones. As Google put "the system learning is a common representation in which sentences with the same meaning are represented in similar ways regardless of language – i.e., an 'interlingua'. This possibility is reminiscent of the universal language envisioned by 17th-century polymath Gottfried Leibniz for formally denoting philosophical, mathematical, and scientific concepts.

Translations are definitely more difficult between languages from different families. Arabic, for example, relies heavily on word endings to convey meanings, so "the concept of a word" is not the same as in English. Goldberg noted the challenge arising from free word order in Hebrew. In these cases, preprocessing of the text, for example dividing Arabic words into multiple segments to facilitate mapping between languages, can significantly improve translation.

A remaining question is how good neural systems can get at translation without exploiting traditional expert knowledge. Knowing something about language in general, or properties of linguistic structure, definitely does help in the translation.

But the powerful new systems are continually challenging the importance of expertise. First in speech recognition, then in image processing, and now in natural-language understanding and translation in particular, it is really a revolution. It's an incredibly short time for going from blue-sky research to industry standard. All the large companies that have big language translation services are basically using neural nets.

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HUMANS VALUES IN THE INFORMATION AGE

Nowadays, the world is changing quicker than ever before. There are changes in our lives, our behaviour and our values. In most cases the most important value to us is love and there is almost no place to exist for this feeling except relationships.

A new way in relationships – virtual communication has come with new technologies. It is a very wide concept, but the most known and uncertain point of it is online dating services. About 40 million Americans use online dating sites [1] and every year this number is growing. This trend is not a nightmare. 19% of brides said they had met their spouses online and what is great, these couple are less likely to break off within the first year and in general stay together longer.

So is it an ideal way to find a new partner? Not at all. There are bots in the Internet and they have been there almost since appearance of web. But with technology of Big Data they became more similar to real people. Now they sometimes can not be distinguished from a real person.

In January, the police of China closed down mobile apps, associated with 21 companies and arrested more than 600 suspects operating across 13 provinces, after discovering that messages from some women were being automatically generated by computer programmes. More incredible is the fact that tens of thousands of people are believed to have been conned out of a total sum of one billion yuan ($154 m).

Religion has also been affected by new technologies. For instance, a catholic church in Paris began to collect donation via NFC-technologies, so now people there need only their cards to donate.

What is more unusual, the man named D. J. Soto started to preach in virtual reality [2]. As he was a pastor in reality he had not met any atheist at his church service but he attracts a lot of them to his services. After ten months of preaching he founded VR Church and the community began to form around it. Now he is creating a system of churches in virtual reality. In some ways, it is not something unexpected. Most of the first printed books were religious. In the last century, many people had been attracted by the radio and a TV to the Christians. There is nothing unusual now when some church has a web-site or stream. Current pope has more than 15 million followers on Twitter. About half of Americans are accessing religious content via web.

As internet touches lives of people and also influences their deaths. Nowadays, Facebook has 2.2 billion monthly active users and this number have been increasing with the rate of about 200 million per year for about 10 years. But with active users Facebook is also filled with non-active accounts of pages of dead people. Several million users die every year and now this number has reached a point of 30 million. It is bigger than total population of Australia and New Zealand. It was predicted that between 2065 and 2130 the dead will outnumber the alive.

Some services as Digital Beyond, MyGoodbyeMessage, Dead Social allow you to do a several afterlife actions such as posting messages during years after death, notification your friends and family, keeping your account clear of spam and so on.

One of the options sounds like a dark Sci-Fi a la Black Mirror episode. It is about using Big Data such as logs of messaging of dead person in social network to create a chat bot which can communicate with you as he/she used to do. One of the most successful project is Replika which was created as a reaction to dead founder`s friend

Summing up, we must ask ourselves what future will bring to us: either AI instead of future partners, a church without any building of church and half-cemetery social networks or stronger relationships, religion for everyone and afterlife rest? Only time will tell.

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THE POTENTIAL OF WIND ENERGY IN UKRAINE

Ukraine possesses significant amount of wind energy resources and due to its geographical location, it can reach one of the leading places in the world for wind energy utilization [1].

Wind-power engineering is a branch of energetics that studies conversion of the air masses kinetic energy into mechanical, electrical or its other useful forms. The wind regime on the territory of Ukraine is influenced by the Atlantic and Arctic Oceans. The wind energy is distributed extremely unevenly on the territory of Ukraine, so the wind potential in the south of the country is much higher than in the north. The most favorable regions are the Carpathians, the coast of the Black and Azov Seas as well as Lugansk region [2].

Currently, there is a rapid development of the wind-power industry in Ukraine. There are 16 wind farms in the country at the moment. Almost a third of the wind energy (90 MW) is produced in Zaporizhia region, slightly less in the Crimea (about 86 MW) and in Donetsk region (83 MW) [1].

Wind-power engineering corresponds to all the conditions that are necessary for its inclusion in environmentally friendly methods of energy production because its main advantages are:

- it is a renewable, inexhaustible source of energy;
- it has minimal losses during the energy transmission;
- it has quick installation, low expenditure on its maintenance.

Despite all the advantages, windmills have serious drawbacks, too. Their work efficiency depends on the weather, so on windless days or when the wind is very strong – windmills will not work [2]. They also have a number of other drawbacks, but they are not so significant [1]:

- high investment costs;
- a variability of power with respect to time;
- noise;
- a threat to birds;
- landscape changes.

Having mentioned all the above, it can be stated that today it is difficult to imagine our life without electricity, however the energy of all its kinds, and the wind energy in particular, is and will be needed to the humanity – people need the electricity as much as water and air [3], but the reasons of its use can be different: in our every-day life, industrial production, heating, illumination and transport systems.

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THE PROBLEM OF PROTECTING INFORMATION SENT VIA THE INTERNET

Information security is a complex of legal, organizational and technical measures and activities to prevent threats to information security and eliminate their consequences in the process of collecting, storing, processing and transferring information in information systems [1].

The problem of protecting information from making changes to it by unauthorized persons, preserving the secrets of information, especially when transfer via the Internet, will never cease to be relevant.

The are many reasons for the leakage of information and the implementation of unauthorized access to it in the Internet: software errors, actions by unauthorized persons (accidental or intentional), force majeure.

Generally, security measures focus at preventing unauthorized persons from accessing in it.

There are any different approaches to achieve above: data encryption, using of certificates of authenticity, using of a checksum, etc. [2]

When you need to ensure a high level of protection or prevent the interception of secret information, Netscape Communications has created an SSL protocol that allows you to transfer encrypted information over unclassified channels, a significant exchange between two applications that work remotely. [3]

To hide the fact of the connection between the client and the server, although without ensuring the integrity of the transmitted data, nowadays it is expedient to use Tor (The Onion Router) – free and open source software for the implementation of the second generation of so-called onion routing. This is a proxy server system that

allows you to establish an anonymous network connection that is protected from listening [4].

However, to maintain a high level of security, protection of communications is required. It is also important to encrypt the files transferred via Tor through their packaging into cryptographic containers and use steganography. [5]

To prevent the deprivation of information in the Internet network we can combine technologies SSL and Tor with additional concealment of information using encryption.

Algorithm of the proposed approach:

1. The session of data transfer begins with the fact that it establishes a connection through a series of anonymous protocol nodes. Tor, which additionally encrypt the information on each of the nodes with a key known only through the present one. (At all stages, the SSL certificate is used additionally).

2. The receiver initiates the request to the sender, and the sender sends a randomly generated key, which will encrypt the information later.

3. The receiver receives the key and generates, using asymmetric encryption, private keys (for decryption) and public keys (for encryption) and then sends them to the sender.

4. The sender receives a public key, adds his own key to it, encrypts the data and sends it to the recipient. Now the recipient can combine his private key and the key obtained at initiation request to decrypt the information. This concludes the session.

The proposed combined algorithm has a greater degree of information security during possible data stealing, but in the process of overcoming the computational complexity of the algorithm, it has a low speed.

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TECHNOLOGY OF CONTENT FILTRATION AS AN INTEGRATED CONTROL OF INTERNET SOURCES

Today Internet is the main source of information for millions of people, as well as a business tool for many companies all over the world.

The uncontrolled emission of the Internet provides its global usage, but at the same time, it causes the number of global problems with serious consequences.

The main problems are [1]:

1. Internet – the main source for distribution of harmful mobile code (software virus, internet worm, Trojan etc.).

2. Worldwide network – the way through which the attacks on individual servers, organization local area networks and computers can be made. Many internet sources have different program codes: JavaScript, Flash, ActiveX etc. Intruders can use this code to make attacks on corporate networks and custom workplaces. Modern IT structural types are subjected to a large number of attacks, the actual ones are:

- Fishing – the way of intercepting passwords, credit card numbers, etc. with the help of social engineering techniques;

- Spyware & Malware – the way of data intercepting and establishing the control over the computer; viruses and other harmful codes;

- SPAM/SPIM – unwanted messages, which clog up the e-mail; the leak of business information that can cause irreparable damage to the company.

3. Internet – is a mean of hidden access into corporate local area networks.

4. Internet – is one of the main sources of confidential information leakage.

5. Uncontrolled Internet usage decreases the work productiveness, because, mostly, the staff spends working hours for online shopping, searching the net and playing computer games.

6. Non-controlled use of the Internet reduces the network capacity because the majority of staff uses its organizational assets to watch movies, listening to music, playing games and downloading the files with the big volume (multimedia files: graphics, music files, movies etc.), this creates a significant load on local area networks.

In order to avoid the problems mentioned above and to provide the flexible control over the use of Internet resources companies must have necessary tools to implement a resource use policy.

An objective need has caused the emergence of a large number of software products aimed at protecting against the above-mentioned threats.

However, on practise, the most effective are the ways of control informational traffic by using the technology of content filtration (from Eng. “content filtering”). Also in sources it can be named as – “content filtering”, “technology of control the content of information exchange” etc., all these terms mean the same [2, c. 136].

Under the “content”, we understand the actual filling of the website and in the broadest sense, it is any kind of data in electric form.

Content can be explicit and implicit, and actually implicit content poses the greatest threat.

The method of content filtration can be used after all basic security measures were implemented.

IT-market offers 3 main options of filtering the content of information exchange of Internet channels: 1) firewalls, intrusion detection systems, proxy servers, routers and similar filtering devices; 2) antivirus programs; 3) e-mail monitoring systems, Webtraffic control tools, antispam filters, antispyware programs, etc. First and Second type means are not intended to control information content when transmitting information on the Internet. They filter traffic at the network and transport levels, while third type means implement the filtration at the applicative level. The most adequate level of threats present day is the gateway (server) means of content filtration.

For instance, we can analyze the Web-traffic filtration to provide the information security. During the Web-traffic filtration it is important to prevent the leakage of confidential information, to monitor suspicious and forbidden activity of users, protection against attacks with the help of social engineering tools (phishing/pharming), protection against viruses and spam, and protection against spyware software [2, 140].

There are special software controls of traffic:

1. TMeter – it uses the URL-filtration technology of the websites, its main point is to analyze the content of each network packet [3].

2. Lan2net NAT Firewall – software firewall which is used to organize secure Internet access and has network protection functions, site filtration, monitoring and traffic metering, blocking access to sites, which is realized through the filtering mechanism of sites by URL and IP [4].

3. Kerio WinRoute. This issue consists of several components: firewall with NAT functions, proxy and VPN server, antivirus module, load distribution, P2P traffic blocking and others.

4. SurfAnalyzer – this program, works like a mediator between the Internet and the consumer, passes through all the traffic, so with the help of this program it's easy

to control uploading files with certain extensions (.exe, .com, .zip etc.), attachments in e-mail, filter IM messages and block certain types of sites [5].

5. BitTally. The traffic accounting program provides the user with the information about Web-server-surfing in terms of users, and categories of domains of countries. The program generates traffic reports, which are divided into users and groups of users reports, protocols and groups of protocols, destination networks and countries – traffic accounting is conducted with the automatic identification of all these data.

In this article, we have examined only several special software tools, which can be used to create filtration systems in global and local networks in data trancfering.

In addition, it was considered only the basic parameters that allow configuring acsess to the Internet and paying attention to the ways of unwanted network traffic filtration.

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DEVELOPMENT OF 3D PRINTING TECHNOLOGY AND ITS BENEFITS

Recently, the term “3D printer” has constantly been appearing in scientific reviews. But people, attached to non-scientific areas, cannot embrace what it actually means. 3D printer is a device, which produces images in a three-dimensional space, transmitting them in layers using a computer-made model. Originally images have

been built with plastic, but nowadays different materials are being added as well for an even more realistic image transfer.

The first ideas for 3D printing began to appear in the 80's, when photopolymers were used in stereolithography. Photopolymers, which have been affected under the action of a laser, solidify and take a solid plastic form. These very properties became the basis for the future printer: laser beam draws every pixel of an image, creating it from a liquid substance, which, when frozen, becomes a solid part of the object.

The second way of producing an image was called "laser sintering". The material that is used is a powder of low-melting plastic. When being affected by a laser, the material melts and becomes elastic, and then sinters into a single mass. To ensure that the plastic does not ignite or oxidize under the influence of the laser temperature, nitrogen (inert gas) is added to the chamber where the work is carried out.

3D printing technology opens a great amount of prospects in different areas. Thanks to progress people can go further than just printing of 3D images on t-shirts. Complicated 3D models of buildings with one hundred micron accuracy can be created, which is a fundamental discovery for technology. Thus, prototypes can not only be created and displayed on a screen, but also their physical models can be examined during research studies [1]. Also, 3D-printing has made a great impact in construction overall, for instance: on Tuesday, October's 17, 2017, the world's first bridge, printed on a 3D printer was opened in the city of Gemert in the south of the Netherlands. The bridge was built within the Noord-Om project, which aims to use advanced technologies (in particular, 3D printing) for the construction of a new section of the road. It took approximately 3 months to finish the work on the bridge. Although it was originally intended for bicyclists, developers have tested it with a load of two tons and assure that the bridge can endure the weight of 40 lorries [2]. The bridge was specially designed and printed by the students of Eindhoven Technical University within the frameworks of the collaboration with BAM Infra Corporation. The work began in June. In September, all the structural elements were ready for installation. It is made of reinforced, pre-pressed concrete and consists of approximately 800 layers, the thickness of each of which is 1 centimeter.

"One of the advantages of printing a bridge is that much less concrete is needed than in the conventional technique in which a mold is filled", is stated on the university website. "A printer deposits the concrete only where it is needed".

BAM Infra representative said that 3D-printed construction appeared to be less demanding in terms of money, more environmentally friendly and efficient [3].

The bridge is 8 meters in length, width – 3.5 meters and thickness – 0.9 meters. It is expected and believed, that the bridge will serve at least 30 years without

malfunctioning. Because of the project's success, the experiment with 3D-printing was decided to continue. In the near future, BAM Infra Co. and the Technical University in Eindhoven are going to use the same method of construction using 3D-printing not only on bridges or roads, but include dwelling houses, residences and other city structures as well [4].

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SUGGESTING FOR DETERMINING AN OBJECT'S SPACE COORDINATES IN A SMALL BASE MULTI-RADAR SYSTEM

From the analysis of the experience of armed conflicts in recent years, especially in the network wars, it is known that one of the trends in the development of modern air attack means is increasing the number of small-sized air objects [1]. The main difficulty in surveillance in such conditions is the detection of airborne objects belonging to the class of unmanned aerial vehicles with small radar cross section [2].

The main trends in the development of modern surveillance facilities for detecting small-sized air objects are a qualitative increase in the informativeness and reliability of the interpretation of radar reflection, shortening the time of inspection, researching and introducing new technologies [2]. The effectiveness of radar surveillance and informative in the processing of primary information can be increased by a more optimal using the system energy. This is achieved by combining individual radars into a single multi-radar system (MRS) [2; 3].

The goal of the work is to analyse the possibility of using additional system effects when combining observation radars into a synchronous MRS. The system effects are considered as the effects that obtained in the MRS but not in one radar.

The development of information technology, the use of special high-speed processors in signal processing of signals and a new element base extends the functionality of surveillance facilities. This enables the implementation of new solutions to improve the quality of detection of airborne objects [2]. It is known [2] that the available surveillance system requires increasing number of radars and compacting of the radar tracking field in the case of a complication of the airspace. This is due to the introduction of additional radars into a certain area. In this area, a larger coefficient of multiplicity of overlapping detection zones is created and a lower bound for the detection of airborne objects is reduced. However, the energy of the entire radar system is not fully used. Each separate radar receives only its echo. In the work, available survey radars are suggested combining to improve the detection of airborne objects.

MRS is a system that uses more than one radar source and has the capability to process and display integral data from all involved radar sources. Synchronous MRS with spatial coherence with the integration of information at the level of primary processing of echo signals has significant advantages. The potential resultant of radar information that can be obtained in such system is more accurate than that of monostatic radar which is not integrated into the system [2].

Two radars with a narrow antenna beam forms an area with synchronous rotation. The area depends on the size of the base and the width of the antenna beam of each radar. The MRS parameters were calculated. It has been shown that the best possibilities for using multiposition radar techniques are provided if the radars are located at a distance of no more than 2 km. In addition, this MRS provides the capability to use system effects. Range-gauge method was used to determine the altitude of air objects. The using of this method enables obtaining an accurate detection of the target coordinates. In this case, the accuracy of determining the angular coordinates of each radar does not change. This enables to using regular mode radar which is not designed to calculate the altitude of the airspace for insuring high-accuracy combat information. From the above the accuracy of determining the range to the object in the MRS depends on: angular measurement errors σ_{α}, values of the base, position of the target in the zone relative to the normal to the base and distance to the target.

Altitude errors may be up to 10% of the distance to the object especially at long distances.

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AI FORECASTS FOR 2018

Brian Burke, Vice President of Gartner claimed that Artificial Intelligence would greatly influence on all aspects of life. He compared the attitude to AI with the attitude to electricity 100 years ago. Both of them are aimed to improve the living conditions, so AI systems has got a big future ahead.

Next, we are going to investigate the trends of Artificial intelligence and how it would affect Big Data, business, security, virtual infrastructure and daily life during this year.

1. Big Data will become more accessible.

On IDC and EMC projections world stock of data would reach 40 zettabytes in 2020. And 85% of this data volume will be Dark Data and ROT. Dark Data is unstructured data (mail, images, audio) that the company stores, but does not use. ROT is electronic documents that a company keeps, but doesn`t use.

2. The speed of delivery of applications and services will increase

According to Marc Edgar GE Research`s informatics head researcher, in the next few years the significant training will reduce the development time of software solutions from several months to several days. That will lead to the improvement in functional characteristics, increase productivity and reduce the cost.

3. The quality of services will increase.

According to Vice President of Bazaarvoice, machine learning and AI systems will help marketers in defining patterns of conduct, preferences and intentions of the customers. This will permit the introduction of personalized services. Opportunities created by AI will also gain prominence in helpdesks.

4. Cyberattacks will become "smarter" (as well as defensive systems against them).

This year IT-community learnt that cracker`s attacks become more sophisticated. AI can help in conducting more accurate and effective cyberattacks – to collect personal data in social networks and use it for hacking, fishing, vulnerability scanning, etc.

5. AI will become a part of everyday life.

According to Georges Nahon C.E.O. of Orange Silicon Valley, artificial intelligence systems and biometric indicators will be used for paying in stores and to secure facilities.

For example, HSBC bank customers in China are already able to confirm payment through their selfies. Nahon claims that soon credit carts driver's license and other documents would be replaced by our faces in the nearest future.

6. Virtual infrastructure is going to get more opportunities.

Achievements in the field of AI are leading to new cloud-based tools. Innovative solutions are going to increase capabilities of computing, make data collection faster and integration process of virtual infrastructure easier. As noted by Evans Strategic Communications providers must help customers to implement new technological solutions, including AI systems to make the most of cloud services.

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THE OPPORTUNITIES AND ISSUES OF ARTIFICIAL INTELLIGENCE IN HEALTHCARE

The scope of artificial intelligence (AI) is huge, but healthcare has probably the most potential for applied AI. Today the use of artificial intelligence in medicine can seriously increase the accuracy of diagnosis and make life easier for patients with various diseases. But AI has much more opportunities.

According to the research by Anand Rao «A Strategist's Guide to Artificial Intelligence», assisted systems will be commercially available and used extensively by 2020 year. Currently, the classification of medical images and the description of images is made by roentgenologists and ultrasound specialists. But the analysis of images can be implemented using artificial intelligence automatically. In November 2017 Stanford researchers developed an algorithm that offers diagnoses based off chest X-ray images. It can diagnose up to 14 types of medical conditions and is able to diagnose pneumonia better than expert radiologists working alone. The introduction of such technologies will help doctors diagnose qualitatively with minimal time-spending.

According to statistics, the number of errors in the diagnosis of stroke is 30%. It means that in almost every third case the doctor gives the patient the wrong treatment, which leads to sad consequences. In February 2016, the Israeli company MedyMatch Technologies presented a new technology that uses AI in combination

with Big Date. In real time, the MedyMatch system compares a snapshot of the patient's brain with hundreds of thousands of other images that are on its "Cloud". The system MedyMatch is able to track the smallest deviations from the norm, which the specialist is not always able to notice. This minimizes the errors in the diagnosis.

AI can also help to cope with epidemics. AIME (Artificial Intelligence in Medical Epidemiology) is a system that combines the time and location of each new dengue casefrom reports filed by local hospitals with 274 other variable factors – such as wind direction, humidity, temperature, population density, housing type. System have been already tested in Malaysia and Brazil and tests have so far shown that it can predict outbreaks with an accuracy of around 88% up to three months in advance. AIME can also determine the epicenter of an outbreak to within 400 meters.

Another area in which AI is indispensable is Biopharmaceutical. According to the biopharmaceutical company Berg, on average, the study of one medicine takes 14 years and costs $ 2.6 billion. However, using AI can significantly reduce both the time and cost of testing. Artificial intelligence is a powerful tool for predicting the results of using medications, because it analyzes all interacting elements in the process of treatment.

The main issue of introducing AI in medicine, especially in Ukraine, is a lack of data. In the healthcare field, all data is protected: information about each patient is secret and protected by the law and directives of the HIPAA and GDPR. Now for the AI training in Ukraine mainly public depersonalized databases are used. But these data is not enough for a high-grade work of artificial intelligence in medicine. For example, in Ukraine there is a system that allows you to determine the likelihood of retinopathy, a stage, and also diagnose it at an early stage. At the moment, the accuracy of the system is 60%. This indicator was obtained on the basis of 11 367 pictures of the retina of the human eye. If the system had more images available, much better results could be achieved. This could save the sight of many people with diabetes. So, making all medical data open to neural networks is a bold move, but it is necessary. Of course, the opening of data must take place under a variety of conditions and be accompanied by the signing of various kinds of agreements guaranteeing their use strictly for the intended purpose.

The development of modern medicine can not be imagined without the introduction of IT technologies. Thanks to AI, the level of medicine can significantly rise in the near future and the lives of many people will become much easier.

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MACHINE LEARNING

Nowadays Machine learning is getting more and more popular and useful field in Computer science. In this article I will try to tell you about this interesting subject.

So, what Machine learning is ? The father of Machine learning Arthur Samuel described it as: “The field of study that gives computers the ability to learn without being explicitly programmed”. then, Tom Mitchell provided more modern definition: “A computer program is said to learn from experience E with respect to some class of tasks T and performance measure P, if its performance at task in T, as measured by P, improves with experience E”. We can describe this using on example of playing checkers, where E – the experience of playing many games of checkers, T – task of playing checkers and P – the probability that the program will win the next game. All problems of Machine learning can be divided on two classes, supervised and unsupervised learning.

In supervised learning we have the set of data and already know what our correct output should look like, understanding that there is a relationship between the input and the output. Supervised learning problems are divided into “regression” and “classification” problems. In a regression problem, we are trying to predict results continuously, meaning that we are trying to map input variables to predict results in a discrete output. In other words, we are trying to map input variables into discrete categories.

For example, given data about the size of house, amount of rooms, age of house we are trying to predict the price of this house. Price as a function of size is a continuous output, so this is a regression problem.

Unsupervised learning allows us to approach problems, where we do not know what our result should look like. We can derive structure from data, where we do not necessarily know the effect of the variables. With unsupervised learning there is no feedback, which is based on the prediction of the result.

Example of unsupervised learning. We take the collection of 1,000,000 different genes, and try to find a way to automatically group these genes into groups, according to lifespan, location, roles.

In ordinary life Machine learning is used in a lot of fields, like pattern of recognition, voice recognition, handwriting recognition, technical diagnostics, medical diagnostics, identify spam, find news, exchange technical analysis. And to my mind, this subject is so important, because of growing volumes and varieties of available data, which is needed to be processed.

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AGENT'S ADAPTIVE BEHAVIOR MODELLING

Currently, various approaches to agent have been developing, which are able to perform given tasks, are able to learn during the process of functioning or adapt to dynamic environment. One of the approaches is to simulate the behavior of an intellectual agent – animat (animal + robot), based on animal behavior imitation.

The aim of this work is modeling basic functioning components of animat, its environment and planning targeted behavior in dynamic environment. Environment is the 2D closed space ("scene"), bounded by a barrier ("black wall"); time is discrete. On this scene there is an animat, who needs to eat. Animat can move around the scene in different directions; it can perform one action per a clock cycle. The food dynamically appears on stage, which animat must find. Also the scene consists of static and dynamic obstacles.

Animat has an input device ("vision"), output devices ("moving function", "rotational apparatus") and a function that characterizes its energy resource.

Vision is 1D tape, which converts image from 2D world. To simplify the orientation in space the animat "projects" the situation, which it obtained by vision into 2D map. The information about scene states also preserves like a template. Since objects on the stage can dynamically appear, a neural network are used to identify the situation at a particular time, by which animat can assume what it sees.

The animat model also consists of task manager that generate urgent tasks (need to eat) and long-term tasks which are generated by statistical repetition of the same tasks.

There are two states of the animat: excited and research, depending on the state different actions are formed. In the excited state animat must find food quickly, so it won't correct its movement algorithm trying to find a better alternative, in the existence of which he is not sure. It will move along the already existed path.

In the research state, when the animat doesn't have any urgent needs, it tries to find a new solution to find more effective one.

The control of the animat (choice of actions) is carried out with the help of a neural network. The inputs of the neural network are the signals of the animat's sensory system; the outputs of the neural network are the signals of actions, which include rest, movement to the next cell to the left or to the right and jump through several cells. The parameters of the neural network (the weight of the synapses) modify during its evolution. The agent's genome determines the weight of the synapses of the neural network.

The disadvantage of the proposed model is a significant amount of knowledge base, which forms during the functioning of the animat. However, the model allows you to control behavior in a changing environment, using strategies that are close to optimal.

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STARLINK OR SATELLITE INTERNET AROUND THE GLOBE

Our current situation with the Internet is completely clear: we can connect to our local provider via copper or optical fibre cables. Our local provider in its turn connects to the global region system, which in fact is a huge web of optical fibre cables around the world. We can expect something about 100 Mbit per second for

regular customers and near 1 Gbit for those, who choose to pay more. And of course, we can get some satellite connection to our houses. The problem is that the companies which provide such services work only in one exact region and their Internet is much slower. But some bright hopes are coming to us. And their name can be Starlink.

Starlink is a project of a system of near-Earth satellites, which is developing by well-known company called SpaceX. At the beginning the number of satellites was 4425, but now we know that it's 11943, which is enough to cover the whole globe with them. This project is going to eliminate the limitations of our nowadays satellite systems. The Internet communication satellites are expected to be in the smallsat-class mass, the first part which are intended to be orbiting at an attitude of approximately 1100 km and the second – on 335 km. The satellites will work according to the principle of the cell-web system, they will be able to divide the surface areas among themselves, in order to increase the throughput even with different heights.

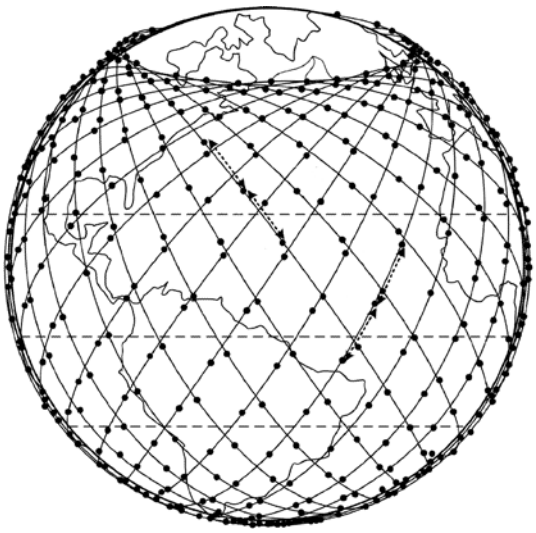

Fig. 1. Orbit scheme of SpaceX Internet satellites

The peculiarity of this method of data transmission is the absence of a large number of peripheral equipment. It way to latency with the lowest limit at 7 ms. Compare to geostationary satellite norm, which is 240 ms. Another great advantage coming with this system is the perspective of up to 1 Gbit/s speed.

The user will be able to connect to Starlink using transceiver, phased antenna and control terminal. How much this equipment will cost is still unknown. Modern transceivers with antennas for satellite Internet cost an average of 300 to 800 dollars.

There are some other problems with the project besides the price. SpaceX got the permission from the US Federal Communications Commission to launch and test two telecommunications satellites, but the formation of a group of almost 12,000 units is still being studied, not only by "signalers" but also by military personnel.

It is assumed that the first universal access to the Internet will be deployed in the US, then in Canada, Europe, and then in the rest of the world. But the authorities of European, Asian or African countries may not issue permission to use frequencies. In this case, either SpaceX will have to turn off the broadcasting of satellites to the territory of countries that did not issue a permit, or the company will be prohibited from supplying its satellite terminals to these states at all.

Starlink isn't the only one of its kind. In 2015 Samsung announced its intention to bring to a near-Earth orbit at an altitude of 1400 km of 4600 satellites. Three years ago was said that the formation of its satellite group would be completed by 2028.

Another satellite race member is OneWeb. The British consortium, which is supported by the founder of Virgin Group, Richard Branson, as well as Qualcomm Inc. It plans to place in orbit in the altitude of 1200 km 648 telecommunications satellites, which will provide Internet coverage of most of the Earth's surface.

In conclusion, creation of groupings from telecommunications satellites will significantly increase the global pervasion of the Internet. Some countries like the United Kingdom intend to give all citizens of the country an inalienable right to the Internet, even if they live in hard-to-reach areas. Nevertheless, near-Earth orbits are already quite heavily littered today, and as the hundreds and thousands of Internet satellites break, the littering will only increase.

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PURIFICATION OF INDUSTRIAL EFFLUENTS FROM HEAVY METALS USING ROBOTS WITH ELEMENTS OF ARTIFICIAL INTELLIGENCE

At present, the following main sections are usually distinguished in the field of computer science: algorithms and data structures, programming languages, computer architecture, operating systems and computer networks, software development, databases and information retrieval systems, artificial intelligence and robotics, computer graphics, human-computer interaction, etc. Artificial intelligence is the set of some branches, which are engaged in different groups of scientists, programmers. The American philosopher John Searle declared two concepts – strong and weak artificial intelligence. And the first, that is, the strong one, was postulated as a certain ability of the machine to think at the same level as the person, that is, to realize oneself, to develop, to evolve. A system of weak artificial intelligence include

computer programs that can perform the tasks that a person does, but without a person [1].

Artificial intelligence and robotics are two areas of science and technology that are now undoubtedly most actively developing. Moreover, it is not only and not so much that some theoretical success is achieved in the laboratories by scientists (here, in fact, progress is perhaps not so noticeable), but rather that there are a lot of practical applications of these results. Ready-made robotic systems, artificial intelligence systems are spreading beyond the limits of research centers in various areas of life both of man and of the society as a whole.

A good example of the use of robotics for solving environmental problems is the robotic fish, created by scientists from the University of Essex, called G8, which is equipped with chemical sensors to detect foci of contamination in water bodies, followed by the transfer of focal coordinates to control center for Wi-Fi. The creation of the robot was associated with certain difficulties, to this day, in the London aquarium, prototypes of the 8th and previous generations are floating. Developers started their project with studying the habits and manners of moving live fish and creating computer 3D-models. It allowed almost immediately abandoning the use of a screw in the tail part of the robot. Unlike previous robotic fish, equipped with a remote control, the latest robots are equipped with sensors; they are completely autonomous and have the basis of artificial intelligence. Using GPS, robots can also return to the control center to leave information, and also recharge their batteries. G8 is 50 cm in length, 15 cm in height, and 12 cm in width. The body of the fish consists of several parts, capable of wriggling and swinging fins and tail from side to side [2].

Humanity is alarmed at the current state of natural ecosystems. The UNESCO International Organization issued a declaration on “The use and conservation of the biosphere” which shows the state and prospects for the recovery of the biosphere.

Pollution of aquatic ecosystems by man-made, anthropogenic and domestic wastewater, regulation of river run-off, destruction of coastal zones of reservoirs, creation of a wide network of canals require technical and technological methods in resolving the issues of water body sanitation. One of the most powerful and most common chemical pollution is the pollution of the environment by industrial effluents containing heavy metals.

It has been established that heavy metals, even at low concentrations, can have a carcinogenic effect on human health, cause severe pathologies of vital organs. Reaching a certain concentration in the body, it begins the detrimental effect – to cause poisoning, mutations.

The following toxicants in water bodies are commonly found: mercury, lead, cadmium, tin, zinc, manganese, nickel, although the high toxicity of other heavy metals such as cobalt, silver, gold, uranium, etc. is known. These substances are the most dangerous pollutants for the environment agreed by the countries belonging to the United Nations [3].

The issue of ecology, the purification of sewage and industrial water nowadays is of particular importance. Pollution of the Dnipro and the Dnipro reservoirs with organic compounds, heavy metals, radionuclides has reached the highest levels in recent years.

Improving the environmental situation by increasing the efficiency of wastewater treatment and reducing the specific energy costs for these processes is one of the most important problems.

Within the framework of the research project " The use of larvae of the lake frog Rana Ridibunda for the purpose of purification of industrial effluents from heavy metals", on the base of DNU (Department of Zoology and Ecology), we earlier carried out the analysis of existing methods for cleaning industrial effluents from heavy metals. Based on the studies conducted, it is proposed to use an alternative "executor", the robot "Rana R1", whose functions can be:

1) identification of pollution outbreak by industrial wastewater in natural reservoirs, determination of their coordinates and area (using GPS);
2) sampling for identification and determination of heavy metal concentrations in stationary laboratories;
3) identification and determining the concentration of heavy metals directly in the outbreak of contamination;
4) determining the necessary reagents and their quantity for the neutralization of heavy metals in the outbreak of contamination;
5) delivery of reagents to the outbreak contamination.

As a result, we received the method for the purification of natural reservoirs from industrial effluents involves the development of robot «Rana R1» and software for managing the object and processing the information.

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BLOCKCHAIN TECHNOLOGIES. THE POWER OF SMART-CONTRACTS

Modern technologies don't stand still. Until recently it has been a wonder that people can receive and send to someone electronic money in a few seconds. Currently, it becomes a usual business to pay for purchases in supermarket through a bank card, to book a ticket on a plane via smartphone application and so on. This is a really impressive, necessary and extremely useful technology. However, anything has its limitations. This approach has a crucial feature, which is its advantage and disadvantage at the same time. This feature is called a centralized system control. It means that all of the operations are controlled by a bank, each transaction is accompanied by essential commission, and private data of clients and their accounts are stored on several servers, to which just some companies have permission to access. Despite the fact that all banks have an extremely strong protection from any kind of attacks of swindlers, they are hacked. It often happens that clients' private information leaks and large amount of money is lost.

Literally a few years ago, the revolutionary new technology was created. It is called blockchain. Speaking briefly, blockchain is a chain of blocks with information about transactions. Each block is inseparably linked with the previous one, because it contains hashed information about it. Each new block is attached to the previous one. Contrary to the centralized bank system, the whole blockchain is stored by each computer of participants. For instance, a blockchain of bitcoin as at March 2018 weights more than 150 GB.

There are some general differences between a blockchain and a bank. Firstly, a blockchain has a new more reliable security system. There is no single source of information storage. Secondly, it's anonymous. The whole data about you is only so-called bitcoin-address. It is a string, which consists of digitals and symbols and it has a length from 27 to 34 characters. The most important thing is that a blockchain has a special currency, called cryptocurrency.

In the case of the new electronic currency, anonymity is a basic and usual attribute. The block chain became truly revolutionary with the help of smart-contracts. Smart-contract is a complex of conditions, written in a computer language. The sides, which signed smart-contract, follow these conditions and exchange any assets such as currency, property, shares and so on. For example, purchaser`s currency transfers to the program and freezes there until the seller fulfils his part of a contract. If condition

breaks, the sum returns to purchaser's account and smart-contract is cancelled. If all conditions are met successfully, exchange of assets takes place. This exchange is fixed in smart-contract and recorded on block chain, then it can`t be canceled, changed or removed. The program tracks down if conditions are met in the automatic mode. Human control or participation is not necessary. In other words, smart-contracts work directly between stakeholders without any intermediaries [1].

As a result, smart-contracts noticeably reduce costs for notarial services, and the time of transactions is significantly reduced. Of course, don't forget about reliability and autonomy of all smart-contract's conditions.

Of course, they also have shortcomings. Smart-contracts use cryptocurrency for their work, which is not allowed in all countries. Smart-contracts must be written without any mistakes and they have to consider even minor conditions and details. You can negotiate with human, but the program will impartially fulfil its algorithm. The more difficult process of deal is, the harder it will be to create a smart-contract.

Smart-contracts are at the stage of active development and improvement now. The powerful support from a huge amount of stakeholders exerts a colossal influence on providing and quality growth of smart-contracts. Without doubt, our future is in electronic technologies, where smart-contracts are only a drop in the sea of human imagination.

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THE NEED TO USE DECISION SUPPORT SYSTEMS IN NON-DESTRUCTIVE TESTING

Decision support system (DSS) is a computer automated system. The purpose of this system is to help people who make decisions in difficult conditions for realizing their objectives. DSS arose as a result of the merger of management information systems and database management systems.

Theoretical research in the sphere of development of the support system was carried out at the Carnegie Institute of Technology in the late 1950's and early 60's of the XXth century. The specialists from the Massachusetts Institute of

Technology combined theory and practice in the 1960's. In the middle and late 80's of the XXth century such systems as EIS, GDSS, ODSS began to appear. Texas Instruments developed the Gate Assignment display System for the United Airlines in 1987 [1].

Decision support system (DSS) is designed to support multi-criteria solutions in a complex information environment. It solves two main tasks:

- choice of the best solution from the set of possible ones (optimization),
- ordering possible solutions on the preferences (ranking).

By interaction with the user, three types of DSS are distinguished:

- passive help in the solution-making process, but it can not propose a specific decision;
- direct involvement in developing the right solution;
- cooperative systems assume interaction of the DSS with the user.

Decision support systems are primarily needed for department managers and all employees who make important decisions for the stable daily operation of the company[2].

The maximum benefit will be the introduction of DSS not in one specific department, but in the whole company, as this leads to the reduction of costs – both temporary and financial (not to mention the lost profits of the company which does not consolidate the diverse information about its activities in an accessible format for processing) [3].

It is productive to use DSS for making important decisions in the field of equipment failure forecasting and, accordingly, about planned repairs. DSSs are needed wherever large amounts of information are accumulated that require serious processing to obtain an answer to the question posed [4].

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WELL-COORDINATED WORK OF MEDICINE AND ROBOTIC

Unfortunately, sometimes doctors cannot save the limbs of a person, so then prosthetics can help. The main task of prosthetics is a full replacement of the lost organ. We are talking about complex consecutive movements and timely reactions to occurring events, so that the person does not feel limited. Such actions can be fully performed in the case of controlling the prosthesis directly by impulses of the nervous system. The researchers of the Medical Center at Chicago University work on solution of this problem.

A new study by neuroscientists at the University of Chicago shows how amputees can learn to control a robotic arm through electrodes implanted in the brain. The research, published in *Nature Communications*, details changes that take place in both sides of the brain used to control the amputated limb and the remaining, intact limb. The results show both areas can create new connections to learn how to control the device, even several years after an amputation [1].

Previous experiments have shown how paralyzed human patients can move robotic limbs through a brain machine interface. The new study is one of the first to test the viability of these devices in amputees as well. The technology passed clinical trials on rhesus monkeys and showed good results. Now the team plans to continue their work by combining it with research by other groups to equip neuroprosthetic limbs with sensory feedback about touch and proprioception.

Similar research is carried out by scientists from the Florida Atlantic University.

The sense of touch is often taken for granted. So this void in sensation for someone without a limb results in limited use or abandonment of these very expensive artificial devices. So why not make a prosthesis that can actually "feel" its environment?

That is exactly what an interdisciplinary team of scientists from Florida Atlantic University and the School of Medicine at Utah University aims to do. They are developing a first-of-its-kind bioengineered robotic hand that will grow and adapt to its environment. This “living” robot will have its own peripheral nervous system directly linking robotic sensors and actuators. So just like human fingertips, the robotic hand is equipped with numerous sensory receptors that respond to changes in the environment and can transfer it back to the brain. Controlled by a human, it can sense pressure changes, interpret the information it is receiving and interact with various objects. For achievement this, the living remnants of the nerves

will bind to in vitro and will electrically stimulate and study the regeneration of the nerves during the use of the prosthesis [2].

Both teams intend to continue their research, let's hope that these technologies help a lot of people who have lost limbs.

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THE NEWEST CONCEPT OF ELECTRIC ENERGY DEVELOPMENT USING THE DYNAMICS OF ENVIRONMENTAL THERMAL ENERGY

A team of scientists from the Massachusetts Technical University, also known as Strano Research Group [1], has recently reported on the results of their research in the fields of chemistry and thermal physics, as well as the discovery in electric power industry and electrical engineering that they have accomplished. Specialists from MIT have developed a new principle of generating electricity and test equipment based on it called “a thermal resonator”. The concept, suggested by the researchers, can be described with the help of this equipment, the use of which has practically proved it.

Speaking about its structure, it is necessary to mention that the main part of the device consists of a composite material with maximized thermal conductivity [1]. Its structural main element is metal foam made of copper or nickel and coated with graphene multilayer, which had been also filled with a substance called octadecane, an organic chemical compound from the alkenes class. The metal foam serves as a heat-conducting and porous matrix, and the octadecane serves to maintain the heat capacity of the material due to the latent heat of the phase transition which is about 28.18 C° [3]. Inclusion of such carbon nanomaterials as graphene increases the thermal conductivity, without affecting the thermal capacity due to the small size of its fractions [4]. In general the elements make up a super-efficient thermodynamic system of two thermal masses, between which a thermal motor is enclosed [1]. The first mass has a phase transition temperature and basically exists with it. The second mass is able to absorb the temperature of the environment rapidly. Thus, the difference in temperature

between first and second thermal masses causes the heat engine to generate the energy.

The device has been tested successfully using the diurnal cycle and also responds to other different-frequency temperature fluctuations [1]. It is capable of providing unlimitedly continuous operation under the supervision of a remote control system providing no need for other sources of energy. A small sample of the material gives 350 mill volts of potential and 1.3 mill watts of energy in response to a temperature difference of 10 degrees during the interval between day and night, which is completely enough to support the functioning of low-level power systems.

However, the major research work on this method belongs only to its inventors nowadays. So, Michael Strano's team and people who are studying outside aspects of the concept have already found a lot of information that makes it possible to consider their discovery of high importance and usefulness. It can be applied to climate conditions of any country, especially those located in the tropical and equatorial zones, taking into account the significant temperature difference of the average daily cycle, as well as in the temperate and subtropical geographic zones, due to their movement during the seasonal changes. There is also a hope that one of such countries can be Ukraine as well, because the temperature conditions are constantly changing here and all other types of alternative energy sources have already been used successfully by now.

As far as Ukraine after its independence has been world-renowned for its greatest scientific initiative and contribution to the scientific and technological spheres, we should support the development of technologies and technical production being made in the world, taking into account positive changes towards the scientific progress that have happened inside the country in recent years.

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MICROWAVE-MOISTURE METERS

Electromagnetic waves of ultrahigh frequencies (microwaves) are widely used in various fields of science and technology. Microwave devices are the basis for the implementation of radar detection equipment for air and space objects, evaluation of their coordinates and speed, as well as for solving technological problems, for example, in metallurgy, for medical and sports diagnostics and treatment. Microwave ovens have an important technological significance. Besides microwave technologies are widely used in mobile radio communications, wireless computer networks [1].

Humidity is the water content in gases, liquids and solids. Methods of measuring humidity are divided into direct and indirect. Direct methods of determining humidity (thermogravimetric method and Fisher's method) have sufficient accuracy, but are difficult to automate and require a long time to measure. Direct methods are generally used for calibration and verification of moisture meters of side effects. Indirect methods are based on the fact that the humidity content of a substance affects its physical properties – thermal, optical, mechanical, electrophysical etc.

High-frequency methods for determining humidity are characterized by high sensitivity, accuracy and the possibility of contactless measurements. The principle of the operation of microwave moisture meters is based on the determination of the moisture content, reflected or absorbed through the controlled substance of the electromagnetic waves (the range of microwave wavelengths is from 1 to 1000 mm) [2; 3].

Among the radio wave methods, the most common are – the "on the passage" method, in which the internal state of the sample is determined by the effect on the signal passing through it; the "display method", in which the signal, used to control, is reflected from the surface or the inner layers of the sample, the particular case of this method is the "scattering" method.

Moisture meter is a device for measuring the humidity of gases, liquids and solids. The physical principle of the work of a moisture meter is realized in the following way: electromagnetic high-frequency waves from the generator pass through a polarization attenuator and a ferrite valve in the measuring cell, in which the test sample is introduced. The weakened electromagnetic wave enters into the detector section through a second ferrite valve and an adjusted attenuator. The detector current is recorded by the indicator. The magnitude of the damping is determined on the scale of the polarization attenuator by the substitution method. The amount of attenuation

is directly proportional to the moisture content. According to the graph, "Attenuation – moisture content" determines the moisture content of non-aqueous liquid [5].

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THE CONCEPT OF THE INTERNET OF THINGS

Nowadays the Internet plays an important role in each sphere of human life. People interact with each other over the Internet more and more, we use it to exchange any kind of information. This all is about people. But what about things?

First the term "Internet of Things" was used by Kevin Ashton as the title of a presentation he made at Procter & Gamble (P&G) in 1999. He said both computers and the Internet were almost wholly dependent on human beings for information, but the fact is people actually have limited time, attention and accuracy. So, Ashton's idea was to use computers that could gather information about things without any help from us. In this case we would be able to track and count everything, and greatly reduce waste, loss and cost. We would know when things needed replacing, repairing or recalling, and whether they were fresh or past their best [1].

Generally, the Internet of things (IoT) refers to a set of various devices and sensors networked with any kind of connection; for interacting with each other things use different protocols, and the only one protocol to access the global network. The Internet is used as the global network, the protocol is IP [2].

The basic principles of IoT are widespread communication infrastructure, global identification of each object and ability of each object to send and receive data via a personal network or the Internet.

The most important differences of the Internet of things from the Internet of people are:

- focus on things, not on a people;
- a significantly larger number of connected objects;
- relatively small object sizes and low data transfer rates;
- focus on reading information, not on communications.

Thanks to RFID (Radio Frequency IDentification), WSN (Wireless Sensor Network), NFC (Near Field Communication), M2M (Machine-to-Machine) technologies it becomes possible to connect really big number of devices, and this number is increasing every day [2].

IoT is becoming the part of our daily life, so people are able to automate routine processes. But this technology is not only about smart devices for consumers such as things of smart house. IoT is being introduced into industry, power engineering, transportation, healthcare, education, financial services. So, IoT is one of the most important line of work of Cisco System, Inc. which is an American multinational technology conglomerate, the biggest producer of networking hardware, telecommunications equipment and other high-technology services and products. They say introduction of IoT in business gives the possibility to optimize work, reduces production costs, increases the protection and safety level. According to a survey conducted by IDC (Global IoT Decision Maker Survey), in which more than 2,300 companies around the world participated, 58% of respondents consider the Internet of things to be the most important component of their business strategy, and 48% have already deployed some IoT decisions [3].

As we can see, IoT is a progressive technology that can make our life more comfortable and easy. But it is not a technology of the future. It is a technology of the present.

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ANALYSIS OF THE CONSTRUCTION OF THE CABLE CAR AS A PART OF PASSENGER TRANSPORT

Dnipro is one of the major political, industrial, financial, scientific and cultural centers of Ukraine.

Despite all types of transport networks being available in the city, a serious traffic problem still exists. Since residential areas are located at a considerable distance, the road network cannot cope with the traffic load. Daily around 250 000 people commute across the Central bridge. Cable cars, monorails trams, tunnels and overpasses is a modern approach to separate traffic flows vertically solving the problem in conditions when structure of the city has been already formed historically.

The cable car between the right and left banks of the Dnipro River allows the following:

1. The redistribution of passenger flows, reducing their density on Slobozhanskiy Avenue and the interchange ramp from the Central bridge on the right bank.

2. The construction of regional bus terminal at the final stop of the cable car in Vasil Sukhomlynsky Street and reduction of inter-city transport in the city itself.

3. Connecting the final stop "Maidan Heroes Square" with the subway station to increase train capacity and profitability of both modes of transport.

4. The construction of transport hub "Industrial Park" in the area of "Interpipe NTRP" industrial zone.

The development of the Industrial Park with a business center and an art exhibition complex on Slobozhanskiy Avenue enables to create 5,000 new jobs. Residential construction in this area is also being considered. The Industrial Park would be the center of gravity on the left bank.

Integrated use of the Dnipro recreation zone in Manuylivskiy residential area.

The proposed cable car trace does not duplicate the project decisions of underground construction and its development is directed to the residential areas where the traffic problem is partially solved. In reality, the cable car is also of tourism interest to city visitors, thanks to the panoramic views during the trip.

The cable car construction will provide a significant boost for the development of city areas.

In 2017 Maidan Heroes Square was supposed to be closed for reconstructions.

There are plans to build a subway station, tunnels for cars, and a pedestrian zone at zero level within two years. Besides the obsolete department store "CUDS" is also

located on the Square. Thus, its reconstruction can be combined with the arrangement of cable car station in the building "Rotunda" attached to it. The cable car will be connected to the subway through the underground communication.

The opening of subway stations and the cable car is projected to be simultaneous.

Advantages of cable car transport

1. Urban ropeways do not harm the environment and have the best ratio of the ratio of benefits and costs.

2. The seamless mobility for everyone. Single-level boarding passengers in wheelchairs and people with reduced mobility carried out at minimum speed or complete standstill of the road.

3. Using a new level. Urban ropeways make it possible to transport on the road. Does not depend on the rest of the movement type.

4. The safest form of transportation in the world.

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INFORMATION TECHNOLOGY IN INCLUSIVE EDUCATION

The rapid computerization of modern society is a consequence of the unceasing development of modern technology. Inclusive education as a new step towards the creation of a modern conscious European society has many challenges to its implementation. It is in this area that the use of information technology in education is very acute. Among examples of successful implementation of IT in education one can distinguish:

1. Using the computer and accompanying objects (video projectors, interactive whiteboards, acoustic systems, etc.) as a teacher during the preparation and conducting of the lesson.

2. Expansion of information flows by the student during independent work, using the resources of the Internet.

3. The use of Internet conferences for consultations or other types of team work.

I would particularly like to note that the introduction of IT in education is acutely lacking in people with disabilities or special needs. According to data for 2017, over 3 million people with disabilities live in Ukraine, with only 20% having the opportunity to study.

In addition, the visual and audio information channel occupies a leading position in the system of the indicated technologies. Accordingly, far from being available in the system of distance learning technology can be applied in the training.

But dividing the children into certain groups according to the defects can be conducted taking into account all special needs of students. Accordingly, it is possible to create electronic simulators, a training complex of special exercises, aimed at developing functions of color sensation, visual fixation, balancing of visual fields, morphological perception for the visually impaired, creating visual chat-counseling or visual on-and-off lessons for deaf or deaf children.

With the introduction of inclusive education, IT has become widespread in education. One of the directions in improving the efficiency and quality of the correctional and educational process in the context of special and inclusive education is the introduction of techniques based on the use of digital technology, in particular the use of the computer and its components, and the creation of multi-profile correction and training programs. Studying the experience of specialists in the methodology of using computer technology, it can be argued that computer technology significantly facilitates the educational process [1].

Since the early 1990s, the popularity of obtaining education through the Internet has increased dramatically in the United States. It is important to note that most educational institutions provide opportunities for obtaining a bachelor's degree through the Web, and some for Ph.D. [2].

In many schools, inclusive education is practiced, and Dnipropetrovsk region has become a pilot region in which children with special needs are effectively implemented. But these are just the first steps to overcome this important problem.

Summarizing all the above, I would like to note that the priority for using IT to study today is to become a training for people with disabilities. It would be symbolic to complete the statement of the world-renowned scientist-physicist, Stephen Hawking, "The human race is not counting on many intelligent accomplishments", then let the solution to the above-mentioned problem become one more breakthrough accomplishment.

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