CONTENT

“INFORMATION SYSTEMS AND NETWORKS” BULLETIN 2016/I

INFORMATION SYSTEMS, NETWORKS AND TECHNOLOGY

RANKING FACTORS ONLINE RESOURCES SEARCH ENGINE GOOGLE

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The purpose of this publication are the main factors determining the ranking online resource for the purpose of entering the top-end position SERPs engine Google. The study will provide the means to implement an integrated approach to design optimized website to facilitate its entry into the top search engine ranking. To achieve this goal it is necessary to solve the following main tasks:

- an analysis of known technologies and methods of evaluating online information and resources search engine Google;
- identify factors that put the most influence on the process of building a high rating of the resource;
- analyze the main methods of evaluation history resource definition sanctions own website download speed of remote nodes and access time, the structure of external links or keyword.

Object of study – the process of identifying the main factors ranging Internet resources in the search engine Google.

The study examined are the methods and means of building high rating resources.

Scientific novelty of the research is to build features optimized Internet resource and determine the main factors that arise in the process of ranking websites in search engine Google.

The practical value of the work is to build the criteria to be applied in the design of optimized Internet resources.

The authors developed a methodological framework for building intelligent system optimization in internet resources and their subsequent entry in the top search engine:

- analysis of known technologies and methods of evaluating Internet resources, which made it possible to identify the factors that are most important in the process of building a resource. As for the internal structure to the following factors should be primarily taken into account: meta tags (Title – basic meta tag that takes into account while ranking the resource; Description – is used to increase CTR index of search results; Key words: determines keywords of the resource); tags (ALT – is intended to describe the images and determine alternative text, its filling contributes to the search for graphics, H1 – specifies the name of the page and is used only once; text – the actual text content); social factors (in modern conditions the presence of social media buttons is a must on your website); Usability (defines design and comfortable use of resources and it significantly affect: page views, orders, sales); code (directly affects the speed of the resource, and then on its ranking);
- describes the main factors influencing the design features high rating resources according to the algorithms search engine Google. Among which allocated the following: the domain name (the name of which links and other resources will be placed and which will be displayed in the search results); Domain age (plays a significant role in the promotion of the new site); Domain History (can either help or hurt advancement, for example, if the subject of the resource did not change, it will positively affect the ranking and vice versa); keywords in the domain (give tangible results in the promotion); subdomain (the practice of using subdomains created by the use of three-dimensional Internet resources as sections of different types separately easier to promote and modify); History penalties domain (substantially affect the process of moving the resource because search engine also evaluates past sanctions); server (the long response of Internet resource, unavailability of Internet resources should be taken into account (especially when Google Bot tries to go to about indexing resource); Uptime-life (time of continuous operation of a computer system or part of, as it is measured from the date of loading until the interruption or end monitoring).

The method of evaluating resource stories (archive.org), the definition of sanctions on a separate website filters by using Google Panda and Google Penguin (first main goal is to improve the quality of search results by evaluating material resources. The main directions of the algorithm are: insufficient, duplicate and low-quality content, what concerns the second one it is intended to fight online resources that use questionable backlinks, namely the algorithm os Google Penguin is used to detect manipulation links, which are created manually by optimizers to

influence the position of Internet resource), download speed from remote nodes and access time (sitespeed), the structure of external links (LinkPad) and Keyword (Google Adwords Keyword Planner Tool).

Key words: online resource, ranking, searching system, rankings factor

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2. Верес О. М. Вибір хмарної технології в проекті СППР з керування великими даними

SELECT CLOUD IN THE PROJECT OF BIG DATA-DRIVEN DSS

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The company needs long-term strategy of introduction of processing big data that answers the question of how the data will be processed and used. That is, at the time of data collection are required to know the details of the future analysis. Gartner analysts also emphasize the need to manage data as an enterprise asset. A huge amount of information coming through various channels to customers and users of the services, but business ignores their value and rarely has a clear monetization scheme this resource. Decision Support Systems (DSS) – an automated interactive system that allows the person who decides using data and models to identify and solve problems, make quality decisions. Modern DSS provides an opportunity to determine the degree of impact of decisions on the further development of business.

Working with big data is not like the normal process of business intelligence. Data-Driven DSS provides the highest level of functionality and decision support that is associated with the analysis of large amounts of accumulated data. The most promising information technology that are useful for building such a DSS project is big data.

This article examines cloud computing and criteria for project approval decision on the choice of the most appropriate model of cloud services as components of Big Data-Driven DSS. Particular attention is paid to the technologies of massively parallel processing formal model of information technology for Big Data. The analysis features of cloud technologies, their use in the project information system. In modern scientific literature is a most common division "cloud systems" architecture and the type of service delivery: Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS). As a result of the task, the task multicriterion received the decision of a defined set of criteria and alternatives. In the process of solving complex problems apply systematic procedures, one of which is the method of analytic hierarchy process (AHP). Construct a hierarchy of criteria and alternatives. Root hierarchy corresponding to the target selection cloud technologies, namely in terms of optimal cloud users. At the second level of the hierarchy are aspects (criteria): Price, administrative complexity and confidentiality. At the level of the leaves of the hierarchy are alternative cloud: SaaS, IaaS, PaaS. The focus of the hierarchy is the optimal cloud technology that best meets the selection criteria, which are defined by the project developer Big Data-Driven DSS. As a result, pairwise comparison of three alternatives for the 3-criteria and three criteria for the importance of their impact on the general purpose 3 matrix was obtained 3–3 dimension for the lower level of the hierarchy and a matrix size 3–3 to focus hierarchy. Received practical confirmation of the effectiveness analytical hierarchical process of decision making and justification.

Thus, using the method of analytical hierarchy, it was determined that the best in terms of design decisions on user components Big Data-Driven DSS alternative to SaaS. It is best for the price, confidentiality, administrative complexity (simplicity in this case). When deciding evaluation was used individual decision maker.

Key words: Big Data, cloud services, decision making, Decision Support System.

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3. Вінтоняк С. М., Коробчинский М. В., Чирун Л. Б., Висоцька В. А. Аналіз особливостей Інтернет порталу аматорських спортивних ігор

AMATEUR SPORTS GAMES INTERNET PORTAL FEATURES ANALYSIS

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In recent years, social networks have become very popular both in Ukraine and worldwide [1-9]. Every day more and more Internet users are registered and begin their vigorous activity in all new social networks that have become the list part of most visited websites of Ukrainian users [1-9]. All this is due to the active development of information and communication technologies. Social networks play an important role in the life of any society. A large number of people to such networks are attracted. Users Number in major social networks exceeds countries population [9-12].

The aim of social networking creation is the people communication. But now are witnessing a very different picture: networks with unnecessary advertising and obscene material are filled. And themselves founders create of networks their, primarily for commercial purposes, and then for communication. Another disadvantage of social networking is the effect creation of "tightening": the more people are on social networking sites, the more the money supply gets its founder [1-9].

Most active Ukrainian Internet users have at least one account in different social networks. Until now, the dominant reason for joining the networks is communicating with friends and acquaintances, not the implementation of certain professional tasks [12-19].

Recently, the National Institute of Denmark Public Health research is conducted aimed at identifying the impact of social networks on the brain of 11-15 years teenagers. Research has shown that teenagers today spend time with their peers about half less time than teenagers spent the late twentieth century. According to researchers, more

than half of their free time young people devote computer having fun various innovations in game industry, reviewing recent movies of global film distribution, and communicating with friends across popular social networks [12-19]. The most popular social network among young people in Ukraine is VKontakte. It has more than 12 million active accounts, representing more than a quarter of Ukraine's population [1-9].

The purpose of work is to review social networks directly in terms of impact on promoting healthy lifestyles among young people and to propose an alternative social network for attraction young people to healthy active sports life. A positive feature of social networks is the ability to create communities of interest. There are communities dedicated to the sports topics that are currently more actual information recourses. Such community's impact on users of any social network is traced in two ways. First, it is by the subscriber's number. In general they are quite popular among Internet users and ranging from hundreds to three million subscribers. Secondly it is the information on the pages of the users (entries that are placed there, photos, etc.). Incessant joining social networks in everyday life, compels to perceive them as a specific tools of mass communication. They provide not only the information transmission and also opinions exchange through possible commenting and expression freedom. Social networks are tools popularizing sports and healthy lifestyle in general, but also they can be viewed as obstacle for sporting activity of youth. Therefore should to move towards a social network creation aimed at promoting and developing sports activity among Ukrainian population, especially young people.

The aim is Web portal developing of the social networks towards not only building social activities and ties, but also in the development and promotion of active lifestyles among people of all ages and status. The systems analysis identifies the key objectives of the information system development through building of an objective tree. UML modeling of the system was fulfilled by building of diagrams such as: USE CASE, SEQUENCE, STATECHART, DEPLOYMENT, also by posing the problem and tasks. During the practical implementation created the website based on the system analysis of the subject area, completed verification and validation, performed an error analysis, detected and removed all of the defects.

The aim of this online portal is to promote sports lifestyle among young people through social networks. The entry of social networks in everyday life compels to perceive them as a specific tool of mass communication that provides information not only broadcast, but also opinions exchange through possible commenting and free expression of their opinions. Social networks can be considered as a means popularizing sport and healthy lifestyle in general. Therefore should to move towards the social networks creation that is focused on promoting and developing sports activity among young people. Potential users of these social networks will be more than enough, judging by the large number of follower's community in sports areas. Intellectual information system of Internet portal for amateur sports is designed. The main goal is the social networks development in the direction of not only building a social activity and communications, but also in developing and promoting active lifestyles among people of all ages and status. The model of Internet portal for amateur sports is developed. Methods and tools for solving the task following when research line choosing and justification are selected that are useful for the implementation of intellectual information system of Internet portal for amateur sports. And the choice and justification of methods and tools for solving the problem are carried. The methods of association rules and A priori algorithm are selected. Web-server XAMPP collection among the tools are selected (which includes Apache, MySQL, interpreter scripts PHP, the programming language Perl and many additional libraries that allow to run a complete Web-server). And open universal content management system for publishing information on the Internet – Joomla! is selected. Database at the stage of practical implementation is designed. This intelligent information system of Internet portal for amateur sports is necessary and notice worthy Web project of social network in our information lives.

Key words: intellectual, information, system, sport, social, network, validation, analysis, Internet portal.

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4. Hnatushenko V. V., Shedlovska Y. I. Shadow Detection and Removal from Urban High Resolution Remote Sensing Images

SHADOW DETECTION AND REMOVAL FROM URBAN HIGH RESOLUTION REMOTE SENSING IMAGES

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This article is devoted to shadow detection and removal from very high resolution (VHR) satellite images. Very high resolution (VHR) satellite imagery is considered one of the highest quality currently available from remote sensing satellites. The VHR satellite imageries support a range of services, especially in urban areas, for city planning and monitoring, urban change detection, estimation of human activities/population, forest fires monitoring and urban object/feature detection. The problem of shadowing is particularly important for VHR satellite images. Shadows appear in images when the light from a light source is completely or partially occluded by elevated objects. Shadows usually provide useful information about the object shape, height, and location, but they also can considerably reduce image quality. The presence of shadows can cause problems in pattern recognition and object identification and incorrect work of classification algorithms. Shadows cause object color and texture distortion. The aim of shadow removal is to obtain a shadow-free image. Shadow removal is an important preprocessing task for further image classification.

The aim of our research is to obtain a shadow-free satellite image. Many works have been devoted to shadow removal for single nature images. Our goal is to apply existing methods and create an efficient automatic shadow removal algorithm for VHR satellite images. Thus our algorithm implementation makes easier further image processing and interpretation. We propose an efficient algorithm for shadow removal from VHR satellite images. A WorldView-2 image of an urban area is used as a test image. Shadow detection is a key step of the algorithm. To detect shadow regions, we perform a shadow segmentation algorithm to obtain a binary shadow mask. First the image is transformed from the RGB color space to the HSV color model. A shadow detection index is calculated to obtain the grayscale ratio image r(x). To determine an optimal threshold for shadow segmentation, we apply Otsu's thresholding method over the r(x) histogram. In order to restore the illumination of the shadowed regions, we applied a shadow formation model. It shows how much direct light each pixel of the image receives. Our shadow model includes two types of illuminance: direct light, when rays from a light source are incident on the object, and reflected illuminance, when the object is lit by rays reflected from surrounding surfaces. Non-shadowed regions are lit by both types of illuminance, but shadowed regions are lit only by reflected light. To estimate the shadow recovery parameters for each shadowed region, we use the lit regions adjacent thereto.

We proposed an efficient algorithm for shadow removal from a satellite image. We are the first to apply a shadow formation model to shadow removal from a WorldView-2 satellite image. For shadow detection a threshold based method was applied. For our image the best result was obtained by NSVDI index and optimal threshold finding. The illumination of the test image is restored using a shadow formation model. As a result, we have obtained a shadow-free WorldView-2 satellite image. The test results confirm the efficiency of the proposed algorithm. There are, however, a number of artifacts introduced into the resulting images. These artifacts are due to the fact that the shadows are illuminated nonuniformly and the determination of the shadow border is imperfect. Further research will be devoted to removing artifacts along the shadow borders and processing images from other spacecraft.

Key words: shadow removal; shadow detection; Otsu thresholding; shadow formation model, NSVDI, VHR images.

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5. Грицюк Ю. І., Грицюк М. Ю. Моделювання стратегій поведінки конкурентних фірм на ринку надання туристичних послуг

MODELING BEHAVIORAL STRATEGIES COMPETITIVE COMPANIES IN THE MARKET OF TOURIST SERVICES

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On the market of providing services any subject must act in accordance with the established rules of behavior and interaction of participants of this market. These rules depend on factors such as the number of market participants, the presence of impediments to entry and exit from it, the degree of influence of each subject on the whole market in general and at own segment of business activities in particular. Rivalry among existing travel companies often comes down to a desire by all available means and methods to achieve a better position using the tactics of the pricing policy of providing services, promotion it's on the market relevant users through extensive advertising. The basis of the market relations is competition of tourist companies, which provide their original services, competition for market of their customers for getting the maximum financial results – incomes, profits.

Perfect competition enlarged represents market, which has a large number of tourist companies that provide approximately similar services for almost the same price. At the same time, market of imperfect competition has several variants in which competition of tourist companies limited by various factors: at a monopoly there is only one big company that provides its services at a relatively high value, while the market entry of other companies and their exit from it almost impossible; at an oligopoly, there are a few relatively large companies which often being in conspiracy and establish certain obstacles through which the entrance of other companies into the market quite problematic, etc. It is believed that perfect competition (not in ideal, of course) dominates of most markets providing tourist services and is the most desirable for the government, which seeks to ensure market principles for leading business and less interference in the activities of tourist companies, as it required in imperfect competition, especially for monopoly.

But the current process of transformation the economic system in general and in the tourism industry in particular that takes place in Ukraine at the present stage of its development, accompanied by manifestation the number of problems on choosing the optimal strategy of behavior and interaction of companies on the market

providing services. In particular, for modeling admissible behavior strategies of competitive companies on the market providing tourist services in the available literature are practically no: the mathematical models which describe the behavior strategies of two or more competitive companies while providing one and different services; no corresponding models describing strategies interaction between two tourist companies in the market providing one service; not developed the model strategies imperfect and perfect competition of tourist companies on the market providing services. All this causes the need of studying a market of possible competition and behavior of tourist companies on it while providing appropriate services and making informed decisions.

Therefore, the purpose of work consists in development the mathematical models of functioning tourist companies, which describe the different strategies its behavior and interaction in the market providing services, that will enable make informed management decisions under conditions of imperfect and perfect competition.

It is believed that in the tourism industry, especially in the methods and means of management, often there are situations in which faced two or more parties that pursue different goals, and the result obtained by each of the parties in the implementation of a certain strategy of behavior or interaction depends on the conscious actions of other parties. Such situations are called conflicts. Examples of conflict situations is a struggle of tourist companies by the market providing its services, any auction or sports competition, military operations and parliamentary elections (in the presence of several candidates), card games. Participants of the game – the persons who make decisions – are called players. Strategy of the player – a deliberate choice of one of the set of possible variants of its action.

To resolve conflict situations are used game theory, which studies methods and means of building mathematical models of making optimal decisions in conditions of conflict. Since the participants which are actively engaged in most conflicts are interested to hide from the competitors their own intentions, the decision-making in conditions of conflict usually occurs in the face of uncertainty. Often the factor of uncertainties can be interpreted as a competitor of subject that makes decisions. So, game theory is trying mathematically fix the behavior of players in strategic situations, in which success of subject, that makes the choice, depends on the choice of other players. Historically, originally has been developed the mathematical apparatus to analyze games in which one of the subject's wins on account of other (game zero-sum). But soon the researchers began to consider a wide class of interactions of game participants who were classified according to certain criteria. In games with a nonzero sum, winnings of any one player does not necessarily mean losing the other and vice versa. Therefore, the result of each of the participants of this game can be both less and greater than zero.

In article considered the features of construction the mathematical model of behavior strategies of competitive companies providing tourist services by the mechanism of resolve the conflict situations between participants with opposing interests, the mathematical model of which is game with non-zero sum. Initially considered a simple case of oligopoly – duopoly, that is, when on the market providing tourist services acting only two competitive companies.

As a result of implementation the developed mathematical model of behavior strategies of two competing companies providing the one tourism service allows to define reaction of one company to the actions of its competitor. The received mathematical expressions by which we can determine the reaction of one tourist company for a certain amount of providing service to another company, and vice versa.

We have developed a models of strategies the interaction between two tourist companies on the market providing one service, that enabled to define the strategy of behavior and situation (not) equilibrium of Stackelberg, point of equilibrium of Cournot and investigate the stability of equilibrium states. The obtained results at an investigation the different strategies of interaction the two tourist companies in the market providing one services are built in certain table, in rows are given market models of interaction, and in columns – mathematical expressions to determine the meanings of different parameters of interactions.

Assumptions models equilibrium of Cournot that tourist companies make decisions about own amount of providing service, considering that some changes of their amount of providing service will not influence on the amount of providing service of competitive companies, in a case of duopoly rather naive. Conversely, in the case of competition, when there are a lot of participants of market providing services indeed possible to believe that the actions of one of the tourist companies will not influence of the actions of others.

Competitiveness of market providing tourist services is determined by the framework, within of which some companies able to influence on market, i.e. on terms of providing its service, primarily on its cost. The less individual companies are influence on market, where they provide their services, the more market is considered competitive. The highest level of competitive companies on market of providing tourist services is achieved when individual company does not influence on it at all. This is possible only when on market of providing services are acting so many companies that each of them in particular does not influence on the value of the services, i.e. accepts it as such that determined by supply and demand of market. This is called the fully competitive market, and tourist companies, operating in its terms, does not keep each other compete. If individual tourist companies have ability to influence on conditions of realization of their services (primarily on their value), they lead between each other competition, but market where this opportunity is realized, is not considered completely competitive.

Therefore, we have developed models of strategies the imperfect and perfect competition of travel companies on the market of providing services that enabled to make informed management decisions. It was established that by conditions of perfect competition every tourist company provides such a small amount of services that it does not influence on its total value; the equilibrium cost of providing tourist services are equal to marginal expenditures.

Key words: the market of providing tourist service, behavior and interaction of companies, perfect and imperfect competition, the response of the company on the actions a competitor, game theory, models of behavior strategies and interaction, Stackelberg strategy of behavior, Stackelberg situation of equilibrium, Cournot equilibrium, Nash equilibrium, making managerial decisions.

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6. Жолубак І. М., Глухов В. С. Особливості створення помножувачів елементів розширених полів Галуа GF(d^m) у сучасних ПЛІС

DEFINITION OF THE EXTENDED GALOIS FIELD GF(d^m) WITH MULTIPLIER MINIMAL HARDWARE COMPLEXITY

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The cost of hardware multipliers various elements of Galois fields GF(dm) with approximately the same number of elements of the field is compared to determine the field in which the multiplier has the lowest hardware

complexity in its implementation on FPGA. Global hardware costs growth while increasing the basics of the field is shown. There are local minimums, which among odd d correspond $d = 2^i - 1$, and global level minimum for two discussed in the work methods of Guild cells evaluation hardware complexity: d = 3 and d = 7, respectively, when the evaluation uses only the number of cell inputs and exits outputs and when the internal structure of the cell is additionally taken into account.

Operations over elements of Galois fields $GF(2^n)$ is used In modern data protection units and these elements are represented in the polynomial basis. Processing elements for such fields have great hardware, structural and time complexity. Therefore, determining the possibility of reducing hardware complexity for Galois field GF (d^m) with base d > 2 (d – prime) and approximately the same number of elements $d^m \approx 2^n$ is an urgent task.

The aim of this work is to determine the fields from Galois field $GF(d^m)$ set (with approximately the same number of elements), multiplier for which will have the lowest hardware complexity.

The matrix multiplier for Galois fields $GF(d^m)$ elements in polynomial basis consists from modified Guild cells with units for finding coefficient, which is used during reduction of interim results.

Estimate the number of LUT in Guild cells can by performed by two ways:

1) to consider Guild cell as a “black box” – a fully integral part with negligible internal structure of the cell and to take into account only the number of its inputs and outputs;

2) to consider Guild cell internal structure (Guild cell has multiplier and adder).

Hardware cost is conveniently to evaluate in comparison to the cost of multiplier for binary Galois field $GF(2^n)$.

For the case when Guild cell is considered a black box The smallest hardware cost for the extended fields of simple basis will be for the Galois field $GF(3^m)$ multipliers. Hardware cost is growing when the basis is increased.

The inner structure of the modified Guild cell significantly affects the estimated hardware cost. Additional consideration of the internal structure of the modified Guild cell reduces hardware complexity.

The smallest hardware cost for the second option would be for Galois field $GF(7^m)$ with a simple basis d=7.

Hardware cost of multiplier for elements of Galois field GF (d^m) with approximately the same number of elements generally increases In today's FPGA field bases d is increased hardware costs are reduced In some local areas with increasing d. Local minimums of even d correspond to $d = 2^i-1$.The global minimum in presentation of Guild cells as “black box” corresponds to the value d = 3, while in its presentation as a set of multiplier and adder corresponds to the value of d = 7.

Key words: Galois fields GF(dm), multiplier, modified Guild cell, LUT.

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7. Кордіяк Д. А., Шаховська Н. Б. Аналітичний огляд мобільних медичних діагностичних систем

ANALYTICAL REVIEW OF MEDICAL MOBILE DIAGNOSTIC SYSTEMS

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The modern world is moving towards globalization in all of it's key processes and phenomens, ranging from socio – economic to cultural processes. For information technology the globalization process is the fastest. More and more functions that were traditionally performed by personal computers, are transferred to mobile devices because people want to read and work with their digital data at any moment anywhere.

Recently, the cloud technologies became widely spread because of carefully universal access and processing of data. Cloud technology in many times simplified the process of common access to several workstations data. The traditional expert systems gradually fade into the past because of the many exceptions to the rule and large databases. Instead of them, mobile expert systems are becoming widely and widely spread. However, there is a certain dependence on platforms, integrating data from various devices and more. Depending on the goal of developing a particular system one should choose the most suitable platform and work with the appropriate types of devices.

The main purpose and objective of the program system is to collect patient medical data directly without the use of special medical equipment and devices. Today becoming more common so-called "smart" watches. The main difference between these clocks from conventional counterparts is the ability to connect to the Internet and synchronization with a smartphone. In addition, some models have hardware and software that allows you to collect patient medical data (user). These models of watches have special sensors that provide a variety of human medical screenings, such as heart rate, pressure, etc. With these impressions doctor can monitor the patient's condition in real time and on time and quickly stanovlyuvaty patient diagnosis and provide recommendations.

This article analyzes the mobile medical diagnostic systems and compare them with the proposed HealthTracker system based on smart watche Apple Watch. Before the development of the system HealthTracker, there was conducted a review and analysis of existing similar systems to identify common and distinctive features of the future system. This analysis will improve HealthTracker system, based on the strengths and weaknesses of existing systems and help identify and justify the key benefits and unique system HealthTracker. The main goal is to provide a system HealthTracker convenient way to interact with the patient the doctor based on the vital signs of the patient. Apple Watch is an excellent watch presented in 2014 that has the capacity to collect and compile data on the health of the user and can be used for medical purposes. The main hardware components of the watch for collecting and analyzing health data is a technology Taptic Engine, infrared sensors and pulse. The main software components of the watch, that will be used in the design of the system is the 3 applications, each of which measures a user's vital signs. Integration with smartphone user makes data on the health of a quick and reliable. On the market today there are analogues of the system, but most of the systems are relatively new and require many improvements, some are under development prototypes. In addition, all the above systems require binding to certain equipment that is not always convenient in everyday use. To eliminate all the inconvenience in using existing systems need to create a system that is integrated into smart watches that provide ease of use, and the mechanism storing and analyzing medical data to cloud storage.

An important aspect of the study is to analyze the general situation in the market of mobile medical diagnostic systems. Thanks to research the key advantages and disadvantages of the proposed mobile medical analysis system and shows its versatility compared with existing systems on the market.

Key words: medical system, diagnostic system, Apple Watch, smart watch.

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8. Кравчишин В. С., Медиковський М. О., Галущак М. О. Моделювання енергетичного потенціалу вітрової електричної станції

MODELING OF ENERGY POTENTIAL OF WIND POWER PLANT

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Renewable energy is one of the important criteria of stable progress of the world community. Continuously, a search of new technologies and improving of existing technologies are happens, to increasing the efficiency and economic benefit of its using on all variety fields.

Modern technologies which used criteria “amount of available energy” accent attention on wind energy. One of the most important areas of research in wind-energy is estimation of wind energy potential in the region and substantiation of specific location of wind power plant (WPP). The wind speed data can be received from meteorological stations archives and give a possibility to get statistic parameters of wind speed for specific region for a day, month, year or any other period of time. An important criteria for calculation wind energy potential of region is annual average wind speed for each specific territory. For researching the territories by their energy potential, also used such parameters as: as density wind power, total wind energy potential and continuous duration of working wind speed as a criteria of stable wind turbines work.

The purpose of the work is to research methods of processing statistic wind parameters data to increase accuracy of stochastic estimates of wind parameters, to determine power of wind flow and to substantiate parameters and location of individual wind turbines and wind power station fully.

Based on analysis of known distribution law of random variables, using two-parameter family of continuous probability distributions such as: gamma distribution, log-normal distribution, Weibull distribution were substantiated. Such distributions can be transformed into exponential law, the law of Rayleigh or normal distribution law of random variables, depending of form parameter. Using of density distribution function gives a possibility to estimate the probability appearance of a specific wind speed with greater accuracy, the expected power of wind flow and duration of needed wind speed in each of specific direction.

In this paper were done the research and comparative analysis of methods of determining the probability of wind speed’s recurrence by using Weibull distribution, gamma distribution and log-normal distribution based on metrological wind speed data. It gives possibility to substantiate the expediency of using one of them in a specific area for modeling wind parameters.

After processing measurement results of wind speed was calculated determination coefficient R2 for each of statistic distributions and was calculated how results of distributions (Weibull, gamma, log-normal) meet the real wind parameters. Determination coefficient R2 allows calculating accuracy of describing of input data by each of used distributions.

The obtained results can be used to substantiate the parameters and location of individual wind turbines and wind power plants in general.

Separately should be noted importance of obtained result in the design and operation of wind power plants. They provide the opportunity to generate control algorithms of wind power station’s modes for effective use wind

potential and installed power, taking into account the customer needs and the possibility of accumulating electric energy.

Key words: wind power plant, gamma distribution, log-normal distribution, Weibull distribution, energy potential of wind.

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9. Литвин В. В., Оборська О. В., Вовнянка Р. В. Використання адаптивних онтологій під час моделювання петлі Бойда

USE ADAPTIVE ONTOLOGY DURING MODELING THE BOYD LOOP

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In this paper, the model based on hinge Boyd Moore automaton. State machine loops are the stages Boyd and ontology editing process and find relevant knowledge in the ontology. Determined the possible transitions between states of the machine parameters and thus transmitted. Designed makers is the basis for building DSS commanders tactical units DFAFU.

Boyd loop model based on Moore automaton is developed. The states of the automaton are the Boyd loop stages as well as processes of ontology editing and search for relevant knowledge in the ontology. The possible transitions between the stages of the automaton and which parameters are transmitted at the same time are defined. Such an automaton is the basis for building of GF AFU (Ground Forces of the Armed Forces of Ukraine) tactical units by decision support subsystem commanders.

For modeling the decision support process in the competitive environment the mathematical supply and methods of using the domain ontology in four OODA loop stages (observation, orientation, decision, action) are developed. So for the military sphere on the stage of "Observation" the reconnaissance data are analyzed by the subject area ontology in order to determine the strengthes and weaknesses of the enemy. On the "Orientation" stage the ontological data are used for simulation modeling of the possible course of the fight and for the optimal placement of own forces. In the "Decision" stage the target distribution method based on genetic algorithms, which allows to reduce the computational complexity, and thus significantly speed up the time needed for tactical section commander for decision making. Probability data concerning the destruction of enemy forces with the use of the certain means, which is input data of the developed method, are taken from the ontology based on the analysis of the normative tables. Also, in order to improve the efficiency of possible solutions in the ontology expert knowledge based on the descriptive logic is presented.

Method of using adaptive ontologies in applied subject areas such as military applications taking into consideration the experts definition of ontology individual elements weights, allows us to increase the effectiveness of such Boyd loop stages as "Orientation" and "Decision" during a simulation modeling of the fight flow and target

distribution. In some situations, the use of expert rules contained in the ontology allows 20 % probability to increase the own forces intact.

The architecture of decision support subsystem which consists of modules that determine the appropriate stages of the OODA loop is developed. The central component of the decision support subsystem is the subject area ontology. Such ontology of the DF AFU is built. The main elements of ontology is fighting sets, their tactical and technical characteristics, combat statute, normative documents that define the extent of fire damage, and etc. The definition of separate elements of ontology with the use of descriptive logic is made.

Developed mathematical software functioning intelligent agent activity planning based on ontologies, allowing to formalize the behavior of agents in the state space. Weighing elements ontology allows you to narrow the search space of the path from the initial state to target state, discarding irrelevant alternatives.

Key words: decision support system, ontology, knowledge database, Boyd loop, genetic algorithm, mathematical expectation, probability.

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10. Марасанов В. В., Шарко О. В., Шарко А. О. Статистична обробка сигналів акустичної емісії та їх параметрів

STATISTICAL SIGNAL PROCESSING OF ACOUSTIC EMISSION AND THEIR PARAMETERS

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One of the main issues in AE method there is decoding complication of control results, which is conditioned imposition on the AE signal made by noise of the probed object, environment, represented by acoustic waves. The exposure criterion of defect which is engendered is an origin of signals of AE with large amplitudes. Development of

defect is represented as a peak distributing of AE signals. Setting the certain levels of discrimination it is possible to select signals related to development of defect. Measuring of acoustic signals parameters allows not only finding out beginning of defect which develops but also his total increase. An origin, forming and exposure of defect which develops, is generated stochastic processes, what inaccessible a direct supervision and fixed only them external displays. Thus inevitable initial vagueness of phase process destruction. Nature of such vagueness is explained distortions of AE signal at distribution from the place of it generation to the point of reception and depends on the places of transformers location, configuration of good and material parameters. A task localization of AE sources is one of central in the problem of control and decides by measuring difference time of AE signals arrival to carried groups of sensors taking into account speed of wave distribution which is included in the proper calculation formulas.

Basic methodological principle of diagnostics at control the AE method is information collection from acoustic sensors and it statistical working for research the determination degree of tearing down construction. A statistical treatment AE signal of in the non-destructive checking system foresees the presence of a priori information about a defect, which is recognized, and consists in the estimation of development phase of defect by comparing the looked after realization process to the standard curves.

Under the statistical signal processing AE understand the formalized description the reaction of material, caused a defect, which develops, adequately represents the change of him underlying structure and provides possibility of estimation the technical state of object.

The optimization problem and useful signal selection on background obstacles can decide with the use of patterns recognition theory. Thus under optimum such methods are understood excretions of useful signal, which satisfy a preliminary select statistical criterion. Grounded methodological principles of treatment the acoustic emission signals at non-destructive control of steel products and looking after the developed defects dynamics. Finding the followings informative signs is fixed in basis of statistical treatment of informative parameters of AE signals: mean amplitude values of single signals, mean values of intervals between single acts, dispersions of amplitudes, dispersion of intervals, correlation coefficient between the values of amplitudes and intervals, time of current realization supervision. The determining role of wavelet transforms is rotined during the selection the useful signal on background obstacles.

At the study of descriptions of defects which develop, for prognostication of destruction it is necessary to have the most complete information about the source of acoustic emission, that to erect to the minimum admissions of useful information at presence of the fluctuation noises.

The effective mean of the continuous signals analysis is Fourier transformation in which a signal is laid out in the base of sines and cosines of different frequencies. Coefficients of transformation are by the calculations of signal scalar work with complex exponents. However, in relation to the analysis of the AE signals Fourier transformation has a row of failings, related to that the separate features of signal lance and breaks cause the insignificant changes of frequency appearance and smoothed out on all of frequency wasp. Partly the problem of spectrology and AE signals synthesis can be decided by Fourier window transformation. The signal increase operation on a window $(t-b)$, which is a local function which moves along a sentinel a landmark in a few positions b, is thus utillized. Then transformation becomes dependency upon time and gets frequency sentinel description of signal. The lack of Fourier window transformation is that for calculations the fixed window which can not be adapted to the real properties of signal is used. It a task is able to decide wavelet transforms.

Such procedure allows not only deleting some statistical fluctuations and promoting the role of dynamic signal descriptions, but also substantially to reduce requirement to the recording apparature of the AE signals and their parameters. Exactness of analytical approximation results, got at treatment of statistical material, depends on the number of laying out complete realization on current, and also from exactness of the estimations parameters of AE signal in current realization. Enlargement such laying out results in the unstationarity of process within the limits of current realization and admission of anomalous informing features of the AE signal. The increase of number of counting out points in current realization complicates measuring and them subsequent statistical treatment. Efficiency the use of wavelets at statistical treatment of AE signals consists also in that by wavelet transforms it is possible to get him an image is megascopic and, opposite, casting aside unimportant details and executing reverse transformation, to get a signal, cleared from noises.

Key words: acoustic emission, signals, statistics, informative parameters, wavelet transforms, useful signals, obstacles.

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11. Парубочий В. О., Шувар Р. Я. Реалізація гібридної архітектури кластерних обчислень

REALIZATION OF HYBRID ARCHITECTURE OF CLUSTER COMPUTING

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The development of the modern computing systems is largely determined by the development of their operational and permanent memory and the increasing of the speed of processors and data bus between them. And if the increasing of memory is virtually unlimited and is determined only by the range of the address space that is supported by the processor, increasing of the processor performance is a complex and expensive process. This process is described by the empirical Moore's law that defines not only the rate of growth of the computing power of processors, but also determines the duration of active growth in computing power.

Moore's Law has proved its truthfulness in 1980th, prompting the manufacturers of computer systems look for new ways to increase computing power of processors. As result of these decisions the multi-core processors were created, as well as multiprocessor systems that allow use multiple processors on a single circuit or several integrated circuits. However, such solutions give only a temporary solution, not fix the problem in general. First, the design of multi-core processors and multiprocessor systems have design limitations and can not combine a large number of subsystems. Second, the main disadvantage of modern processors is their architecture, which isn't fixed using these decisions.

Modern CPUs, even multi-cores, are sequential processors optimized for fast execution of the sequence commands, and cannot be use for execution of a large set of simple, sometimes identical, commands.

Another area of development of computing power was the emergence graphics processors for processing graphical data and displaying the processed information on the display. The graphic information does not require such accuracy that is used in many scientific researches. Moreover, the most of the fragments graphics – pixels, sub-pixels, blocks – can be processed independently. As result, GPUs, unlike the CPUs, are originally designed as parallel processors with low precision of calculations.

However, even given the limitations in accuracy, parallelism of GPUs interested the manufacturers of computing systems and in 80-ies the first solutions of the general-purpose computation on GPUs (GPGPU) were created. The last stage of development of the GPGPU technology become CUDA Technology (Compute Unified Device Architecture) by NVIDIA and ATI Stream Technology (ATI FireStream or AMD Stream Processor), developed by AMD.

The article analyzes the possibilities of solutions of the GPGPU technology, and implementation of the hybrid architecture of the cluster computing based on the computing cluster of Ivan Franko National University of Lviv using solutions of CUDA technology, developed by NVIDIA.

The article analyzes the main characteristics of GPUs and computing power of the CUDA and ATI Stream Technology. The main part of the article contains the theoretical analysis of hybrid architecture cluster computing, provides an overview of hardware and software features of all levels of parallelization and an overview of hardware and software, which are needed to implement this architecture. In addition, describes the principle of organization of the hybrid architecture on hardware and software levels based on architecture, hardware and software of the computing cluster of Ivan Franko National University of Lviv. Implementation of hybrid architecture uses classic architecture of computing cluster based on the system queues and resource allocation SGE and open implementation of message passing technology MPI (OpenMPI). The level of the cluster nodes uses the adaption that allows you to move from computing on the CPU to the GPU. As the main software this layer uses a standard set of tools CUDA Toolkit, provided by NVIDIA.

In order to generalize the approach to writing programs using hybrid architecture of cluster computing we implemented a software framework that allows not only implement the basic processes of interaction between levels of hybrid architecture, but also allows to divide them logically. In addition, in order to facilitate the compilation process of applications, which are used our software framework, we developed scripts based on make utility.

For practical demonstration of the proposed hybrid architecture and its hardware and software implementation, the article describes the application of two-dimensional Fourier transform based on the classical and hybrid architecture of cluster computing, and contains a comparative analysis of their execution performance for large resolution image.

Key words: hybrid architecture, cluster, CUDA, CTM, OpenCL, MPI, NVIDIA, GPGPU, FFTW, CUFFT.

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12. Пасічник В. В., Савчук В. В., Єгорова В. В. Мобільні інформаційні технології навігації користувача в приміщеннях

MOBILE INFORMATION TECHNOLOGIES OF USER NAVIGATION IN BUILDINGS

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Considerable attention the researchers, practitioners and programmers nowadays pay to the development of mobile software and algorithmic applications based on information about current location of the user in the open environment (cities, roads, fields, forests, oceans, etc.), while relatively little attention is paid to solving problems arising in the process of positioning and navigation of the user inside buildings.

Especially noticeable is the lack of these mobile information technologies oriented to the needs of the tourism industry as much of the popular tourist sites are quite complex structured, because without human assistance or tourist guide it is difficult to navigate in the spacious indoor museums, castles, palaces, theaters and galleries.

The paper shows the results of the analyzes of the techniques and information technologies of user computer device indoor positioning. The possibilities of computer technology indoor positioning of device when navigating the user through the territory of tourist sites, which are castles, museums, galleries and architectural monuments.

The article devoted to the analyze of the possibilities of mobile information technology of indoor positioning of computer devices (smartphone, tablet, etc.) to navigate the user through the territory of tourist sites.

The authors concluded that today's technology market is not fully functional for high quality of positioning and navigation of tourists in indoor invironment such as museums, castles, galleries, hotels, architectural monuments.

Special attention should be paid to the number of original modern techniques and technologies of positioning of dynamic objects in an enclosed space. The most popular of them are Wi-Fi, iGPS, RFID, NFC technology and processing visual images. Each of these technologies has its advantages and disadvantages depending on the fields and the specific environment.

Wi-Fi technology has higher accuracy positioning comparing to Bluetooth or RFID technologies. Although there is a limit on the value, type of access point Wi Fi are more cost and technologies than other positioning. Bluetooth-technology is also not available in that scope in terms of its high cost, but has significant advantages – it is relatively simple to use, reliable and compatible with standard mobile devices that use and are usually small in size. The accuracy and value of RFID technology depends on the type of receiver signal and the number of RFID tags. Rapidly gaining popularity technology NFC, which has a relatively high accuracy, and transmitter operating on this technology appear in most modern mobile means. However, due to the small range of specified technology has limitations on its scope.

Major efforts, researchers now focus on developing efficient algorithms for processing of navigation data to improve the accuracy of positioning procedures and improve the technological compatibility of different user devices.

The study shows the structure of the navigation component of “MIAT” system in the complex structured tourist facilities that designed by the authors.

The paper presents the algorithm of positioning of the mobile device (smartphone, tablet) in a difficult organized space tourist sites on the example of castle in town Khust, that is based on the combined technology of positioning, which uses the combination of Wi-Fi, GPS positioning techniques and technology of processing of images from the mobile camera. The proposed scheme of the location of WiFi access points in the Khust castle is shown in the article.

Keywords: tourism, positioning techniques, indoor navigation, MIAT, Wi-Fi positioning, Indoor GPS, mobile technology, telecommunication.

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13. Приймак М. В., Дмитроца Л. П., Олійник М. З. Аналітичні способи задання функцій зі змінним періодом та інформаційні технології визначення їх коефіцієнтів Фур'є

ANALYTICAL APPROACHES FOR DEFINITION OF FUNCTIONS WITH VARIABLE PERIOD AND INFORMATION TECHNOLOGY FOR DETERMINING OF FOURIER COEFFICIENTS

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Besides class of periodic functions signals exist, for which periodicity is also typical but their period somehow changes. Electrocardiograms during or after physical activity of the patient may be the apt example of such signals. If periodical functions are being learned rather versatile, and Fourier series theory is widely known among scientists, the same cannot be told about studying signals with variable period – the study of which started rather recently, when a notion of a function with variable period was defined and the class of such functions was entered. One of the main contributions to the theory of these functions was a construction of systems of trigonometric orthogonal functions with variable period, their variable periods were recorded and the space of functions with variable period was defined. Each of such spaces is defined by the length of the interval of the orthogonality, which varies due to the position of the interval and the value of variable period in the left point of the interval. The scalar product that is entered at specified spaces consists of weight function, that is also connected with appropriate trigonometric system. Achievements like this are the basis of new scientific directions: a) theory of functions with variable period; b) information technologies of analysis of functions with variable period.

In this work main stages of research of functions with variable period which underlie the "algorithm of convergence". It's meaning lies in changing the researched function with variable period (from the set of convergence functions) by the other one from the set of convergence functions. The "algorithm of convergence" includes some quantity of problems: selection of means for approximation, i.e. the family of functions, with assist of which the approximation of given function will be performed; selection of approximation method, i.e. composition of orthogonal functions system with variable period; actual composition of approximating function, i.e. decomposition of function with variable period in Fourier series; error evaluation between function with variable period and approximating function; software and, in general, information system development for examination and analysis of functions with variable period. However, the main problem is to compose the Fourier series for functions under "approximating", for instance, electrocardiograms with variable period, mentioned above. Stage realization of "algorithm of convergence" that includes questions of theory and creation appropriate information technologies research functions with variable period.

It is stressed that while development of the theory "convergence" functions with variable period the problems of verification of theory principles in specific examples with the usage of analytically set functions with variable period. Whereas there are no ways of setting functions with variable period up to now, first the main methods of setting periodical functions were reviewed.

One more important result of this work – for the space that is specified by appropriate trigonometric system of functions with variable period recorded into scalar product of its' elements and norm of space elements. The general appearance of Fourier series for function with variable period and expression for determination of its coefficients is

represented. Herewith the orthogonal trigonometrical system of functions with variable period and its interval of orthogonality are consistent with variable period of the function under examination. Obtained theoretical results are approved by concrete examples with application for this analytically defined function with variable period: the Fourier coefficients are determined, the finite Fourier series is composed, and Bessel's inequalities are checked. Besides, comparison of these results with the same results on the example of similar to the function with variable period – function with stable period. Obtained results do not contradict the correctness of theoretical positions, obtained in this work, and therefore formulas, algorithms that were used may be engaged in developing program ways of research of functions with variable period and creating appropriate informative technologies.

Key words: variable period, function with variable period, Fourier coefficients of the function with variable period, Fourier series of the function with variable period, information technologies of functions with variable period investigation.

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14. Шаховська Н. Б., Худоба Б. П. Система заохочення молодих людей до наукової роботи

THE SYSTEM TO ENCOURAGE YOUNG PEOPLE TO SCIENCE

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Innovative ways to make technical education and research attractive to young people is a widespread problem not only in Ukraine but in the whole world. Education is the process by which a person receives knowledge and practical skills. In this process, a person develops mental-cognitive and moral-aesthetic level. The promotion of undergraduate and postgraduate learning and research activities in Ukraine and worldwide is becoming increasingly important for all segments of the population, falls as qualification level of future workers, which leads, in turn, reduce the level of production in the tangible and intangible spheres. The lack of young people who want to engage in scientific activities will lead to the fact that there will be enough people in the workplace. Another factor, which stems from the lack of motivation is the deceleration, and in some cases, and degradation of the population. There is a need to develop a system that combined an interesting game and at the same time encouraged students to study, and stimulated them to self-improvement and toward scholarly activities.

Today online games have become popular among young people. It is established that the average age of "gamer" is 30 years old, and 47% are women. It is known that the game industry is one of the most developed sectors of software development. In Poland the amount of funds received from sales, and the number of programmers working on the creation of games, is the largest among all sections of it. Having the opportunity to develop the game, competing with others, students will gain real practical knowledge and skills that will be useful to them for a successful career. Also attracting students to the writing games will provide an opportunity to increase the number and quality of doctoral candidates, because every game will require the development of proprietary algorithms, architectures, methods and the like that provided incentives and rewards, will enable the student to start an academic career.

Nowadays one of the most popular methods of training is to conduct tutorials with explanations of the lecturers. Also the tutorials are complemented with tests and homework to monitor student progress. There are also a number of systems to create simulated real world conditions for research. These systems help you find interesting for each individual area of research.

Also an important point in the development of such a system to accommodate the wishes of the girls to ensure gender equality, because games are interested in mostly boys. It speaks once again about the importance of content that can be offered by the system.

In the article analysis was conducted. The main tasks in the design of the system are selected. Opportunity writing games by students are consider, what will help understand exactly what they want and what are the most interested for them. Present solutions are analyzed. Their advantages and disadvantages are included in projected system. Activities of the system are described. Important elements of the system, namely: providing graphical representation for implemented programs from solutions and evaluation, which makes it possible to keep statics and to give advice are included. Players present in the system and their possibility are given. Advanced architectural solutions, which enable the use of a common API for multiple clients are directed. The current popular design patterns that underlie the system are analyzed. Model–view–controller (MVC) is a software architectural pattern for implementing user interfaces on computers. It divides a given software application into three interconnected parts, so as to separate internal representations of information from the ways that information is presented to or accepted from the user. The chart of grade for competition which shows the work of the main objectives of the system are modeled. Also technologies that are present in the system architecture are given. The stages of implementation are formed.

Key words: innovative teaching methods, system architecture

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15. Шелевицький І. В., Ткаченко Є. В. BOX метод ідентифікації прямих на растрових зображеннях

BOX METHOD FOR IDENTIFICATION STRAIGHT LINE ON THE RASTER IMAGE

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One of the typical problems of computer vision is the identification and selection of line segments on raster images. The above problem occurs during image vectorization, text recognition, picture classification [1]. A typical approach to solving problems of line identification is the direct application of classical Hough transform and its variations [2]. The essence of itis to project multiple lines passing through the point of raster image onto the curve on the reflection plane. According to the curves intersection density the lines are identified at the raster image. The number of calculationsis a power function of the number of points. The power equals to number of lines passing through the point.While increasing accuracy the power increases.Extremes search on a reflection plane is a challenging real-time task, and thresholds for extremes have no obvious interpretation. The noise presence in the raster image greatly distorts the display quality and complicates identification. These shortcomings impede the computer vision solution in real-time. A typical example of such systems is the Advanced Driver Assistance Systems (ADAS) where it is necessary to identify the road, road markings, road signs and vehicles [3].

This paper proposes a slightly different approach to the lines identification on raster images. Authors eliminate the need to conduct multiple lines through each point of the image and to project them onto the curve on the reflection plane. The lines passing through the pair of points are searched. A similar approach is used in Random Hough Transform (RTH) [4] where the pairs of points are chosen randomly. We analyze all possible pairs. Thus the number of calculations equals the square of the number of points on the raster image. Pairs of points lying on a straight line will appear as one point in the reflection plane. By calculating the number of reflections at one point, the number of points that lie on a straight line can be determined. Thus, the significance threshold is easy to establishbasing on the number of points on a straight line.

There are many ways to project a line onto the point on reflection plane. In the classical Hough transform the length and angle of the perpendicular from the line to the origin are used as coordinates. In other modifications the

coordinates of the line and horizontal lines intersections, the coefficients in the line canonical equation and others are used. In the BOX-method we use the line to elemental square intersection coordinates (hence the name). To display the uniqueness we use a special algorithm of opening thesquare(polygonalcoordinate system).

This approach allowed usingreflection areabounded by values from -1 to 2 of 6 sub squares, each of which refers to a certain lines' position. This leads to easier interpretation and reduce calculations for lines search onreflection area.

The proposed method reduces the number of calculations from power N to power 2 and allows avoiding general optimization problem by reducing it to a comparison with points' values threshold in a limited area. BOX method allows parallelization of calculations and application of the method of least squares to estimate the line parameters. Thus the method allows working with images that contain noise and blur lines. The method is implemented in Python to the images predefined by lists of points. Demo version allows demonstrating the features of converting and key problems. The demo version of software for processing real raster images is developing.

Keywords: Hough transform, line detection, filtering images, computer vision

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16. Шелевицький І. В., Шелевицька В. А., Семенов Б. С. Частотно-часовий аналіз серцевих звуків у сплайнових базисах

TIME-FREQUENCY ANALYSIS OF HEART SOUNDS IN SPLINE BASIS

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Despite the development of ultrasonic tomographic research methods, the cardiac murmur auscultation method does not lose relevance. On the one hand this is due to the high cost and duration of ultrasound, on the other hand there are a lot of heart defectsthat are difficult to detect without auscultation. Recording, reproducing and graphically displaying sounds (usingelectronic stethoscopes and analytical software) makes the auscultation method objective, not dependent on therapist's subjective judgment. The modern problem is the creation of algorithms and software for automated and predictive analysis of recordings. The complexity of the problem stems from the fact that heart sounds are fickle and existing methods of evaluation are subjective.

The problems concerning cardiac sounds analysis are: sound recordings segmentation (identification 1st and 2nd heart tones), time-frequency analysis and heart tones modeling. There is a lot of research to determine the parameters of cardiac sounds which could efficiently classify sounds and detect cardiac murmur. Currently there is no reliable algorithm solving those problems.

This paper suggests spline-based solution. It provides a single flexible and easy to calculate model for all three tasks. Similar to Savitzky-Golay spline filters are used for sounds filtering and segmentation. Variouswidth of spline fragments allows varying smoothness and caliber of fragments. The time-frequency LSS analysis is used for heart tones selection. Decomposition is archived by multi-scale spline approximation by least squares. The selection of coefficients of significance decomposition by Student's criterion "t" is used for allocation of significant time-frequency components. The original retroactive algorithm is used to account for different decomposition frequencies. Hermitian cubic spline approximation byleast squares with optimization by spline nodes position is used to analyze heart tones.

The result of analysis is a set of parameters that give a detailed characteristic of the heart tone. Those are: number of vibrations, degree of attenuation, duration of attenuation, oscillation period's ratio and oscillation smoothness. This allows comparing the similarity of tones at different observation periods, forming a generalized tone and using these parameters for heart sounds classification.

Experimental sound database consists of over 300 newborns' heart sounds and three and six monthsafter birth verification recordings. For more than 50 children along with heart sounds audio recordings, ultrasound echocardiographic studies were performed to identify and evaluate heart features to correlate them with acoustic picture. An electronic stethoscope Thinklabs Model ds32a+ is used for the recording. Audio recording was carried out on recommended by stethoscope manufacturer digital voice recorder Sony-ICD-UX71. Heart sounds recording is performed in 5 characteristic points, with duration 5..6 seconds each.

The proposed LSS analysis allows obtaining statistically stable heart sounds decomposition coefficients with the estimation of coefficients' reliability (standard deviation factors). Student's significance statistical testing allowed resection of statistically insignificant coefficients. The multi-scale LSS analysis allows determining of cardiac rhythm period and receiving acoustic signal sound recognition patterns. As the result more than four times signal compression is archived.

Key words: time-frequency transform, spline, murmur, computer vision, filtering, Student's t-test

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17. Шулькевич Т. В., Селін Ю. М. Математичний апарат для прогнозування аномальних припливів (цунамі)

MATHEMATICAL APPARATUS FOR PREDICTION OF ANOMALOUS INFLOWS (TSUNAMI)

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Tsunami – a wave length of 500 m, which are formed in the sea or in the ocean is usually as a result of earthquakes (asteroid, etc.) and cover the entire water column. In deep water a tsunami propagates with the speed of several hundred kilometers per hour and is undergoing minor energy losses.

The main difference from other tsunami waves is that all the water is moving, not just the surface layer. In the sea, at a considerable depth tsunami pose no threat to shipping, they can not even notice. At the shore, where the depth gradually decreases, the tsunami slows down, and wave height increases, it becomes a moving wall of water. When you exit aground off the coast of height can reach tens of meters. In addition, the wave that runs at an angle to the shore, slowing unevenly and tends to turn around the shore.

In general, there are three main areas and, therefore, three methodological approaches to mathematical modeling of the dynamics of ecologically dangerous processes of different types of nature – the area consisting of dynamical-numerical approaches based on numerical methods for solving different types of differential equations that describe the fundamental physical dependence, as well as atmospheric and hydrodynamic processes.

The second area that contains empirical dynamical and statistical approaches based on the use of long-term statistical data of field measurements is an international system of analysis and forecasting components of ecological systems. They focused on identifying fundamental spatial and temporal patterns characteristic of atmospheric processes over decades. The main purpose of these approaches is, in fact, setting based on years of statistical data profound spatial

and temporal correlations between various natural processes. Depending on the purpose of the study of mathematical apparatus of analysis of the dynamics of environmentally hazardous processes advisable to carry based on the ideas as speakers, numerical and dynamical and statistical approaches, but given the specific characteristics and properties of these processes.

The third class of the processes that can not be modeled using dynamical-numerical methods, and a lack of a certain frequency (daily, monthly, annual or other constant intervals) are difficult to describe using empirical-statistical methods. So urgent is the task of developing the analysis of flow processes and develop methods of forecasting processes for the information system management and control of environmental conditions.

This is the third class include abnormal tides (tsunami).

The article describes the approach to modeling environmental processes, such as abnormal tidal (tsunami). A mathematical apparatus based on statistical methods and includes a hidden Markov models, and linguistic modeling method similar trajectories.

Throughout his life, humanity is suffering from the harmful effects of the tsunami. This is especially touched the residents of the Pacific coast. Only recently, with the development of mathematical sciences and information technology now also forecasting such phenomena. The general lack of statistical techniques is the lack of historical information. But humanity all his life engaged in environmental monitoring, watching the weather, natural processes. Therefore, the use of statistical methods it is justified. The use of the mathematical apparatus seems possible given the large amount of accumulated information about the processes observable abnormal tides.

Key words: environmental processes, abnormal tidal, tsunami, modeling, mathematical apparatus, hidden Markov models, linguistic modeling, linguistic modeling, similar trajectories method.

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COMPUTER AND MATHEMATICAL LINGUISTICS

18. Бісікало О. В., Висоцька В. А. Метод лінгвістичного аналізу україномовного комерційного контенту

THE LINGUISTIC ANALYSIS METHOD FOR A UKRAINIAN COMMERCIAL CONTENT

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Research linguists in the sphere of morphology, morphonology, structural linguistics have identified different patterns for the word forms description. With beginning of the development of generated grammars theory linguists have focused not only on the description of the finished word forms, but also the process of their synthesis. The article scientific and practical problem of automatic detection of meaningful keywords and Ukrainian content categorization in Internet systems on the basis of linguistic analysis of text information is unleashed. The article presents a theoretical and experimental substantiation of linguistic analysis methods for Ukrainian content using Porter stemming. The method is directed on automatic identification of meaningful keywords in the Ukrainian content based on proposed analysis components formalization – the grammatical (grapheme), morphological, syntactic, semantic, structural and referential. In Ukrainian linguists is fruitful research in functional areas such as theoretical problems of morphological description, the classification of morpheme and word creative structure of derivatives in Ukrainian language, regularities for affix combinatorics, modeling word-formative mechanism of the modern Ukrainian language in dictionaries of integral type, the principles of internal organization in words, structural organization of different verbs and nouns suffix, word creative motivation problems in the formation of derivatives, the laws of implementing morphological phenomena in Ukrainian word formation, morphological modifications in the verb inflection, morphological processes in word formation and adjectives inflection of modern Ukrainian literary language, textual content analysis and processing, etc. This dynamic approach of modern linguistics in the analysis

morphological level of language with focused attention researcher on developing morphological rules allows to effectively use the results of theoretical research in practice for the computer linguistic systems construction of textual content processing for various purposes. One of the first attempts to apply generated grammars theory for linguistic modeling belongs to . Gladky and I. Melchuk. Experience and research of Noam Chomsky, A. Gladky, M. Hross, A. Lanten, A. Anisimov, Y. Apresyan, N. Bilhayeva, I. Volkova, T. Rudenko, E. Bolshakova, E. Klyshynsky, D. Lande, A. Noskov, A. Peskova, E. Yahunova, A. Herasymov, B. Martynenko, A. Pentus, M. Pentus, E. Popov, V. Fomichev are applicable to the tools developing for textual content processing as information retrieval systems, machine translation, textual content annotation, morphological, syntactic and semantic analysis of textual content, educational-didactic system of textual content processing, linguistic support of specialized linguistic software systems, etc. Linguistic analysis of the content consists of three stages: morphological, syntactic and semantic. The purpose of morphological analysis is to obtaining basics (word forms without of inflections) with the values of grammatical categories (eg, part of speech, genus, number, case) for each word forms. There are the exact and approximate methods of morphological analysis. In the exact methods use dictionaries with the basis of words or word forms. In the approximate methods use experimentally established links between fixed letter combinations of word forms and their grammatical meaning. A dictionary using with word forms in the exact methods simplifies using the morphological analysis. For example, in the Ukrainian language solve the problem of the vowels and consonants letters alternation by changing the conditions of using the word. Then for finding the words basics and grammar attributes use algorithms of search in the dictionary and selecting appropriate values. And then use morphological analysis provided the failure to locate the desired word forms in the dictionary. At sufficiently complete thematic dictionaries speed of textual content processing is high, but using the volume of required memory in several times more than using a basics dictionary. Morphological analysis with the use of the basics dictionary is based on inflectional analysis and precise selection of the word bases. The main problem here is related to homonymy the words basis. For debugging check the compatibility of dedicated bases in words and its flexion. As the basis of approximate methods in morphological analysis determines the grammatical class of words by the end letters and letter combinations. At first allocate stemming from basis words. From ending word sequentially take away by one letter after another and obtained letter combinations are compared with a inflections list of appropriate grammatical class. Upon receipt of the coincidence of final part with words is defined as its basis. In conducting morphological analysis arise ambiguity of grammatical information determination, that disappear after parsing. The task of syntactic analysis is parsing sentences based on the data from the dictionary. At this stage allocates noun, verb, adjective, etc., between which indicate links in the form of dependency tree. In the given article the main problems of electronic content commerce and functional services of commercial content processing are analyzed. The proposed model gives an opportunity to create an instrument of information resources processing in electronic content commerce systems (ECCS) and to implement the subsystem of commercial content formation, management and support. The process of ECCS design and creation as an Internet marketing result is iterative. It contains in its structure a number of stages (from the analysis, design and development of a plan to a prototype construction and experimental tests). The latter process begins with the specifications and layout formation, content template creation, content formation and its subsequent publishing according to the site's structure. In the initial stages (before setting functional requirements and development process initiation) regular users are involved into the process through poll letters, alternative design and prototyping of varying degrees of readiness. Thus, valuable in formation is collected without much effort, along with both evoking users' sense of direct involvement in the design process, as well as winning their trust. The paper analyzes sequence methods and models of information resources processing in electronic content-commerce systems. It also allocates the basic laws of the transition from commercial content formation to its implementation. The formal model of ECCS is created, which allows implement in phases of the commercial content lifecycle. The developed formal model of information resources processing in electronic content-commerce systems allows us to create a generalized typical architecture of ECCS. The generalized typical architecture of ECCS is proposed in the paper, which helps implement the processes of commercial content formation, management and realization.

Key words: text, a Ukrainian, algorithm, content monitoring, keywords, content analysis, Porter stemmer, linguistic analysis, parsing

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19. Борисова Н. В., Кочуєва З. А., Оліфенко І. В. Метод автоматизованої лематизації дієслів німецької мови

METHOD FOR GERMAN VERBS AUTOMATED LEMMATIZATION

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The timeliness of software development for automated lemmatization is defined that procedure of lemmatization is used for solving many problems of natural language processing: indexing of web-documents, information search, text content uniqueness, schematization of web-documents, classification of e-documents, creation of computerized dictionaries, machine translation, text tagging, etc.

Mathware, algorithmic support and software for problem solution of automated lemmatization of German verbs with separated prefixes are represented in the article. The task complexity is that separated prefixes are situated at the distance from the verb and can change its meaning partially or fully, moreover, current programs, which work with German – GermaNet, A Self-Learning Context-Aware Lemmatizer for German, The Durm German Lemmatizer, A freely available morphological analyzer, disambiguation and context sensitive lemmatizer for German, Work Package 2 – Lemmatizer, StaLe and some other lemmatizers, which are on the open Internet and can be used free, despite diversity of their functional capabilities they have some disadvantages: process only nouns, not take into account the context of the word, use certain operation system and hardware platform, etc.

As the mathware of the task was chosen a model of natural language forming, proposed by Prutskov O.V., where generation of any word form with the certain grammatical meaning is regarded as the sequence of finite number of stem transformation. Every transformation has inverse one that makes the cross effect. This model is open – you can add other types of transformation if the model has the same result due to it and applying of direct and inverse transformations to the line do not change it. The presence of these characteristics is the obligatory condition for the right work of the algorithm. If the transformation or coherence of the transformations can be used, their result is the modified form. If the transformation or coherence of the transformations cannot be used on the form, the result is not definite. For solving of the lemmatization task it is appropriate to use the inverse transformation on the word form.

By the aid of the chosen model the algorithmic support for problem solution of automated lemmatization of German verbs with separated prefixes was developed. The algorithm includes such stages: loading or manual entering of the text for analysis; dividing of the text by the sentences according to separation characters; search of the verbs in the sentence, if the separated prefix is found, it is added to the verb; normalization of the verb with the help of the lemmatization algorithm; presentation of the normalized verb with its translation to a user.

During the development of the software for problem solution of automated lemmatization of German verbs with separated prefixes principles of OOD were used, the software conforms to all main criteria of its development. Not only Java standard packets and libraries were used for making of the software, but also specifically developed classes, functions, methods, collections and arrays. The software is realized in NetBeans IDE 8.1 environment. The program has comfortable interface for users and instinctively plain menu. Using of this software provides an opportunity to analyze any text in German. The loadable text should be in txt-format. Online-service Leo.org is used for translation. The program shows three the most widespread translation variants of the verbs which were found in the text with some additional information, for example, word stress, which preposition is used with the verb and what case of nouns is used after these verbs.

Therefore, the developed software realizes the proposed method of automated lemmatization of German words with separated prefixes and has the necessary functional for the task. A further improvement of the software is planned.

Key words: lemmatization of German verbs, automated lemmatization, development of lemmatizers.

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20. Крак Ю. В., Лозинська О. В., Пасічник В. В., Тернов А. С., Шкільнюк Д. В. Математичні методи та прикладні інформаційні технології моделювання, перекладу та навчання для української жестової мови

MATHEMATICAL METHODS AND APPLIED INFORMATION TECHNOLOGIES OF MODELING, TRANSLATION AND TRAINING FOR THE UKRAINIAN SIGN LANGUAGE

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The objective of this scientific paper is to develop the mathematical methods and form a complex of the applied information technologies of modeling, processing and translation of the Ukrainian sign language.

Scientific novelty of the study is that the research proved for the first time and solved a number of important scientific and applied tasks related to the development of mathematical methods and the formation of a complex of applied information technologies of modeling, processing and translation of the Ukrainian sign language. It is analyzed and proposed the new methods of recognition and dactyl identification of the sign alphabet, methods of computer translation of the annotated Ukrainian sign language. It is designed the multimedia technology of the analysis of the visual sound images and the emotional facial gesture, allowing to implement the animation of the emotional speech channel of the sign language speaker.

The paper is devoted to developing methods, models and algorithms for modeling and recognition of emotional and articulation component in speech production on photographic images of the human face and three-dimensional models of the human head for reproduction and recognition of sign language.

An experimental information technology to recognize lips mimics when pronouncing the Ukrainian language on the basis of flexible design templates provided by non-uniform basis splines is created in the work. On the basis of an improved model of synthesis and articulation of emotional images using relative morphing to the synchronous

animation of sign units and saying by lips, achievement in a field of visual-speech animation has been managed to integrate to the technical solution of a task of sign language reproduction.

Functioning developed and implemented software tools for modeling and recognition of the emotional component of speech and articulation of the process on the human face for reproduction and recognition of sign language by the example of articulation for the sample of words-pattern of gestures are checked.

Authors performed the original research of the linguistic peculiarities of Ukrainian sign language and developed the grammatically augmented ontology (GAO) of Ukrainian spoken language and Ukrainian sign language. The mathematical model of grammatically augmented ontology was developed. The model provides the possibility of integrating expressions into ontologies and supports the means for description of grammatical attributes.

It is developed software and algorithmic complex for bidirectional translation Ukrainian sign language. Method and algorithm for machine translation annotated Ukrainian sign language based on grammatically augmented ontology were developed.

As a result, a computer translation system of annotated Ukrainian sign language using GAO was developed. The quality of Ukrainian sign language translation was increased to 93.2 % compared to the statistical method of translation (57.2 %) and the rule-based method of translation (75.3 %).

Authors developed information technology detecting finger alphabet sign language of the deaf. The paper presents a number of features for submission of the human hand showing his (her) finger alphabet. It is carries out the review in order to identify effective features for different groups of dactylic rhythm.

Information technology developed using the results of analysis of the sign effectiveness to detect finger alphabet.

Information technology testing conducted on groups of people with different age, sex and parameters at different focal lengths showed unequivocal identification of the correctness at the level 80–87 %. The analysis of incorrectly identified elements showed that the cause of poor recognition is incorrect playback of dactylic rhythm or its fast displaying. The experimental group at a given condition of proper displaying (training, demonstration rate) showed recognition at the level of 98 %.

Practical significance of the obtained results consists in the development of the information technologies complex for the dactyl alphabet of the sign language recognition, for the lips mimic recognition within pronouncing the Ukrainian language on the basis of the flexible templates that are represented using non-uniform rational B-splines, and the information technology of the annotated Ukrainian sign language translation. The developed mathematical methods and applied information technologies used for the design of the computer system synthesis and analysis of the visual component of mimic-articulatory process for the Ukrainian sign language reproduction and recognition, as well as in the development of the correct articulation training system, lip-reading system, preparation and creation of the educational materials, presented with the annotated Ukrainian sign language.

The results of the scientific research are implemented and used in Lviv special secondary boarding school for deaf children named after Maria Pokrova, in Zhytomyr specialized boarding school for children with impaired hearing, in Kamianets-Podilskyi multidisciplinary education and rehabilitation center, in Ternopil specialized secondary boarding school for levels I-III. The results of the scientific research used for the development of the industrial software in the “Infoservice” scientific-technical company.

Key words: Ukrainian sign language, information technology, recognition of gestures, finger alphabet sign language, visual-speech synthesis and lips reading, visemes, realistic three-dimensional animation of sign language, model of visual-speech animation synthesis, computer translation system, grammatically augmented ontology, parsing tree, affix probabilistic context free grammar.

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STATISTICAL DISTRIBUTION AND FLUCTUATIONS OF SENTENCE LENGTHES IN UKRAINIAN, RUSSIAN AND ENGLISH CORPORA

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We have studied statistical distributions of the frequency of sentences over their length for large Ukrainian, Russian and English corpora. The average sentence lengths have been found in terms of linguistic signs, letters and words for those corpora, as well as for some particular representative texts. The results have been interpreted in the frame of modern linguistic theory. It has been shown that the tails of the statistical distributions are fairly well described by the exponential function. Since some discrepancies between the empirical and theoretical data still remain, we have also tried to fit our results with the functions closely related to the exponential. We have proven that the fluctuations of the frequency of sentences of different lengths depend on the average values of that frequency according to the Taylor's power law. Significant relative fluctuations of the frequency of sentences and the relative changes in the average sentence length reported in the present work confirm the importance of fluctuation phenomena in the statistical linguistics.

We have found a significant asymmetry of the distribution function $f(l)$ of sentence lengths with respect to the length l that corresponds to the maximum frequency and discussed possible reasons for the irregularities found in the curves $f(l)$. We have found the average lengths of sentences in terms of signs, letters and words. It has been ascertained that, in terms of sentence as a measure of informative communication, the information capacity of the Ukrainian sentence is a bit higher than the corresponding values for the English and Russian sentences, regardless of the sentence-length measurement units.

We have discussed possible analytical forms of the distributions $f(l)$ for individual texts and corpora, and have attempted to set the appropriate parameters using graphical methods of linear approximation. It has been shown that the tail of the function $f(l)$ is satisfactorily described by the exponential, stretched exponential or the log-normal distributions. Using the approach to the sentence lengths as the waiting times between the consecutive punctuation marks that signal the completion of the sentence, we have shown that the exponential or the other close functions are consistent with the random nature of sentence lengths, the absence of heavy tails in the distributions $f(l)$, and a limited semantics carried out by the length of the sentence.

It has been proved that the dependence of frequency fluctuations of sentences of different lengths on the average values of the frequency f is determined by the Taylor's power law. The differences in the respective exponents γ for the Ukrainian, Russian and English languages can be caused by different positions of these languages on the syntheticity/analyticity scale, although it is possible to explain these differences more easily as a consequence of the effect of finite size of our statistical samples. The differences of the values $\gamma = 0{,}56 \div 0{,}69$ from a classical value ½ indicate anomalous scaling of the fluctuations, deviations from the stochastic Poisson process of forming sentence lengths in the texts, and a presence of interactions or correlations among the elements in the complex linguistic systems.

Significant relative frequency fluctuations and significant relative changes $\Delta l / \bar{l}$ for the average length, which are equal to about 40% almost regardless of the language, confirm the importance, even a principled character, of the fluctuation phenomena in the statistical linguistics. Even if the scaling of the fluctuations were normal ($\gamma \approx ½$), the relative fluctuation too slowly decreases with increasing f, in order to come to a reliable 'macroscopic' limit: the $\Delta f/f$ value is not less than 7% even for high relative frequencies that are unattainable in practice ($f \sim 0.5$). Moreover,

with $\gamma \approx 0.6$ we obtain $\Delta f/f \sim 12\%$, which cannot be considered as a negligibly small value. Consequently, even the absence of interactions or correlations in the linguistic system does not guarantee a stable macroscopic averaging of its characteristics. This is associated with essentially 'mesoscopic' nature of the linguistic systems: even in the case of relatively large texts ($L \sim 10^6$) or corpora ($L \sim 10^9$), these systems are hopelessly small when compared with typical macroscopic systems in the statistical physics, which can include $\sim 10^{20}$ or significantly more particles. Hence, in case of the mesoscopic linguistic systems one cannot get rid of the influence of the fluctuation phenomena.

Keywords: computational linguistics, linguistic corpora, statistical distributions, sentence length, fluctuations.

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22. Хомицька І. Ю., Теслюк В. М. Статистичний метод визначення стилерозмежувальної здатності групи губних фонем в системі англійських стилів

THE STATISTICAL METHOD OF DETERMINATION OF LABIAL PHONEME GROUP STYLE-DIFFERENTIATING CAPABILITY IN THE SYSTEM OF ENGLISH STYLES

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The present paper's study deals with modeling of the phonostatistical structures of English functional styles. It is expedient to determine phonostatistical characteristics of labial phoneme group as it makes it possible to relate a text to a certain class of texts.

The statistical method used in the research has determined essential and unessential differences among the texts compared for labial phoneme group. The essential differences reflect style factor whereas the unessential differences – language factor effect.

Three cases of the position of a phoneme in a word have been researched: a) unidentified position of a phoneme in a word; b) phoneme at the beginning of a word; c) phoneme at the end of a word.

In the case of a phoneme at the beginning of a word the texts under study differ essentially in 16 of 21 paired styles. Style and language factor effect has been established in this case. Author's manner of writing factor has been determined only in one case – a phoneme at the end of a word.

As an example of language factor effect in the case of the position of a phoneme at the beginning of a word we represent comparison of texts from the colloquial style and poetry by G.G.Byron and Th.Moore. The differences between the paired texts are unessential. Colloquial lexical elements have high frequency of occurrence in the texts compared and cause their closeness. Style factor effect has been established in comparison of texts from the colloquial style and emotive prose by Byron. Lexemes from different lexical-semantic groups and specific expressive elements have caused essential differences. In comparison of texts from the colloquial and newspaper styles essential differences have been revealed. Style factor effect has been caused by different lexical units functioning in the mentioned styles. Texts of emotive prose and poetry by Byron differ essentially for the case of the position of a phoneme at the beginning of a word. Compositional pattern of a verse has considerably limited a great number of lexemes frequently used in emotive prose. That is why style factor effect prevails in this case. Strong style factor effect for three cases of the position of a phoneme in a word has been determined in comparison of texts from poetry by Byron and the scientific style. Terms from technical physics are those distinctive elements which differentiate the paired texts. The texts of poetry by Moore differ essentially from texts of drama by Shaw in two cases of the position of a phoneme in a word: 1) a phoneme in any position of a word; 2) a phoneme at the beginning of a word. Melodic, similar to a folk song poetry is opposed to the prose texts of drama in which lexemes used in social-political sphere of human activity and Irish colloquial speech have high frequency of occurrence. These lexical differences imply strong style factor effect. Lexical units functioning in the texts of the newspaper style have caused strong style factor effect in comparison with lexis of poetic speech by Moore. Essential differences have been established for three cases of the position of a phoneme in a word. For three cases of the position of a phoneme in a word unessential differences have been revealed in comparison of the texts of the colloquial style and poetry by Moore. Language factor effect prevails. Closeness of the texts compared has been caused by common lexical layer of spoken language. The use of colloquial speech is typical for romantic poetry of this historical period. Language factor effect has been determined for the case of the position of a phoneme at the end of a word in comparison of the texts from the colloquial style and drama by Shaw. In two other cases the differences are essential. Similarity of phonemes constituting the lexemes used in both texts resulted in the unessential differences. Texts differ essentially for the case of the position of a phoneme at the end of a word in comparison of the colloquial and scientific styles. High percentage of terms from the latter style has caused style factor effect.

The theoretical aspect involves building for labial phoneme group a statistical analogue of phonological subsystem of the researched style system (belles-lettres, colloquial, newspaper, scientific).

The practical aspect of the research involves determination of phonostatistical characteristics by which an author or style of a text may be identified.

Key words: phonostatistical characteristics of a text, style-differentiating capability of labial phoneme group.

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PROGRAM AND PROJECT MANAGEMENT

23. Бойко Н. І., Михайлишин В. Ю. Ефективність застосування генетичних алгоритмів для пошуку оптимізованих рішень

THE EFFICIENCY OF USING GENETIC ALGORITHMS TO FIND OPTIMIZED SOLUTIONS

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The article substantiates theoretical principles, methodical and practical recommendations that improve the effectiveness of functioning of the information system. Presents the basic models of genetic algorithms for finding the best solutions in the information system. Describe the main aspects of using genetic algorithms for their application in evolutionary modelling. Presents genetic algorithm for operating the selection criteria and selection population of solutions. Given existing approaches and methods to use genetic algorithms to solve multicriteria optimization problems. Analyzed the computational complexity of genetic algorithm search for optimal solutions.

Examines the methods of evolutionary modeling that are not only effective tools for the purpose of optimization, self-organization and modeling of adaptive behavior in various applied fields but also as a basis for exercises in the improvement of programming techniques algorithms and software systems. Special place here is genetic algorithm, which contains all the existing linguistic structure of modern programming languages (including parallel programming). Genetic algorithms are the starting point for making modifications to it – a new genetic algorithms for solving specific application tasks. Thus, the technology of evolutionary modeling allows using the natural methods of evolution to create a deployed information system and the algorithms, than having a limited set of input data and parameters.

In the article the General idea of the evolutionary simulation was to replace the process of modeling complex systems on the modeling of its evolution. In the process it was used by the mechanisms of natural development in the integration of complex information processing systems. The so-formed Darwin proposed the basic laws of development of the organic world, heredity, variability and natural selection that enable an efficient organization of complex information systems.

Given the practical ability of evolutionary modeling are first evaluated on the basis of application of the main method of evolutionary computing – genetic algorithm. In it most fully implemented the mechanisms of natural evolutionary processes that include selection, reproduction and imitation. The presence of flexible means of regulating the intensity of these processes allows to manage the process of finding solutions, ensuring the best definition of them.

The paper analyses the approaches of evolutionary algorithms, which are compared against other numerical methods and is a particular strategy of searching optimal solution by simulating the development of certain situations instead of directly computing the answers from a formal deterministic dependencies. Thus, the use of genetic algorithm gives advantage in uncertain situations, where there are quite a few good, albeit non-obvious solutions, while other methods of finding solutions are unsuitable or ineffective. In addition, these algorithms can effectively shape the patterns of adaptive behaviour of the system, because chromosomes that were able to survive in the evolution process solutions, retain, essentially, the collective experience of many generations.

Analyzes technology of object-oriented programming, to implement the aforementioned tasks as flexibly as possible and convenient for the programmer. Such technologies are effective for their subsequent implementation and maintenance of information systems.

Is allocated the role of genetic algorithms in the evolutionary mechanism of simulation as an effective search procedure competitive with other procedures. The efficiency of genetic algorithms depends strongly on details such as method of encoding solutions, operators, parameter settings, individual success criteria. This work reflects the

important role of genetic algorithms, and does not give grounds to speak about certain develop strict mechanisms for precise predictions.

Key words: system, information flow, information processes, “cloud computing,” corporate information systems, information technology

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24. Кунанець Н. Е., Небесний Р. М., Мацюк О. В. Особливості формування цілей соціальних та соціокомунікаційних складових у проектах “розумних міст”

FEATURES OF FORMATION OF GOALS SOCIAL AND SOCIAL COMMUNICATION COMPONENTS IN THE PROJECTS OF THE “SMART BRIDGE”

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The article presents an analysis of the “human factor” on the formation of goals within social and socio-communicative projects of “smart cities.” The rapid development of technology pushes mankind to think for laws that were once invisible. Finding them and influencing the main factors mankind becomes more educated, which in turn again stimulates science. New technologies are rapidly gaining major new territory, the territory of the large abundance states and that of developing countries. Because the world is interconnected, so there is a constant level of

cooperation on science, economy, technology and society. Even very remote areas, are unable to be alone with themselves, people who live or work in these areas bring with them science. It has long been proven that an educated person gets from his work much more material benefits than unskilled workers. Advances in technology made their case, people who feel the strength to constantly learn and acquire new skills begin to leave the places that do not bring them any abundance. The large waves of migration motivate talented people to create new local branches of science, art, economics, big level. Such associations can be described in two words – "smart city." "Smart City" – a place of new opportunities, effective investment of resources in the lives of residents, and ultimately in the economy. A key factor in the development of "smart city" is a society with its needs and prospects. It is people, not technologies who are the creators of modern cities, active participants in their transformation projects and major consumers of municipal services provided. Services that can change society. New ideas that arise in a reasonable society can make their home more attractive. Barcelona, Helsinki, London or others can serve as perfect examples. Along with the fact that every city has its own specifics, the latest technology is involved to achieve goals, together with technical capabilities the society development is in full swing. Various research technology is used in conjunction with the most recent, such as big data. The behavior of people in the "smart cities" forms the budget of these cities. To examine each and every mark a person left every day of his/her stay in the city, is a great opportunity to organize this mark better, at the end spending less time on work and more on creativity or leisure. New Directions – crowdfunding, crowdsourcing provide more opportunities for ideas that were not supported by government programs, but have great popularity among the inhabitants of these cities. However, it is less burden on the state, because people find a job of interest, while paying taxes into the budget. Population gets re-educated constantly, to always be competitive, increasing its level of qualification. People of retirement age are engaged in facilitated work. The author analyzes how this interaction results in the formation of innovative emerging centers of administrative services based on new models of interaction between citizens and government. The "smart cities" produce electronic services that provide online help, which in turn again unloads a quick delivery of public services. Electronic portals is the ability to make a suggestion or ask about the performance of a workload to a public servant; problems that exist in the public or the city are resolved quickly, without wasting time on paperwork or place. Transformation of urban communities, where citizens are the main driving "change factor", guarantees successful performance outcome through the city's innovative and practical implementation of intelligent solutions. In the article the methods of forecasting or prediction process that can be used to build the strategy "smart city." In the article the author tries to show how systematically the problems faced by "smart city" and the society which it resides, using the latest technology may go to the formulation of the problem, or goal. The purpose may be different because it is affected by a variety of factors: residence, wealth, education, life expectancy, nationality, climate and other factors, but it all comes down to one thing – to do a job and stay comfortable, capable of performing assigned tasks. So a person has confidence in the future, and remains in a "smart city" benefiting self and the society in which s/he lives.

Key words: мsocial, humans smart city, societal needs, human resources, urban analytics, urban GIS, urban analysis and modeling, social innovation, populations smart city, creative city.

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25. Марковець О. В., Березняк Є. Ю., Лисик Б. О., Кравець Р. Б. Інформаційна модель системи проведення соціологічних досліджень у веб-середовищі

INFORMATION MODEL OF SOCIOLOGICAL RESEARCH IN THE WEB ENVIRONMENT

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New opportunities open the use of the Internet for empirical sociology as a tool for research. Although quantitative methodology and "classical" methods still remain in priority, the Internet emerges as a particularly important technology for current researches, the rate of which affect the modification of existing methods and the emergence of new ones.

World practice of using the Internet for sociological researches exist for more than ten years. In our country, such researches have not received enough circulation however the practice of Internet researches are likely to be developed because these surveys have several advantages over traditional methods of collecting primary sociological

information. The purpose of this work is to design and create a consolidated information resource for sociological research, which researchers can use in their professional activities for collecting and consolidating data.

Access to information is constantly spreading and giving everyone the opportunity to get it at any time when it is necessary. The interaction on the web is a new form of public relations and product of the latest information technology. Therefore, the researchers predict further development and dissemination of sociological researches online. Gradually research tools and software will be improved for their conduction. The creation of consolidated information resource is the best tool for sociological research that will help researchers in collecting sociological information that will be accompanied by the creation of questionnaires or interview forms, and their distribution on the Internet. Further it can be seen in unloading the collected data (respondents) in packages for statistical data processing. Due to the consolidation of the gathered information, researchers get aggregate data about an object that is studied in accordance with the goals and tasks that are put in the initial stages of the research.

In developing the consolidated information resource for sociological research such generally accepted principles as modularity, ease of support over the life cycle, etc. should be considered. and also specific requirements for its service conditions and the possibility of using the Internet. We need to develop collection and storage subsystem information, which would provide: 1) generation of questionnaire structure and its storage it in a data warehouse; 2) generation on the basis on established structures of graphical user interface for transferring user data information to a central data repository; 3) acceptance and storage in a central data repository; 4) transfer of entered forms of information into the data warehouse; 5) receiving and storage of information in a central data warehouse.

This consolidated information resource designed for providing the necessary level of information content and quality of data collected in the survey respondents, transformed into a single format in which they can be downloaded into the data warehouse or analytical system. Through consolidation of sociological information the researchers to get totality information about object that they learn the purpose and tasks set himself researcher. Working with this data helps researchers identify the main characteristics, differences, trends and more social processes and communities that is made in the reports, conclusions and recommendations.

Key words: web environment, case studies, information technology.

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26. Угрин Д. І., Демчук А. Б., Наум О. М. Моделювання плану туристичних маршрутів на основі методу поведінки колонії бджіл

DESIGN PLAN TRAVEL ROUTE ON THE BASIS OF CONDUCT COLONY OF BEES

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In the tourism business interest of every tourist to visit tourist units is to solve a number of simultaneous requests tourists. Among the most urgent requirements that must meet the conditions of tourist travel – a scheduling travel and tourist routes that can reach most all tourist points, including the minimum distance between them; ensuring the necessary range of services activity tourism and others. Find optimal routes with minimum distances and reach the maximum amount of tourist offers is an actual problem of the entire tourism industry.

One of the most pressing tasks Continuous Optimization final measure in practical terms and, simultaneously, the most difficult is the problem of global optimization of conventional tourist routes. Solutions to problems of this area can be divided into two areas methods: methods of reducing the problem of global conditional optimization to the problem of global unconditional optimization with penalty or barrier functions; methods specifically designed to solve the problem of global conditional optimization.

Considered in the bee colony behavior method refers to methods of the first group. This method is designed to meet the challenges of global unconditional optimization.

Methods for solving the problem of global unconditional optimization share for deterministic, stochastic and heuristic methods.

Heuristic methods are relatively new and so rapidly evolving. These methods should be noted evolutionary and behavioral (simulation) methods.

Behavioral methods for solving the problem of global unconditional optimization based on modeling self-organized collective behavior of living or non-living systems. Interactive elements of these systems, in general, called agents. Key ideas include behavioral methods detsentralizovanist, the interaction of agents and ease of behavior of agents. In other words, these methods have the living of bionic nature, ie they are based on modeling the behavior of insects, birds, animals, etc., whose behavior is a collective, thus achieving a so-called collective intelligence.

The main feature of multi-agent methods is their collective intelligence bionic nature – analysis methods colonies intended to solve optimization problems, including the method of evolutionary optimization (including genetic algorithms), methods of ant and bee colonies. It should be noted that these methods simulate the behavior of different social groups of animals, insects and other creatures. This allows these groups to solve various difficult practical problems in nature, indicating the effectiveness of their behavior and, consequently, on the effectiveness of these methods.

With the implementation of these methods used paradigm agent-oriented programming based on modeling collective intelligence which include: the method of ant colonies (Ant Colony Optimization, ACO), method for bee colonies (Bee Colony Optimization, BCO), optimization by means of a swarm of particles (Particle Swarm Optimization, PSO) and other methods. These methods are effectively used to solve different tasks: ACO is used to solve the traveling salesman problem, task scheduling, feature selection, clustering, etc.; BCO – to solve the problem of scheduling, solving the traveling salesman problem, solving the transport problem and others.

To address search optimal routes, assembly schedules tourist transport with provision of maximum service to the example of collective intelligence necessary to define functions that perform social insects in the solution of various problems. Method of bee colonies is a heuristic iterative method of random search and apply for solving various optimization problems relating to both discrete and continuous optimization to that will improve the quality of the tourism development plan.

Self bee swarm is based on these four basic mechanisms: positive feedback – on the basis of information received from other bees, a bee flies to a source of nectar; negative feedback – based on the information it has received from other bees, this bee may decide that “her” source of nectar significantly worse than other sources are found, and leave this source; accident – probabilistic bees scouts search for new sources of nectar; the multiplicity of interactions – information on the source of nectar, which found one bee and passed many other bees hive.

Based on the proposed approach was developed bee colony method to solve the problem of scheduling (Bee Colony Optimization for Job-Shop Scheduling Problem, BCO-JSSP).

Task scheduling can be characterized by a plurality of works, each of which consists of one or more transactions. Operations performed on a specific sequence of special machines. The purpose of planning is scheduling operations that minimizes (maximizes) measure of performance.

Task scheduling refers to the NP-difficult. Measure performance include: downloading of tourist transport (utilization of tourist transport); a bus cycle; performance (cost, throughput); inventory levels and services.

In general, task scheduling supplied by the disjunctive graph. Count consists of nodes that represent the operation. There are two additional components that make up the resources and costs. The set of oriented arcs used to describe the benefits of each.

As the main features of the method of bee colonies is wagging dance and foraging process, the proposed modification to solve the problem of scheduling by these different stages of the method of bee colonies compared to previously proposed method.

In the article the modified paradigm of bee colonies for hiking trails through the solution of combinatorial problems on graphs: the selection in the column independent subset of vertices of maximum paropoyednannya in column coloring graph, click in the selection box. Based on the analysis of behavioral models of self colony of bees developed methods and mechanisms of formation of the ideas discussed making combinatorial problems on graphs. Methods of forming search space. Position in the search space is represented as an ordered list. The key operation bee algorithm is promising research positions and their space in the vicinity of the search. Based on the various applications of the method of bee colonies are the following advantages of the method: the method is averse to a local optimum loop because based on a random search; multyahentnist implementation; Search the best decision based on the decisions of agents throughout the colonies of bees; can be used in dynamic applications, because it is able to adapt to environmental changes; can be used to solve both discrete and continuous optimization problems; does not lead to a recurrence local optimum, since they are based on a random search; used in dynamic applications as able to adapt to environmental changes. Also in the article the method of forming a neighborhood solutions with adjustable degree of similarity and closeness between them. A use three approaches to determining the number of foragers agents who are sent in the vicinity of each base position.

Key words: bee colony, hiking trails, optimization, bees algorithm, self-organization.

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27. Шулима О. В., Шендрик В .В., Шестак М. О. Побудова сховища даних системи підтримки прийняття рішень для проектування розподілених енергетичних систем

THE DATA WAREHOUSE CONSTRUCTION FOR DECISION SUPPORT SYSTEM FOR DESIGNING DISTRIBUTED ENERGY SYSTEMS

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Authors study the topical scientific and applied problem of development of information technology which is regarding to the planning and choice of distributed grid with alternative energy sources, its components and forecasting the performance of such a system. Authors consider the process of creating such hybrid systems as a set of solved problems in each stage, such as planning, design, installation and operation.

As the basic methodology of the analysis of the design process of distributed grid is used systems approaches which are refer to the procedure of building a common model system. To achieving an optimal solution in the energy planning process should be performed a processing of huge number of both incoming and aggregated information. Furthermore, the decision also depends on subjective factors which are should be identified and included in the planning process. Therefore, it is reasonable to use decision support systems with developed data communication between sub-systems.

In this research DSS is proposed to solve problems in the stages of planning and design. The result of the DSS is formed the feasibility report of optimal system configuration that satisfies electricity demand and in the minimum term covers the installation costs.

DSS for planning distributed energy grid should use the data of collecting and processing information about weather conditions, geographical location and data on typical load schedule of consumers and should take into account the possibility of using a few renewable energy sources and connection to the external grid.

To support decision-making during the design process of distributed energy grid is necessary to provide storage and information management; processing as structured and unstructured information, work with map data; the analysis of different types of information using the approach of information consolidation and federated data approach.

An important scientific – practical problem that arises is the development and improvement of methods for processing different types of data to support decision making. Working in a single system with several independent information products that use different databases, management scheme, etc. requires the development of a unified domain model. The paper proposes a conceptual determination of data sets that affect the decision with the further development of a conceptual domain model.

The authors analyzed the methods of data sources processing with different data structures. Determined that architecture of developed DSS in addition to the consolidation of information provides a hierarchical ordering of components and aggregating information while transferring it to the upper levels. Considering this, to work with information in the DSS, which comes from different sources, the authors proposed to combine such types of integration, as the search for information sources based on metadata, web-integration and integration at the level of data warehouse. The listed subsystems are led by different servers: Web, GIS, Matlab, and Microsoft SQL Server. As the final integration method is used integration at the level of data warehouse. Integrated data is used in subsystems of decisions and the presentation of results.

To support decision-making in the design of a distributed energy system is decided to use the following information modules: the subsystem of collecting and preliminary data processing, the data analysis subsystem, the storage subsystem, the subsystem of forming decision and the subsystem of results presentation.

It is proposed an integrated technology of information processing. Hierarchical ordering is used as communication tool between the parts of the system. The scheme of data integrating between distributed databases is based on replication methods. A concept scheme of data warehouse is presented by the “snowflake” type.

The scientific novelty of work lies in solving scientific and practical tasks of use consolidated data warehouse of the relational type during decision-making to meet the challenges of designing a distributed energy system.

Key words: conceptual model, database, data warehouse, decision support system, renewable energy system, distributed energy system.

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28. Юринець З. В., Юринець Р. В. Теоретико-ігровий підхід до оптимізації інноваційної діяльності суб'єктів господарювання

GAME-THEORETIC APPROACH TO OPTIMIZATION OF INNOVATIVE ACTIVITIES OF MANAGING SUBJECTS

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In article it is established that feature of innovative activities consists in long-term nature of receipt of results, to the increased risk, unpredictability of results, potentially high income. The driver in implementation process and the embodiments of innovative strategy in system of strategic management is process of management of innovative activities. The choice of innovative strategy, the choice of ideas which are the best implementer of the strategic innovative objectives of subjects of business activity requires allocation of kinds of innovations and their implementation in case of selection of the best innovative strategy, refusal of obsolete innovations. The maturity and system effectiveness of strategic innovative management by subjects of managing reflects ability of administrative personnel optimum, rationally, productively and successfully to use the available resources, to implement changes, innovations.

It is established that game-theoretic modeling has taken the important place in an arsenal of methods of the economic analysis. In the last decade explosion of interest in application of the game theory in such various areas as the management theory, economy, political sciences, evolutionary biology, the international relations and conflictology and especially competitive strategy is observed. The problem of enhancement of game-theoretic approach to optimization of innovative activities of subjects of managing in the conditions of the market competition is especially actual today.

Scientific and methodical interest in the solution of questions of optimization of innovative activities by subjects of managing thanks to mathematical apparatus pays attention to the komparativny analysis of teoretiko-applied material. One of important tasks at the entities is development and reasons for the choice of innovative strategy of organization development, level and type of innovative development, forming of the purposes, behavior and a market position, financial and economic, organizational and technical criteria, characteristics of innovative strategy of development of subjects of managing.

Methodological approaches on optimization of innovative activities and production of advanced products by subjects of managing are developed. Applied aspects of production of innovative products on the basis of the offered optimum strategy of development are stated. It is calculated an optimal variant of release of advanced products of the entity for receipt of the greatest profitability owing to sales of products. On the basis of the carried-out calculations managers can reveal a favorable and adverse condition of market conditions for a certain type of products and improve decision making process on increase or reduction of amounts of release of advanced products.

In research general scientific and special methods have been used: game-theoretic method, method of group, scientific abstraction, inspection and expert assessment, specification, critical analysis, specification, schematic and graphics, synthesis and synthesis of scientific experience of modern theoretical researches.

Application of game-theoretic approach is necessary for forming of optimum strategy of production of advanced products by subjects of managing, will allow them to resolve issues of optimization of production volumes of new products taking into account additional expenses which they incur as a result of production, storage, transportation of basic products, additional expenses which receive in case of development and production of innovative products and additional resources for reduction of foreseeable losses from the specified reasons. If the subject of managing makes and market products according to discharged, then it will be able to maximize the income from implementation of unit of all types of advanced products.

Proceeding from the opened essence and need of search of new methods of management of subjects of managing, ten stages of decision making process on optimization of innovative activities of subjects of managing which shall include features of forming of optimum strategy (determination of a managerial task and creation of optimum strategy of production of new products by subjects of managing, forming of the purpose of implementation of management decision, collection of necessary information on innovative activities of subjects of managing, the analysis of the entering information for development of economic-mathematical (game-theoretic) model, generation of alternative versions of decisions and the choice from alternatives, carrying out calculations taking into account indicators of activities of subjects of managing in recent years and receipts of basic data, the analysis of basic data and an economic case of results of the carried-out calculations, an organizovaniye and control of accomplishment of the decision are offered, adjustment of the purpose and task).

On optimization of innovative activities of subjects of managing which include features of forming of optimum strategy of production of innovative products and carrying out calculations thanks to the offered approach the preventive measures promoting subjects of managing in time allow to create accounting of stages of decision making process to enter the market with advanced products, having been ahead of possible competitors and to win a market segment, to maximize the income from implementation of unit of all types of advanced products.

Key words: game-theoretic approach, optimization, innovation, business entities, making decisions.

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