DOI: 10.18372/2410-7840.22.14869
UDC 004.056(045)

MATHEMATICAL DESCRIPTION OF ANGSTROMTECHNOLOGIES FOR ARTIFICIAL INTELLIGENCE USAGE IN AVIATION CYBERSECURITY

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This article discusses the mathematical results in the form of a mathematical description of the management of human thought for the safety of aviation facilities based on the introduction of new author's concepts and the author's classification of aviation technology reform. Mathematics today faces the challenge of developing new mathematical tools to ensure cyber security in aviation. In the process of constructing a mathematical model, two systems of scientific knowledge mutually adapt - cybernetic and mathematical. With the development of information technology, this interaction has gone from the field of cybernetic research into the real practice of business management in the field of aviation. Therefore, the authors introduced new economic and mathematical concepts and determined the role of 3D-modeling in angstromtechnology of aviation enterprises from the point of view of information security and cybersecurity. The authors performed 3D-modeling of information security and cybersecurity in matters of airspace, which can be considered as a small version of the simulation usage angstrom-management technology. This work does not have the stated procedures, it requires a deep understanding of various types of neural network architectures, it includes a lot of research and analysis and can take a lot of time to prepare, but in the end it can produce the most effective solution at a certain moment and in a specific situation in a short period of time.

Keywords: *mathematical description, artificial intelligence, technology, aviation, cybersecurity.*

INTRODUCTION

This article the possibility of 3D-modeling for thought control is shown and introduces the authors' concept of angstromtechnologies in their relationship with cybersecurity.

Problem Determination. In the modern aviation industry, the issue of decision making through thought management is of great importance, as it can eliminate accidents and save lives. Successful business leaders are trying to "program" as much as possible management resolutions to improve the effectiveness of their management. That is why the authors introduce new concepts which define the role of neural networks in angstromtechnology.

Analysis of recent research and publications. Lack of theory and practical recommendations on airline Angstromeconomics, Angstrommanagement and Angstromtechnology taking into account the modern peculiarity of economic development of Ukraine determines the special urgency of the problem.

Mathematics today faces the challenge of developing new mathematical tools to ensure cyber security in aviation.

1. Cybernetic objects are developing objects, they are characterized by a dynamic effect, when the cause begins to act after a certain time, so when developing dynamic models, it is necessary to take into account time lags.

2. When using the mathematical apparatus in cybernetic research and control, it is not the objects themselves that are studied, but their 3D-mathematical models, the adequacy of which is very difficult to evaluate.

In the process of constructing a mathematical model, two systems of scientific knowledge are mutually adapted - cybernetic and mathematical.

With the development of information technology, this interaction has stepped from the field of cybernetic research into real business management practice in the field of aviation.

Knowledge of mathematical methods is becoming an integral element in the formation of professional knowledge of specialists in the field of cybernetics and aviation. In modern conditions, in connection with the increasing role of applied mathematics in cybernetics, the emergence of new technologies for the mathematical processing of information, an urgent need is to build an accurate mathematical model of aviation security.

In their previous article «Angstromtechnology of aviation cybersecurity» the authors introduced new concepts.

Nanoeconomics (human economics) – a branch of economic theory which studies the behavior of economic agents in the market and non-market conditions, it is the deep level of study of economic phenomena and is a theory of transactions within the formation of decisions by market participants (collectively, the definition by K. Arrow, G. Simons, P. Lucas).

Angstromeconomics (economics of thought, gift, intuition) – a branch of nanoeconomics which studies the effect of the intellectual, moral and spiritual abilities of economic agents of productive management decision making.

Angstrommanagement (management of thought, gift, intuition) – a profound control of intellectual, moral and spiritual leaders capabilities of economic systems by selecting from a set of conscious and super conscious aspects for effective decision making.

More precisely, Angstrommanagement – science that studies "what" exactly manages the man and "what" does the man manage while making decisions.

To improve the economical and mathematical conceptual apparatus the author has used classification of different types of economics, but not in full compliance with the SI system, but according to the logical interpretation of the author:

– 10^{-10} – Angstromeconomics: economics of thought, gift and intuition;

– 10^{-9} – Nanoeconomics: economics of privately held company;

– 10^{-6} – Microeconomics: economics of an enterprise;

– 10^{-3} – Minieconomics: corporate economics;

– 10^{-1} – economics of art, management art;

– 10^{0}= 1 – System;

– 10^{1} – economical good, economical human factor;

– 10^{3} – Mezoeconomics: regional (local) economics;

– 10^{6} – Macroeconomics: the national economics;

– 10^{9} – Megaeconomics: world economics;

– 10^{10} – Multieconomics: economics of "mason, The Heads of the World Bank", hitch govern global economic policy.

From the author's classification some properties and patterns based on disjunction (multiplication, intersection) of the economic categories can logically be noticed:

– $10^{10}\times10^{-10}$ (Multieconomics on the basis of thought, gift and intuition) = $10^{6}\times10^{-6}$ (micro- and macroeconomics crossing) = $10^{3}\times10^{-3}$ (regional and corporate economics crossing) = 10^{0} = 1 – system;

– $10^{10}\times10^{-1} = 10^{9}$ (Multieconomics creates Megaeconomics);

– $10^{10}\times10^{-9} = 10^{1}$ (with the help of enterprise economics Multieconomics manages the creation of economical good).

The study these patterns with the help of mathematical logic and its operations can last long. For this article, the original ideas and evidences that is sufficient.

Creation of the Angstrommanagement technology of airlines lies in ensuring the most effective management decision-taking of airline leaders and safety managers at Mission Control Centers in emergency situations. Nowadays, within the current technological and informational economy, the consistent patterns of Angstrommanagement technology of airlines creation are closely associated with forecasting and modeling of neural networks and volumetric 3D-models.

In the former time the problems were never investigated constructively. There are only eight scientists abroad (K. Arrow, G. Simons, P. Lucas, G. Kleiner, B. Kanaplyov, G. Baharev, A. Inshakov and T. Lyubimova) who are engaged in Nanoeconomic approaches and methods used to solve problems in the development of intellectual capital on the whole and knowledge control in particular. But in the aviation field and airline management there are no studies or publications, either in Ukraine or in foreign countries.

Neural networks – are adaptive systems for data processing and analysis, which appear to be the mathematical structure that mimic some aspects of the human brain and demonstrate the capabilities such as the ability to non-formal learning, the ability to generalize and cluster unclassified information, the ability to build predictions based on submitted time series [3]. Their main difference from other methods, for example expert systems, is that the neural networks do not require previously acknowledged models but simply create them only on the basis of the information provided. That is why neural networks and genetic algorithms are introduced wherever you need to solve the problems of forecasting, classification, management (especially Angstrommanagement) – in other words, within each field of human activity where algorithmic process cannot be considered properly, for an instant resolution a group of qualified constantly working experts is required or the adaptive automation system, which the neural networks are.

The neural network receives the input information and analyzes it like the human brain does. While the analysis the network is learning (acquiring knowledge and experience), and then provides output information based on previously acquired experience.

The main task of the analyst, who uses neural networks to solve any problem, is to create the most efficient architecture of the neural network, which means to choose the right kind of neural network, the algorithm for its training, the number of neurons and types of connections between them. This work has no stated procedures, it requires a deep understanding of the various types of neural networks architectures, it includes a lot of research and analysis, and can take a lot of time for preparation, but as a result, it is able to

issue the most effective solution for the definite moment and the specific situation in a short amount of time.

For informal tasks the neural network models can be far more effective than the traditional methods of solution.

Neural networks are especially helpful when there is a large amount of input data, among which there are implicit relationships and patterns. In this case, the neural network can automatically consider different nonlinear dependences hidden in the database. This is particularly important at decision taking systems and forecasting systems.

It should be noted since Nanoeconomical, financial and social systems are very complex and are the results of actions and reactions of different people, it is very difficult (even impossible) to create a complete mathematical model taking into account all the possible actions and reactions. It is almost impossible to approximate a model based on such conventional parameters as utility maximization or profit maximization.

In systems of this complexity it is natural and effective to use models which directly simulate the behavior of society and Nanoeconomics. This is exactly what the technology and methodology of neural networks is capable to offer.

It is a technology for purposes and means of behavior in a wide range identification, based on the simulation of intelligence operations; generated by the human brain research, aimed for building a logically functioning system with a large number of simple elements, conjugated with branched connections, designed to identify non-linear patterns in the absence of a simple knowledge about an object that is being studied, used for predicting the dynamics of market and in other areas of economy and Nanoeconomics.

While studying the network adjusts the coefficients of connections and polynomials of transfer functions, which would further determine the mode of operation. Multistep prediction of time series is performed as following. The known values vector is submitted to the neural networks input $x(tn-2), x(tn-1), x(tn)$. The predicted value is formed at the output $x*(tn+1)$, which determines the vector of the predicted outputs and joins to the initial set values, simply, approved. Next, the vector $x(tn-1), x(tn), x*(tn+1)$ is applied to the input and $x*(tn+2)$ is received at the output together with the further predicted values.

Vectors are applied to trained neural network serves inputs for multiparameter tasks

$$x(tn-2), y(tn-2), z(tn-2),$$
$$x(tn-1), y(tn-1), z(tn-1),$$
$$x(tn), y(tn), z(tn).$$

The output produces values $x*(tn+1)$, $y*(tn+1)$, $z*(tn+1)$,which form the output values vector and sequentially append to the initial set. If the icon is shifted to the step of prediction, which has been generated by the system, they are considered as real and participate in forecasting the next output, i.e. the vector is applied to the input $x(tn-1)$, $y(tn-1)$, $z(tn-1)$, $x(tn)$, $y(tn)$, $z(tn)$, $y*(tn+1)$, $z*(tn+1)$, at the output we receive $x*(tn+2)$, $y*(tn+2)$, $z*(tn+2)$ and other predicted values.

GOAL OF THE ARTICLE

The main goal of this article is to consider the mathematical results as a mathematical description of thought management for the safety of aviation objects based on the introduction of new author's concepts and author's classification for aviation technology reform.

MAIN MATERIAL

Multistep forecasting allows to perform short- and medium-term predictions, because accumulation of errors at each step of forecasting has a significant effect on accuracy. In the application of long-term multi-step forecasting, particular for many predictive systems gradual attenuation process is observed, phase shifts and other distortions of the forecast. This type of prediction is preferable for time series, falling under the definition of a stationary process with a small random component.

Summary statistics include total number of observations in this data set; observations of this class, which network correctly classified; observations of this class, which network classified incorrectly, belonging to another class; observations from this class that the network could not classify. Assignment statistics shows how each set of observations were attributed to each of the possible classes, including correct (vague observation not shown). From the above table follows the conclusion of high quality training and work neural network.

The resulting neural network model aims to classify new secure flights for which there are known values of the above parameters. Work model was tested on a test set data that did not participate in the training network and has shown good results, indicating broad practical application of this approach.

The study examined various modifications of multilayer architecture of perceptron (settings Temporary window – Steps and Horizon – Lookahead, the

number of items in the hidden layers), configuration of training options (training speed, inertia, and the number of periods). As a learning networks algorithm method RFP was used. Logarithmic activation function in the output layer was replaced with linear to improve the quality of extrapolation, which does not change the level of activation and thus, unlike logarithmic, is not fulfilled, so is better predictable. Possibility of automatic design a network that is implemented in the package Statistical Neural Networks was used during searching for a better alternative network. To solve the problem of forecasting flight safety indicator K_1 the best option was network of five centers of input, one hidden layer, consisting of ten neurons and extrapolating unit, resulting in the type of network architecture 5-10-1.

The value of the control error is 0,18 for educational subset and to 0,21 – for control.

Time series projection of flight safety (Fig. 1) can perform by using the trained network.

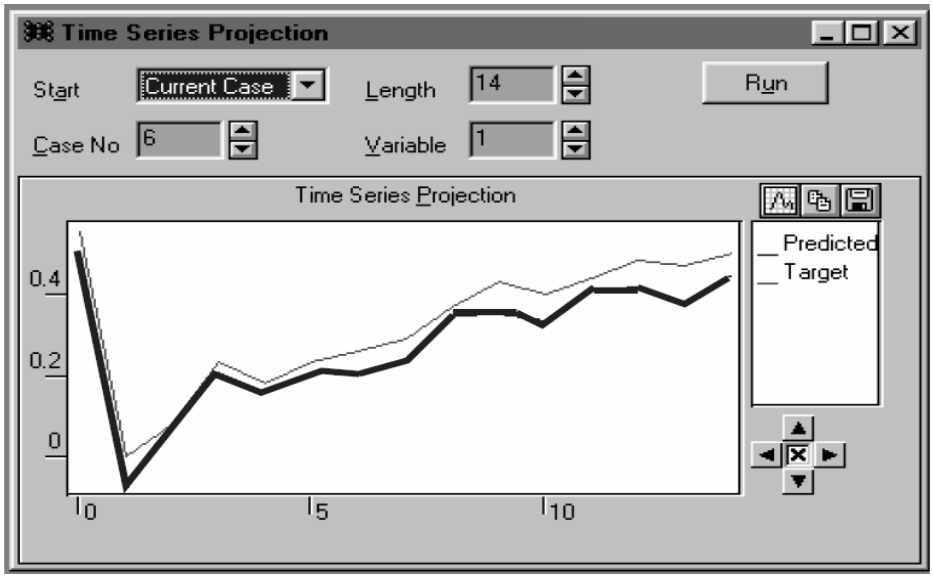

Fig. 1. Time series projection of flight safety (obtained by authors)

The graph shows that the estimated number approximates well the original sequence and as a result, gives a reliable estimate forecast for the two periods (19 and 20) forward.

This search goals and means to conduct a wide range of environments technology based on the simulation of linear operations of intelligence and nonlinear laws of intuition. It is generated by the study of the human brain, as aimed at building a logical functioning system with a large number of simple elements, to identify mutually conjugated as well as branched connections without a priori knowledge.

In the process of determining the effectiveness, neural networks can solve problems related to the technical diagnosis aircraft using the methods of nondestructive testing in real time. Moreover, mechanical damage to the aircraft is evaluated, both on Earth and in flight. The method of high-frequency ultrasound scans can achieve nearly 100% accuracy. Network predict the reliability of systems that are used both in aircraft and in ground traffic control flight [1].

Neurocomputers are used to recognize the types of aircrafts. Observations on the image allow profiles turns, movement, zooming, reduce high noise levels.

Neural network algorithms and neurocontroller quality management used in teaching of beginners helicopter pilots. Training takes place automatically without human intervention: the system actively control helicopter, makes beginner to increase degree of control over the flight for a particular skill. In fighter aircraft neurocomputers accounts external conditions, are responsible for the precise maneuver against the goals, adjust pilot mistake, noise, etc. [10].

The results of the analysis based on patent statistics selected list of the most promising technologies for new design solutions of the new generation, development of the previous set of technical documentation and design policy processes.

As Hero of the Soviet Union Colonel-General M. M. Gromov wrote: «In order to fly safely, it is necessary to know how to control the aircraft, but even more important is to know how to control himself. My success in the aviation industry is often explained by excellent knowledge of technology. That's true ... but at 1%, while the remaining 99% relate to the ability to learn, to explore myself and the ability to improve myself. This improvement should start with learning the basics of psychology» [5].

This method can be automated, namely to build a structure that can be used by the pilot during a medical control before the flight. The main part of this design will be the «helmet», which is connected to the computer.

«Helm» comprises a magnet coil which can be moved mechanically, depending on the areas that need to be activated. The principle of operation is exactly the same coil as in the manual. It generates an alternating magnetic field and an electric field; because of this neurons begin to generate action potentials, which are further transmitted to the appropriate locations along nerve pathways in the nervous tissue [9]. The path of movement of the coil is determined by the computer. There is a database with medical conditions and symptoms of the pilot, his medical map and the volume of the head. The program builds a model of the brain based on these data. Also, using different algorithms movement trajectory and the power coil stimulus are calculated. Usage of this machine can diagnose a variety of characteristics of the pilots, which may affect the quality and safety (Fig. 2) of the flight or can be cause of the crash.

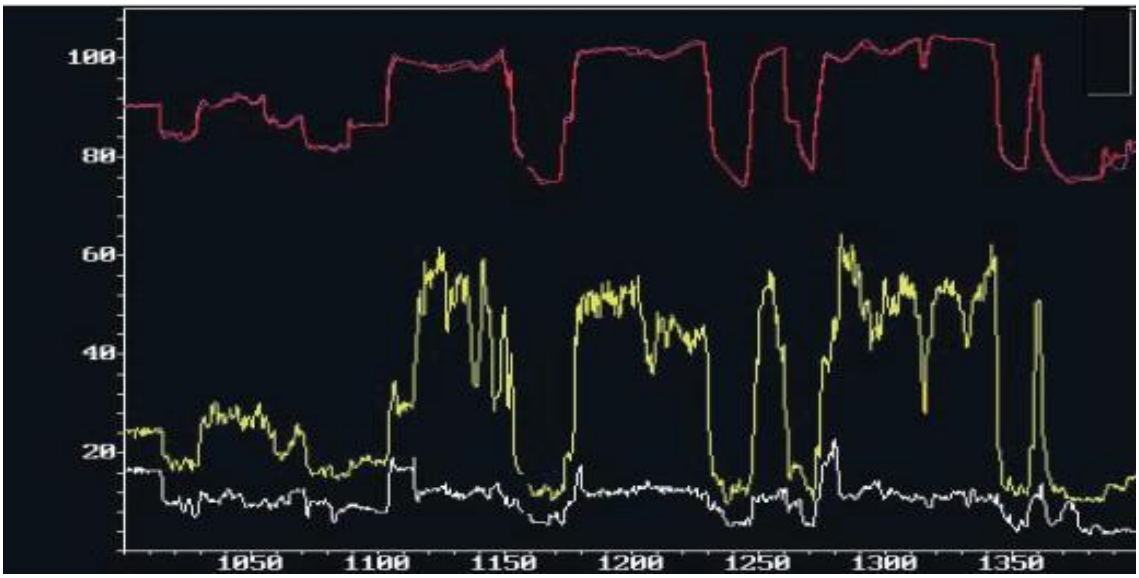

Fig. 2. 3D-model of flight safety characteristics obtained by the neural network, signaling about the frequencies of the object revolutions of neurons making decisions (high pressure) in extreme conditions (obtained by authors)

In addition to this function of the human brain as the only channel information have natural limits. Information overload (Fig. 3) occurs in flight practice is much more common than is commonly believed. For many decades, the share of «human factor» is estimated to range from 55 to 80 percent [12] of the causes of accidents. And this figure only applies to certified flight personnel. In view of the flight training process, departmental, private aviation share of the HR on average increased by four percent. With the addition of «human reasons» from the manager, maintenance overall proportion of the human factor is equal with the traditional classifications and methods about 87%.

While engineers have created a kind of helmet, which a person needs for mechanisms manipulation. However, in the future, these technologies will become more advanced and compact that will issue commands of various tasks without attracting undesired attention, focusing exclusively on the power of their mind. Human brain is still a mystery part of the body for scientists. This is why active study of brain activity (Fig. 4), technology understanding and ideas origin, imagination are processes that help make robots more human-like and autonomous. Nevertheless, these technologies are unavailable to modern man now.

Nowadays devices with the help of which people could operate aircraft and cars by thought became very active in designing.

Researchers at the Technical University in Munich launched a project named «Brainflight», to demonstrate the possibility of using Mission Control opinions. According to scientists, with the help of this even people with no experience of piloting are able to cope with it.

In the experiment, the virtual simulator involved seven people with different levels of experience. Helmet with electrodes was put on heads of the participants, and information about brain activity was transferred to the computer.

As Gagadget explained, scientists developed an algorithm that converts the electrical signals of the EEG into commands, as a result, all handles and steering wheel in the cockpit simulator is moving due to pilot's thoughts.

There was one man in the experimental group who was never associated with the management of aircraft, but eventually he was able to perform eight tasks out of ten – with deviation from the course of just 10 degrees. Several people under test were able to land the plane in conditions of poor visibility.

New technologies will help to control the aircraft using thoughts.

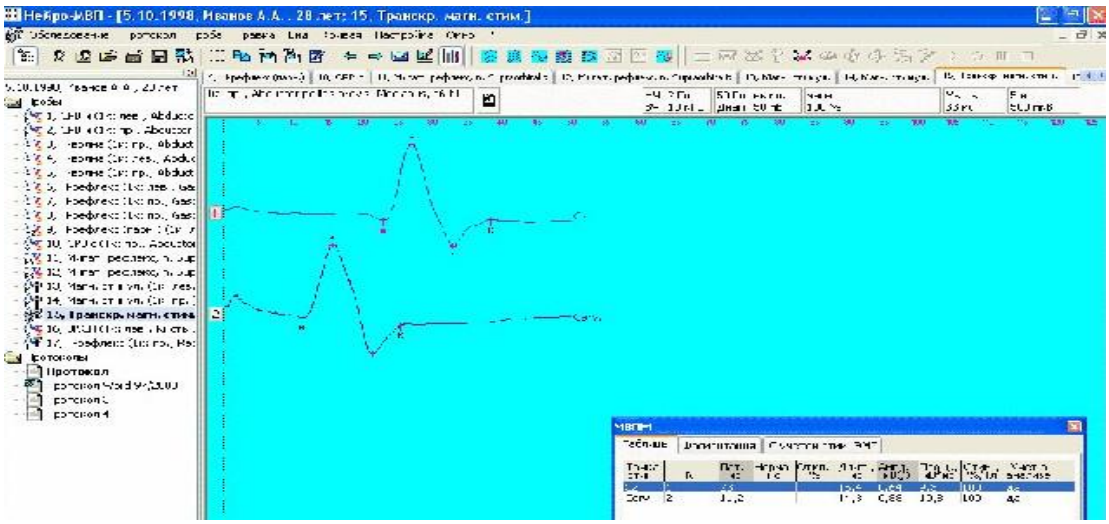

Fig. 3. 3D-modeling of information channels (obtained by authors)

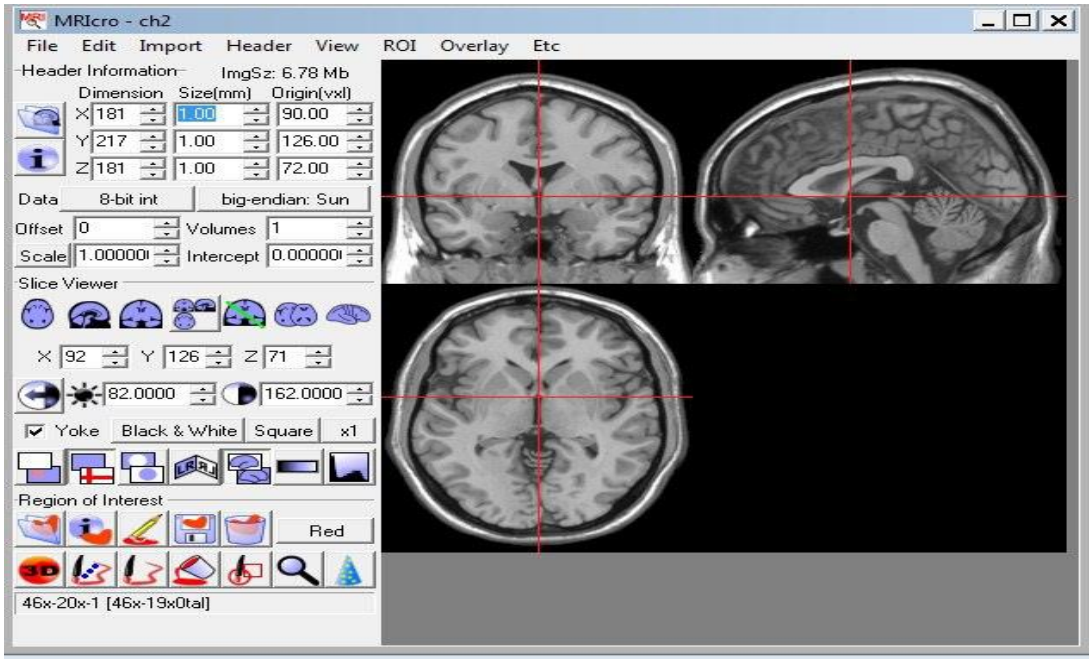

Fig. 4. Information about the brain activity (obtained by authors)

Experiments under supervising of German experts proved: control the plane using thoughts may be as effective as manual control. Plane can be easily controlled by thoughts. German researchers came to this conclusion, following a series of tests of flight simulation.

Participants followed exactly preset course using only their thoughts. According to scientists, the results of such experiment shown: volunteers could get pilots licenses.

Helmet with sensors was worn on the head of participants, which retreated cables, transmitting information about brain activity to the computer.

The participants were in a copy of the aircraft; while the steering wheel and handles moved independently, basing on the «pilots» thoughts.

The project «Brainflight» was organized by a group of researchers led by Florian Holtsapfel in Munich Technical University. For the first time, American scientists proved the theoretical possibility of managing aircraft a year ago. In their experiment, the subjects managed miniature helicopters using thoughts.

Munich experts made the next step: using real simulator for mental control. Scientists believe that their study may have a great future in aviation. After all, if the

pilot will be able to mental respond quickly to unusual situations, he will have great freedom of movement.

Man-machine communication became possible by a complex algorithm that deciphered electrical signals obtained by EEG, into the specific commands to the onboard computer. This program allocated only those thoughts in the flow of ideas, which belonged to the management of plane.

Researchers want to do next step – to establish a feedback between the plane and pilot. E.g., if a particular maneuver requires machine to overcome very large resistance, the pilot has to make a significant physical effort to hold it. Scientists want that onboard computer to give information about the complexity of the commands to future «mindpilots».

Machines are already an integral part of our lives. In the future, when the cities become bigger, cars – faster, we will need a new way to drive (Fig. 5-7).

Experiments with machines are still quite frequent. Scientists create machines that are able to fly, swim underwater, cars of the future, after all. The new development is something innovative, something that had not been.

AUTONOMOS Laboratory, which is located in Berlin, presented a new invention. The main breakthrough was the ability to control the car through the power of thought. To create this device was much easier as previously required devices parts were invented. One exception they use a computer instead of machine. This principle is the same.

Fig. 5. Usage of helmet into an airplane [13]

Fig. 6. Usage of helmet on the simulator [3]

Fig. 7. Usage of helmet into a car [6]

In words, this project is quite simple, unlike its implementation. Man has special device that reads information from the brain and sends it to the computer. The computer, in turn, writes EEG.

So people can mentally give commands like «deceleration», «right», «left», «accelerate» and so on. As mentioned earlier, the computer recognizes the information as pulses and depending on what type of information, it changes into the command and executes it.

The car has passed all tests Tempelhof airport in Berlin.

German scientists showed that driving with power of thought is realistic. The main task now is to teach people the right to give commands, so the computer can recognize and fulfill it.

Particularly promising areas are related to navigational robotic systems that allow autonomous navigation with full respect to external influences, such as its own speed and speed changes in the environment, rotation, direction of travel and so on.

This information is automatically assessed without human intervention. In addition, there are possible solutions to the most difficult task – instead of the human operator, computer-operators of air (or underwater) ships can control movement in three areas simultaneously: along the front, up and down, around the axis. Network error is less than 1.2%, which is unattainable to the human operator. Interesting land robots-loaders can be used in extreme environments and on other planets, small-sized aircraft with autonomous piloting etc. [8].

Increasing the effectiveness promotes the use of neurocomputers, due primarily, with the ability to signal processing at high noise levels. Handling images in two ways: recognition and allocation of moving target on stationary or moving background – opens tremendous opportunities in the implementation of tactical tasks. Being the most efficient algorithm for selection of moving targets on the background – neural networks open the way to fully automatic combat operations with conventional weapons. Building systems compatible with human biological vision will increase the productivity of operations tenfold. The ability to

restore the original picture by the following data will create significant market security. It is now obvious advantages of neural networks over human in the allocation of targets on the image even in the optical range. Networks have been used for systems of robots that move in an environment with obstacles.

Also, increasing the effectiveness contributes in transporters market, creating three-dimensional paintings and using for radars. They use three-dimensional (3D) model of radio sources. Networks allow qualitatively solving problems of goal in any of the signal/noise ratio by removing obstacles and simulation purpose. Solved the problem of information processing in a wide area view of the presence of large numbers of objects, task-tracking goals, identifying goals maneuver in the area of deliberate interference, etc. Before, all of this caused great difficulties in real time mode and in the ability of the human operator. Experienced dispatchers cope with simultaneous support of 25-26 goals. In real situations, such as in the area of the airport, the number of targets can reach several dozen. Joint activities of several controllers that communicate with each other goals; reduce airport capacity due to the human factor. Neural networks allow you to analyze and predict the future trajectory of the movement for a large number of obstacles. The creation of tracking the trajectories of many targets based on neural networks engaged in several companies in China and Singapore [12].

CONCLUSION

The performed analysis of the capabilities 3D-modeling and the concepts of «new engineering» showed that the modern knowledge in technics is fundamentally changing the traditional principles, approaches and models. There is an intelligent value of the role of modeling. The intellectualization of technics activity requires the creation of intellectual automated systems, that contribute to more active use of modern intellectual, geoinformational communications, corporate integrated systems and technologies, and will improve the quality process and stimulate the development of intellectual capital.

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МАТЕМАТИЧНИЙ ОПИС АНГСТРЕМТЕХНОЛОГІЙ ЩОДО ЗАСТОСУВАННЯ ШТУЧНОГО ІНТЕЛЕКТУ В АВІАЦІЙНІЙ КІБЕРБЕЗПЕЦІ

У даній статті розглянуто математичні результати у вигляді математичного опису управління людською думкою задля безпеки авіаційних об'єктів на основі впровадження нових авторських концепцій та авторської класифікації реформи авіаційних технологій. Математика сьогодні стоїть перед завданням розробки нових математичних інструментів для забезпечення кібербезпеки в авіації. 1. Кібернетичні об'єкти – це об'єкти, що розвиваються, для них характерний динамічний ефект, коли причина починає діяти через певний час, тому при розробці динамічних моделей необхідно враховувати затримки часу. 2. При використанні математич-

ного апарату в кібернетичному дослідженні та контролі вивчаються не самі об'єкти, а їх 3D-математичні моделі, адекватність яких дуже важко оцінити. У процесі побудови математичної моделі взаємно адаптуються дві системи наукових знань - кібернетична та математична. З розвитком інформаційних технологій ця взаємодія вийшла з поля кібернетичних досліджень у реальну практику управління бізнесом у галузі авіації. Отже, автори ввели нові економіко-математичні концепції і визначили роль 3D-моделювання в ангстремтехнологіях авіапідприємств з точки зору погляду на інформаційну безпеку та кібербезпеку. Успішні менеджери намагаються «запрограмувати» якомога більше управлінських рішень для підвищення ефективності управління інформаційною безпекою та кібербезпекою. Автори виконали 3D-моделювання інформаційної безпеки і прийняття рішень з кібербезпеки в питаннях повітряного простору, які можна розглядати як невелику версію моделювання з використанням ангстремтехнології управління. У дослідженні визначені засоби економіко-математичного моделювання управлінської інформаційної безпеки та створення кібербезпеки в задачах авіаційної промисловості, що складаються з програмних модулів, які використовуються для задоволення потреб проектувальників повітряного простору. Ця робота не має заявлених процедур, вона вимагає глибокого розуміння різних типів архітектур нейронних мереж, вона включає багато досліджень та аналізів і може зайняти багато часу для підготовки, але в результаті вона може видавати найбільш ефективне рішення на певний момент і конкретну ситуацію за короткий проміжок часу.

Ключові слова: математичний опис, штучний інтелект, технологія, авіація, кіберзахист.

МАТЕМАТИЧЕСКОЕ ОПИСАНИЕ АНГСТРЕМТЕХНОЛОГИЙ ДЛЯ ПРИМЕНЕННИЯ ИСКУССТВЕННОГО ИНТЕЛЛЕКТА В АВИАЦИОННОЙ КИБЕРБЕЗОПАСНОСТИ

В авиационной отрасли проблема принятия управленческих решений, полностью устраняющая авиационные аварии и спасающая человеческие жизни, является особенно острой. В прежние времена эти проблемы никогда не исследовались конструктивно. За рубежом всего восемь ученых (К. Эрроу, Г. Симонс, П. Лукас, Г. Кляйнер, Б. Канаплёв, Г. Бахарев, А. Иншаков и Т. Любимова), которые занимаются наноэкономическими подходами и методами, используемыми для решения проблемы развития интеллектуального капитала в целом и контроля знаний в частности. Но в области авиации и управления авиакомпаниями нет ни исследований, ни публикаций ни в Украине, ни в зарубежных странах. Следовательно, авторы ввели новые экономико-математические концепции и определили роль 3D-моделирования в ангстремтехнологиях авиапредприятий с точки зрения взгляд на информационную безопасность и кибербезопасность. Успешные менеджеры пытаются «запрограммировать» как можно больше управленческих решений для повышения эффективности управления информационной безопасностью и кибербезопасностью. Авторы выполнили 3D-моделирование информационной безопасности и принятия решений по кибербезопасности в вопросах воздушного пространства, которые можно рассматривать как небольшую версию моделирования в гибкой шкале времени (FTS) с использованием технологии управления angstrom. В исследовании определены средства экономико-математического моделирования управленческой информационной безопасности и создания кибербезопасности в задачах авиационной промышленности, состоящие из программных модулей, которые используются для удовлетворения потребностей проектировщиков воздушного пространства. Инструменты моделирования обычно не используют изогнутые сегменты. Точное описание маршрутов прибытия и отправления, определенных изогнутыми сегментами, может быть определено с использованием аппроксимированных линейных сегментов модели. Этот же метод предлагается использовать для описания резервных областей. Разработана концептуальная модель информационной системы ангстремтехнологии авиапредприятий, получено влияние на принятие решений по обеспечению информационной безопасности и эффективности кибербезопасности авиапредприятий. В этой статье освещаются результаты использования нейронной сети для управления человеческим мышлением. Сделанные выводы свидетельствуют о том, что ангстремтехнологическая модель является удобным инструментом руководителя авиапредприятия и мощным аналитическим инструментом в целом. Благодаря их использованию можно не только хранить и интегрировать данные, но и отражать процесс работы объектов на 3D-моделях.

Ключевые слова: мысль, искусственный интеллект, технология, авиация, киберзащита.

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