

SUMMARY

THE BULLETIN OF INFORMATION SYSTEMS AND NETWORKS SCIENTISTS

INFORMATION SYSTEMS, NETWORKS AND TECHNOLOGY

1. Андруник В. А., Чирун Л. В. Формування та рубрикація електронних дайджестів

THE ELECTRONIC DIGEST FORMATION AND CATEGORIZATION

Vasyl Andrunyk¹, Lyubomyr Chyrun²

¹Information Systems and Networks Department, ²Software Department, Lviv Polytechnic National University, S. Bandery Str., 12, Lviv, 79013, UKRAINE, E-mail: ¹phottt@ukr.net, ²chyrunlv@mail.ru

Information support is always needed when solving complex problems in any field of vital activity [1-5]. Meeting the information requirements is a mandatory requirement for innovation realization. At the same time, the complexity of information obtaining affects efficiency and quality of solutions. The Internet can be considered as large-scale mass media. The chaotic nature and the existence, the absence of the clear maintenance and update intervals of the most sites, as well as the problems concerning the effective information search, contribute to the Internet not having become the single reliable mass media so far. Only certain network elements (which are often called network or the Internet media) are considered to be full-fledged mass media. Network mass media are deemed to be news portals with a certain updating frequency, electronic versions of printed periodical publications and newspapers or magazines that exist in online electronic format.

One of the main features of the information production is the constant growth of its rate. Apart from increasing the amounts of information to the scales that render impossible its direct processing, there were a number of specific problems associated with the rapid information technology development. Therefore, on the one hand, there is quite a powerful array of information (the Internet resources) for decision making in various public living environments, society and the individual. On the other hand, there is a lack of information which is necessary for decision-making because of its dynamics, volumes, sources, and unstructured nature. The coverage and the generalization of the large dynamic information flows which are continuously generated in the media entail qualitatively new approaches.

While working in informational and analytical services or enterprises, one has to deal with a great diversity of the information sources, such as electronic newspapers and other Internet resources. This article considers Ukrainian electronic mass media – their disadvantages, benefits, and services. The conducted research studies of electronic mass media found that it is inexpedient to exploit human labor in the processes related to the digests formation and the digests ranking. The main part of this paper is also devoted to the methods elaboration of the formation and the rubricating of electronic digests. The practice of implementing systems in different organizations has proven effectiveness and simplicity of the system adapting due to the developed instrument of the automated digest formation and their rubricating. The universal data acquisition module allows you to automate completely the electronic information introduction from sources with bringing information to a common internal format, i.e. to minimize the routine work while entering the text data.

The digest is an annotated text based on the analysis of several documents. While compiling digests the automated abstracting methods of one document apply to the array with a large number of documents. The majority of the document automated abstracting algorithms consists of three basic stages: the source text analysis, the significant fragments definition (suggestions or whole paragraphs) and the conclusion formation. At the same time, a digest may also be considered as the source of annotated hyperlinks to the underlying documents. While forming out digests, the usage of quasi-abstracting methods makes the task of a coherent text attainment almost impossible. The combination of each document abstract will contain an excessive amount of incoherent information. However, while forming out the auto abstract, which consists of a certain number of source document announcements, and which is divided into subsections, the usage of the above mentioned method is quite acceptable.

Key words: content, content analysis, content monitoring, content search.

2. Безрук В. М., Ніколаєв І. П., Чеботарьова Д. В. Інформаційні та телекомунікаційні технології розпізнавання сигналів у телемедицині

**INFORMATION AND TELECOMMUNICATION TECHNOLOGIES
OF SIGNALS RECOGNITION IN TELEMEDICINE**

Valeriy Bezruk¹, Ihor Nikolaiev¹, Daria Chebotarova¹

Communication Networks Department, Kharkiv National University of Radioelectronics, Lenin Ave., 14, Kharkiv, 61000, UKRAINE, E-mail: valeriy_bezruk@ukr.net

One of the problems of telemedicine, from a practical point of view, is more efficient use of skilled medical professionals at remote diagnosis of patients' diseases. Some routine tasks of processing medical information with sufficient accuracy and reliability can be solved by an automated decision-making support system based on appropriate mathematical apparatus. In this case specialists can save their time and attention to focus on making more difficult and important decisions, appropriate to their experience and skills. Furthermore, while non-strictly formal methods of decision making are often used in diagnosis, the use of appropriate precise mathematical methods can provide more objective conclusions about the diagnosis. An example of the optimization of medical professionals work process in telemedicine is the use of automated systems for remote diagnostics, based on the methods of recognition of the electrophysiological signals, transmitted by the appropriate communication channels.

This work reviews the features of solving of one of the tasks of medical information processing - electroencephalograms recognition, which takes place in an automated decision making support system at remote diagnosis of the patients' diseases.

Also work proposes the algorithm for automated recognition of sleep stages by EEG samples, transmitted in digital form by appropriate communication channels. The signals recognition algorithm is based on the description of the sequence of EEG samples by an adequate mathematical model in the form of autoregressive processes. Recognition algorithm can be implemented in software on a computer and a decision making support system used in the remote diagnosis of diseases of the brain, nervous and cardiovascular systems of the patients.

We consider some details of choice of bandwidth and according communication technologies for the information transfer in telemedicine. Capacity requirements for telecommunication technologies for medical information transfer in telemedicine are also reviewed.

Key words: telemedicine, sleep stages recognition, electroencephalogram, capacity.

3. Берко А. Ю., Висоцька В. А., Чирун Л. В. Створення та застосування систем електронної контент-комерції

ELECTRONIC CONTENT-COMMERCE SYSTEMS CREATION AND USAGE

Andriy Berko¹, Victoria Vysotska², Lyubomyr Chyrun³

¹General Ecology and Ecoinformation Systems Department, ²Information Systems and Networks Department, Software Department³, Lviv Polytechnic National University, S. Bandery Str., 12, Lviv, 79013, UKRAINE, E-mail: ¹berkoandriy@yandex.ua, ²victana@bk.ru, ³chyrunlv@mail.ru

The main task of electronic content-commerce systems (ECCS) is to facilitate the information resources work of moderators, authors, analysts and administrators. The main goal of the ECCS functioning is to improve the information resources functionality for users of the content. The ECCS selected topical issues range in the content set from various external sources for moderators and authors according to their ranking through the commercial content formation subsystem. The author creates a commercial content according to automatically matched information analysis from various sources of actual content. The moderator creates new rules, when necessary, to filter content from different sources. He, also, updates other sources addresses in the subsystem of the commercial content formation. The analyst analyzes the target audience activity and the ECCS functioning. As a result, he develops the new rules of statistics and dynamics analysis of the commercial content lifecycle through the commercial content support subsystem. These rules can increase the target audience range; the visits number; the unique visitors number; revisits; the visits number from search engines; the direct visits number; the regional visits number; the thematic visits number, etc. for the information resources in the ECCS. The article aims at modeling the information resources processing in the ECCS. This allows us to build the general approach to the design, the construction and the implementation of similar systems. Such problems solution will alternatively promote the generalization and the standardization of the information resources processing in the ECCS methodology through the stages of the commercial content formation, the management and the support. This helps to reduce the construction time for a typical e-business systems building. Such systems implementation allows to reduce time in the production of its own commercial content, to analyze the external commercial content derived from external sources, to analyze the dynamics of the content lifecycle, to analyze the statistics of the ECCS function, to analyze the statistics of the user activity of information resources in the ECCS, to increase the target audience of information resources and to expand

the feature set in the ECCS. The set of functional requirements and standardized specifications for the similar system creation are the result of modeling and the development of information resources processing in the ECCS. The purpose of these requirements is to provide a generalized approach to the ECCS development of particular, an online newspaper, an online magazine, an online publishing, distance learning, an online shop for content selling in the form of electronic books, photos, videos, audio and others. The requirements standardization for the ECCS construction provides the creation of the generalized approach for developers of such systems. This reduces the time for such systems design and implementation and helps to omit the phase of the project development respectively.

Key words: information resources, commercial content, content analysis, content monitoring, content search, electronic content commerce systems.

4. Бігун Г. В. Інформаційна технологія рекурентного аналізу часових послідовностей

INFORMATION TECHNOLOGY OF RECURRENCE ANALYSIS OF TIME SERIES

Halyna Bigun

Information Systems and Networks Department, Lviv Polytechnic National University, S. Bandery Str., 12, Lviv, 79013, UKRAINE, E-mail: halyna.bigun@gmail.com

In recent years the attempts at the information systematization have led to the nonlinear analysis of the time series. Analytical methods of time series play an important and direct role in obtaining quality results. The development of the nonlinear dynamics and chaos theory reinforced the nonlinear gist understanding of natural phenomena. Chaotic systems gaining interest, the analysis of such systems can be difficult. Traditional analytical methods impose restrictions that are usually difficult to overcome. The recurrence plot is the method imposing no such restrictions.

The recurrence plots method was introduced for the display and the recognition of the trends in time series data of complex dynamic systems. The analysis of such structures can provide understanding of nature processes. The latter occur in all dynamic systems and always have mathematical basis.

The recurrence plots are a new tool for analyzing complex dynamic systems which progresses dynamically. Diagrams visualize the multidimensional phase space even in the case of short and non-stationary data, and the type of geometric structure can verify the evolution in time of the selected process. Such graphical instrument allows you to see a dynamic picture in general. The visualization by recurrence plots is efficient, because it analyzes a typical activity and extends the field of study. Such visualization can help in the process of decision making by explaining the data; it helps to draw conclusions.

Recurrence plots are anew method for the qualitative explanation of time series. Recurrence plots can show the hidden graphical regulatory and structural changes in the data or similar regularities by studying and researching time series. Recurrent plots are one of the most interesting modern methods that obtained the theoretical development and the practical usage in the last decade.

Key words: nonlinear dynamic, time series, recurrence plots.

5. Бісікало О. В., Кириленко Г. О. Метод формального визначення якості допису на спеціалізованих сайтах

FORMAL METHOD FOR QUALITY DETERMINATION OF POSTS ON SPECIALIZED SITES

Oleh Bisikalo¹, Hanna Kyrylenko²

Institute for Automatics, Electronics and Computer Control Systems, Vinnytsia National Technical University, Khmelnytskeshose St., 95, Vinnytsia, 21021, UKRAINE, E-mail: ¹obisikalo@gmail.com, ²anyakurul1@rambler.ru

The article is devoted to the problem of the Internet searchers of useful information. The question is very relevant today since the Internet technologies are developing rapidly, and the amount of information in the network is increasing at a fast pace. The search of necessary information takes much time. The method proposed in this article will reduce the time wasted on the search of useful posts on specialized forums.

The method of the formal post quality determination based on the array of parameters is considered in the article. The authors have proposed to use the following parameters: the post size, the links presence, the question mark presence, the ellipsis presence, and the code percentage in the post. During the research it has been defined that all the proposed parameters are informative for the post usefulness determination. The characteristics are received from the parsing of the HTML-code of the page with posts via Java library Jsoup. The next stage is the decision tree building using the Matlab tools. At the input the decision tree receives the text file with the parameters array for each post. At the output we get the answers array whether the post is useful or not.

In the authors' opinion the advantage of the method of is its simplicity. Since the HTML-code is the input text, there is no need to mark it out additionally. And we use the prepared library Jsoupfor parsing. Giving the high percentage of correct post quality indications, the proposed method will allow users to reduce the time spent on the necessary information search.

Key words: post, parsing, Jsoup, Matlab, decision tree.

6. Вовк О. О., Астраханцев А. А. Розроблення методики оцінювання важливості характеристик стеганографічних алгоритмів

DEVELOPMENT OF THE TECHNIQUE FOR DETERMINING THE IMPORTANCE OF STEGANOGRAPHIC ALGORITHMS CHARACTERISTICS

Olesia Vovk, Andrii Astrakhantsev

Communication Networks Department, Kharkiv National University of Radioelectronics, Lenin Ave., 14, Kharkiv, 61000, UKRAINE, E-mail: olesia.vovk@gmail.com

With the advent of global computer networks, access to information has become incredibly easy. The simplicity and speed of such access are much improved. The threats of compromised data have also increased. Steganography is one of the ways to support information security. It is a method of communication that conceals the existence of secret messages. Today steganography is used for protecting of information from unauthorized access, network resources monitoring systems, as well as for the protection of copyright in certain types of intellectual property and in the authentication of digital objects.

Currently a very large number of different steganographic methods are proposed, part of them are universal, or designed for a wide range of tasks. At the same time, each steganographic task has different requirements for characteristics such as robustness, capacity, complexity of embedding information and others.

In this paper, methodology of analysis that allows determining the importance (weight) of each of the qualitative characteristics of the methods of hiding information during transmission by communication networks in objective way was proposed.

All the most common fields of using steganography were analyzed and evaluated, such as: covert communication, copyright protection of images (authentication), fingerprinting (traitor-tracing), adding captions to images, adding additional information, such as subtitles to videos, image integrity protection (fraud detection), copy control in DVD recordings and intelligent browsers, automatic copyright information.

Based on the requirements put forward the most common areas using the steganography principles, the most important characteristics of algorithms for all major areas of application of steganography were defined according to the developed methodology. So for protection image integrity the greatest weight values are stability and security, for covert communication are once three characteristics - bandwidth, security and invisibility. Scientific novelty lies in identifying the most influential of all characteristics for steganographic applications, which proved to security, stability and complexity of detection.

There is also scientific novelty in the proposed technique of evaluating the steganography effectiveness based on the above characteristics. The technique allows providing equally weighted algorithm estimation, and also considering coefficients obtained during the evaluation of the characteristics importance. Studies have shown that during general evaluation methods the best results was demonstrating by the method of replacing the least significant bit (A1, metric = 0.266). While more detailed analysis considering the importance of the various factors of performance, the best result was shown by integrating methods based on discrete wavelet transform (DWT, A6, metric = 0.240).

On the basis of the research we plan to develop a proprietary method that will be highly resistant to the certain attacks, but generally the above assessment would not be lower than the results for DWT methods.

Key words: steganography, characteristics, methodic, weight, algorithm, robustness, multiobjective choice.

7. Вовнянка Р. В., Оборська О. В. Моделювання поведінки інтелектуального агента на основі стимулюючого навчання

MODELING BEHAVIOR OF RATIONAL AGENTS BASED ON STIMULATION LEARNING

Roman Vovnyanka, Oksana Oborska

Information Systems and Networks Department, Lviv Polytechnic National University, S. Bandery Str., 12, Lviv, 79013, UKRAINE, E-mail: oksana949@gmail.com

In this article the method and the algorithm of the intelligent agents simulated training are developed, which could enable to use effectively the knowledge of the agent to maximize winnings. Generally, the agent has to explore the environment and choose the optimal behavior. The agent behavior evaluation depends on the following four factors: the performance metrics, the knowledge of the agent about the environment, the actions and the sequence of the agent perception. Given these factors for each possible sequence of perception acts, the intelligent agent must choose an action that is expected to maximize its performance metrics, given the facts provided by some sequence of perception and all embedded knowledge held by the agent, i.e., to a rational action. The rational choice depends on

the sequence of the perception acts formed to a predetermined point. After the sufficient existence experience in their midst, the intelligent agent behavior can essentially become independent of its priori knowledge. The inclusion in the project of the learning abilities will allow us to design simple intelligent agents that can act successfully in various versions of the environment.

Also, the appropriate mathematical software was developed based on the number of states in which such an agent may be, based on the dynamic programming, the probability theory and Markov processes. Appropriate algorithms are used to model the behavior of intelligent agents. In the future, it is planned, based on of mathematical software, to investigate the behavior of intelligent agents as tactical units of the armed forces and the rational functioning of higher education institutions.

Key words: rational agent, model finite horizon, Gittins allocation indices, dynamic programming, Markov process.

8. Holub K. Yu., Zabolotnyi O. V. Synthesis of test actions for capacitive moisture meter that is invariant to substance type change

SYNTHESIS OF TEST ACTIONS FOR CAPACITIVE MOISTURE METER THAT IS INVARIANT TO SUBSTANCE TYPE CHANGE

Kateryna Golub^{1,2}, Oleksandr Zabolotnyi¹

¹Department of aviation devices and measurements, National Aerospace University "KhAI", Chkalova Str., 17, Kharkiv, 61070, UKRAINE

²PRE HARTRON-ARKOS LTD, Acad. Proskury Str., 1, p/b 9971, Kharkiv, 61070, UKRAINE,
E-mail: golub-ekaterina@bk.ru

The main objective of the article is ensuring the invariance of capacitive moisture meters to change of a substance type. Determination of moisture using capacitive moisture meters is based on measuring the capacity of primary converter filled with the studied substance, thus capacity depends on substance dielectric permeability (i.e. its type). So, there is a problem of substance type uncertainty for capacitive moisture meters.

In the article the analysis of existing methods for substance type uncertainty compensation within a capacitive method is carried out. As a result of the analysis it is revealed that the most widespread method to solve the problem today is determination of moisture using calibration schedules (or tables). However, this method is not without disadvantages, as assumes not disposal of type dependence for capacitive moisture meters, and only its some account. The authors identified, perhaps, the most perspective direction for further researches – test methods. Are chosen and applied the block diagram of measuring system for realization of test approach including additive and multiplicative tests units, and test algorithm for carrying out of measurements. According to the chosen algorithm some capacity measurements of primary converter are carried out: with the studied test of substance, with addition of a known amount of water and by change of capacity of initial substance in k-times. The expressions for determining the substance moisture at various water additions and multiplicative test coefficients are carried out. As a result of synthesis of these expressions it is obtained the expression which allows to compensate a substance type uncertainty having a dielectric constant in the range from 2 to 3,5 (for example, oil and oil products) with moisture content from 0 % to 30 %. Pearson's criterion is applied to determine quantitative estimates of divergence magnitude of the obtained moisture results from the true values. On the basis of Pearson's criterion calculations results the conclusion is drawn on good convergence of moisture measurement results, i.e. this expression allows to define substance moisture with the minimum value of type uncertainty. Also it is carried out the comparative assessment of test expression for moisture determination with the expressions received in early works on this research direction. By the results of this assessment it is determined that the received expression has the best convergence indicators of results.

Key words: capacitive moisture meter, uncertainty of substance type, test method, additive test, multiplicative test.

9. Гопяк М. Я., Демчук А. Б. Метод оцінювання якості онтологій баз знань інтелектуальних систем на основі ISO/IEC 25012

ISO\IEC 25012–BASED METHOD FOR ONTOLOGY'S QUALITY EVALUATION OF INTELLIGENT SYSTEMS KNOWLEDGE BASES

Andriy Demchuk¹, Mariya Hopyak²

Information Systems and Networks Department, Lviv Polytechnic National University, S. Bandery Str., 12, Lviv, 79013, UKRAINE, E-mail: ¹andriydemchuk@gmail.com, ²mariya.hopyak@gmail.com

In the article ISO / IEC 25012 is considered as the basis for developing the method for the ontology's quality evaluation of the intelligent systems knowledgebase's. The basic indicators of the standard have been considered and an attempt to adapt them to the ontology's quality evaluation has been made. The quality of the software should be high enough to ensure the success of electronic processes in all areas of life. Hence, the data processed by the software must meet specific characteristics

of the data quality. Ontology's have been used to solve several problems of a methodological and a technological character, which arise during the creation of the knowledge bases. In the article, the basic quality characteristics of the intelligent systems from ISO / IEC 25012 (usability, credibility, understandability, accessibility, portability, recoverability, security) have been described. Owing to the considered class of information systems being designed on the basis of ontological domain model, these characteristics depend directly on the ontology's quality. By way of example, the process of creating the ontological model of nosology is described and illustrated in the article. It is a well-known fact that the general ontology's are used to represent concepts that are common to a large number of areas. But, if the system uses specialized ontology's and develops, it may be necessary to merge them. The ontology of nosology has been constructed to solve the problem of the persons with various disabilities access to the information resources. The source for the construction of the ontology of nosology has become its classification and approaches to overcoming the disabilities effects. The appropriate classification and approaches have been converted into the software tool Protégé. One of the main tasks of further research will be the problem of evaluating the novelty of knowledge that has been proposed to be added into the ontology.

Key words: ontology, intelligent system, evaluation of quality, data, knowledge base.

10. Григорович В. Г. Семантичний Веб: інформаційно-комунікаційна складова соціальної адаптації

SEMANTIC WEB AS INFORMATION AND COMMUNICATION COMPONENT OF SOCIAL ADAPTATION

Viktor Grygorovych

Information Systems and Networks Department, Lviv Polytechnic National University, S. Bandery Str., 12, Lviv, 79013, UKRAINE, E-mail: viktor.grigorovich@gmail.com

To socially adapt persons with disabilities is to provide them with education. This important part of their socialization depends on many factors: the availability of the space, the lack of barriers to education and information. The level of the space availability for people with various forms of restrictions remains one of the most pressing problems. The difficulty in ensuring the people with restrictions with the accessibility is that it requires different types of the accessibility. Modern information technology, including Web 3.0 and the Semantic Web, contribute to breaking barriers to the education and the information by implementing educational and information systems that take into account the individual characteristics of the user, his/her possible limitations and, consequently, the special needs. This paper considers the prospects of the Web 3.0 technologies application in the implementation of the intelligent educational systems that train persons with disabilities. There are three areas of the Web 3.0 technologies use in teaching people with special needs: (1) the student-oriented design of knowledge and databases for people with special needs, (2) the support networks of the personality-oriented education of persons with special needs, and (3) the administration process of the student-centered learning for persons with special needs. Obviously, the biggest challenge in realizing the full Semantic Web is the task of transferring the existing Web content into the "semantic" form, i.e. the construction of the "second level" for the existing content: the contemporary web is human-oriented (the vast majority of its content has the form suitable for processing only by a human being). A second machine-oriented level should be built to provide the content form suitable for processing by machines. This content, such as the education, should be formed taking into account the possibility of its use by persons with disabilities. Now we are witnessing only the first steps in developing the technology Web 3.0 and the Semantic Web. However, it is important to immediately determine what future we want to get, how you can use the new technology. By answering these questions, the research efforts will be focused on the implementation of selected areas. Taking into account the interests of persons with disabilities in the design and the construction of the future technology can neutralize the difference between the individual members of the society, as far as the access to the education is concerned and the level of the social adaptation in general.

Key words: Web 3.0, Semantic Web, people with disabilities, social adaptation.

11. Гринчишин Т. М., Кіт Г. В. Застосування оптичних лазерних систем та перспективи їх подальшого розвитку

APPLICATION OF OPTICAL LASER SYSTEMS IN DIFFERENT AREAS AND PROSPECTS OF THEIR FURTHER DEVELOPMENT

Taras Grynychshyn, Grygoryi Kit

Information Technologies and Programming Department, International University of Human Development of «Ukraine», Ivano-Frankivsk branch, Nabereghna Str., 42a, Ivano-Frankivsk, 76000, UKRAINE, E-mail: gtarasm@rambler.ru

The appearance of lasers has directly influenced and continues to influence various areas of science and technology, lasers being used to address specific scientific and technical problems. The conducted studies have confirmed the possibility of the significant improvement in many optical devices and systems and led to the creation of innovative devices (brightness amplifiers, quantum hygrometer, high-speed optical circuits, etc.). New scientific

and technical areas, like holography, nonlinear and integrated optics, laser technology, laser chemistry have sprung into existence, as well as the use of lasers for the controlled nuclear fusion and other energy problems.

The high mono-chromaticity and the coherence of the laser radiation provide successful application of lasers in spectroscopy, initiating chemical reactions to separate the isotopes in the systems measuring linear and angular velocities in all applications based on the use of the interference in communication systems and holography.

To implement the bi-signal (simultaneous) transmission in the optical data transmission lines, the parallel signal generation of two lasers in different optical bands is required, for example, in red and green spectrum. The conducted research and the development of differential bi-signal methods of the optical signals manipulation in open channels indicate that opportunities to optimize the system performance and increase the transmission distance of optical signals under the atmospheric noise can be realized based on the bi-signal lines, using modern methods of digital signal processing by improving the energy signal box. The exponential characteristic of the attenuation of the optical signals in the atmosphere increases significantly the maximum distance transmission with a slight improvement of the signal / noise ratio at the receiver output.

The most important feature of the wireless optical communication is the high degree of the protection against the unauthorized access channel. An unauthorized interception is impeded, because it requires an accurate beam focus and the application of the unique method of encoding information pulses for each model. To detect the access attempts, a number of measures based on different principles are developed, such as: the reference of the wave front, the analysis of the received signal changes, etc., which further enhances the security of the communication channel.

The conducted research studies and the development of differential bi-signal methods of the optical signals manipulation in the open channels indicate that opportunities to optimize the system performance and increase the transmission distance of optical signals under the atmospheric noise can be realized based on the bi-signal lines, using modern methods of digital signal processing by improving the energy signal box. The exponential characteristic of the attenuation of optical signals in the atmosphere increases significantly the maximum distance transmission with a slight improvement of the signal / noise ratio at the receiver output.

Key words: laser, wireless systems, optical transmitter, optical channel.

12. Грицик В. В., Грицик В. В. Оцінювання якості зображення при розв'язуванні задач автоматичного опрацювання образів

EVALUATION OF IMAGE QUALITY IN AUTOMATIC IMAGE PROCESSING

Volodymyr Hrytsyk¹, Volodymyr Hrytsyk²

¹Ternopil National Technical University by I. Puluja, ²Lviv Polytechnic National University, S. Bandery Str., 12, Lviv, 79013, UKRAINE, E-mail: sriiii@i.ua

The semantic gap in the analysis of the human behavior digitally videotaped is huge. Most surveillance software operates on a very limited amount of parameters. In order to bridge the gap, it is necessary to build the artificial cognitive solution that operates at much higher level and analyzes footage, describes the events taking place and reasons about what is going on.

The presented article has analyzed the factors that contribute to the formation of the image as well as the methods of these problems solution. This will help us research mechanisms of the additional parameters that are of importance in the problem under consideration. Authors of the article attempt at constructing the computer vision that analyzes a vast array of external factors. This problem is especially topical in case of the same situation evaluation from different visual angles.

The conducted research has allowed the mechanisms development based on the measures for evaluating the quality of images. The probabilistic method based on the image quality evaluation is considered in this paper. In the paper basic information is selected, on which parameters are established the measures for evaluating the quality of images.

Video senders produce a glut of the material daily. Refining that ore into the gold of useful information requires new approaches. The proposed method in the article presents the possibility to much effectively analyze the streams of video data.

The use of different metrics for the task automation for evaluating the quality of the video stream is investigated in the work. The factors affecting the image quality are explored. The topicality of the research is proved by the publications of the American and the European research programs, in particular by the results within FP7.

The dependability of the metric choice (on the scale from speed up to quality) is shown in article.

Within the given article the task is set to create the sophisticated computer vision technology necessary to develop the automated assessment of what the robot sees. This problem includes the assessment of factors influencing the image quality. The influence of industrial factors and factors of lighting are described in the paper. The approaches and the methods to solve specific problems and their relationships are presented.

The use of the automated image evaluation realizes a flexible approach to the understanding of factors value (impact factors) that are of bearing on the recognition algorithm. This will make the computer vision more adaptive to the external influence.

Of particular importance this estimate is in the recognition systems, because according to the recognition system an object can be described in different modes – the robot receives different images of the object from different visual angles.

Key words: modern methods of image quality evaluation.

13. Євланов М. В. Задача синтезу опису архітектури інформаційної системи

SYNTHESIS TASK OF INFORMATION SYSTEM ARCHITECTURE DESCRIPTION

Maksim Ievlanov

Kharkiv National university of Radio Electronics, UKRAINE, E-mail: evlanov_max@mail.ru

The purpose of the article is the development of basic definitions and models that allow us formally to describe the task of the synthesis of the information system architecture description as a problem of finding the compromise between Providers and Users of IT-services during the initiation and planning IT project to create a new information system.

The article solves the problem of developing mathematical models describing the task of the rational synthesis of the information system functional structure.

The object of the study in this article are methodologies, architectural frameworks, and the information technology design of the information systems aimed at the analysis of the requirements to the information systems and the synthesis of the functional structures of these systems on this analysis.

The mathematical models, which describe the synthesis task of the information system architecture description, are the subject of the study in this article.

In this article, for the first time, were obtained the following results:

– the mathematical model synthesis of information system architecture description, optimal from the point of view of the User of IT-services. This model, unlike existing ones, takes into account the User's requirements and limits the IT project to the design of the system;

– the mathematical model synthesis of information system architecture description, which is optimal from the point of view of the Provider of IT-services. It, unlike existing ones, takes into account the Provider's requirements and limits IT project to the design of the system;

– the formal description of the interrelations of Provider and User of IT-services using a game-theoretic model.

The practical value of this article lies in defining the main features of the approach to automating the process of the synthesis task of architecture of the information system under the design with the help of a new information technology introduction.

All scientific and practical results are obtained by the author individually.

Using the game-theoretic models to address the task of the synthesis of the information system architecture description can provide significant benefits over existing approaches to solve this task. It is due to the use of mixed strategies by which the Provider offers the User IT-services instead of typical functional modules of the created information system, some IT-services that make up the functional modules of the system being fully adapted to the requirements of the User. Thus, it is possible to form at the formal level the information system architecture description as a set of artifacts that can then be used as the process specification and the automated database and software synthesis of the information system under the design.

Key words: information system, architecture, requirement, IT-project, IT-accommodation.

14. Кісь Я. П., Чирун Л. Б., Фольтович В. М. Особливості застосування методу контент-аналізу для опрацювання інформаційного ресурсу Інтернет-газети

FEATURES OF THE CONTENT-ANALYSIS METHOD FOR PROCESSING INFORMATION RESOURCES IN ONLINE NEWSPAPER

Iaroslav Kis¹, Liliya Chyrun¹, Vasyl Foltovych²

Information Systems and Networks Department, Lviv Polytechnic National University, S. Bandery Str., 12, Lviv, 79013, UKRAINE, E-mail: ¹lchirun@mail.ru, ²vfoltoych@gmail.com

In the last ten years humanity has made a huge advance in developing and implementing new technologies. The development of technologies has given the opportunity to solve a lot of complex tasks, which humanity faced, but also generate new tasks, the solution of which is difficult. One of these tasks is the task of content analysis. Methods and systems of content analysis are used in various areas of human activity (politics, sociology, history, philology, computer science, journalism, medicine, etc.). These systems are quite successful and do not require large funds and time to get the desired result. At the same time, the use of this product type allows you to increase the success level at 60 %. The basic system of content analysis includes the following features: quick information

updates, the search for information on this resource, collecting the data about customers and potential customers, creating and editing surveys, analysis of resource visits. If the system is automated for the information system of content analysis use, the workload can be reduced, the time for processing and obtaining the necessary information can be also reduced, the productivity of the work system increases, which leads to the decrease in the money and time expenses spent to obtain the desired result. The issue of the theme has been caused by increasing users' demands for these systems and by the following factors: the rapid growth in demand for reliable information, the necessity of forming the operational information set, as well as the use of the unwanted information automatic filtering.

The development of the Internet technologies and its services gave humanity the access to virtually unlimited quantity of information, but, as often happens in these cases – there is the problem with the reliability and the efficiency. For the information being efficient and trustworthy, the technology of content analysis is implemented. The use of this technology allows you to receive the information, provides the opportunity of interference in the system operation to increase the level of that system, the activity of the information resource and for the popularity to increase among the users. The world's leading producers of processing information resources work actively in this direction, such as Google, AIIIM, CM Professionals organization, EMC, IBM, Microsoft alfresco, Open Text, Oracle, SAP.

The content analysis is a high-quality and quantitative method of information studies, which is characterized by the objectivity of conclusions and the austerity of the procedure and is about the quantitative treatment of results and their further interpretation. The content analysis underlies journalism and mass communication, which reveals the use of the technique in the following empirical areas: psychiatry, psychology, history, anthropology, education, philology, literature analysis and linguistics. Overall, the methods of content analysis in these areas are connected with its use in the sociological research framework. The content analysis is rapidly developing nowadays. It is associated with the development of information and the Internet technologies, where this method has found a wide application.

When creating an effective information system, significant attention should be paid to the content management, because content analysis is used in the content management systems for work automation and decreases expenses of time and money. There are several stages in the content management, such as: the content analysis, the content processing and the submission of the content. For the effective system work, firstly, the content is analyzed, then the relevant results are processed and conclusions made and then that content is worked on. The final step is the presentation of the content. The methods of content analysis are: the comments analysis, the rating evaluation, the analysis of statistics and history.

The comments analysis is used for the adjustment analysis of the system users' moods who write in its comments, reviews about the system advantages and disadvantages or for adjusting operational and liquid information. The analysis of statistics and history is used for the observation and the result processing, which are used to determine the information efficiency and liquidity. For example, if one of the articles was visited by 100 users and another by 1, then you can undoubtedly maintain that the information is more efficient in the first article than in the second. The rating assessment is used to determine the rate of the same articles and is conducted by the polls, the evaluation users, etc.

The content being the base of the online newspapers, the user is looking for the necessary information on its bases. Based on the content analysis, the system owner can determine the reliability and efficiency of the information contained in the articles of the online newspaper. You can determine the popularity of the newspaper and conduct some activity in order to increase the users with the help of this option. General recommendations are established in the architectural design of content analysis systems. These recommendations differ from existing ones in much more detailed stages and the availability of information processing module resources. This allows more efficiently and effortlessly to handle information resources at the system developer's stage.

Key words: content, analysis of content, information resource, content management system.

15. Ковалик М. І., Камінський Р. М. Організація багатопотоковості у мобільній платформі Android

ORGANIZATION OF THE MULTITHREADING IN ANDROID MOBILE PLATFORM

Mykhailo Kovalyk¹, Roman Kaminskiy²

Information Systems and Networks Department, Lviv Polytechnic National University, S. Bandery Str., 12, Lviv, 79013, UKRAINE, E-mail: ¹mishakovalyk@gmail.com, ²kaminsky.roman@gmail.com

Currently, mobile platforms have very powerful computing capabilities for parallelizing tasks that perform independently from each other tasks simultaneously. Increasingly, there are mobile devices with 2, 4 and 8-cores processors. However, parallel work has its limitations, because if organize this process incorrectly, the user will not notice the difference in performance between usual single core and multicore processors. Also for multithreaded work increases the likelihood of errors during simultaneous shared data processing what could lead to inaccuracies.

To use a mobile system Android, it is an essential condition to implement multithreading. Multithreading is the ability of a program or an operating system process to manage its use by more than one user at a time and to even manage multiple requests by the same user without having to have multiple copies of the programming running in the computer. When performing certain tasks such separation can achieve more efficient use of computing resources. Android - the

operating system and platform for mobile phones and tablet computers, Google's kernel-based Linux. Mobile devices with Android system is characterized by a special approach to the multithreading and interaction with the user interface.

Android is a relatively new system and is characterized by lack of research in conventional terms and techniques concerning the right of multithreaded work in the system. To develop and debug multithread programs is more difficult than usual the sequential program. Often, the introduction of multithreading leads to reduced reliability programs. Organization common address space requires high-level engineer qualifications. Using threads may reduce productivity applications. This is typically the case in uniprocessor systems. In such system attempt to perform complex calculations in parallel multiple threads only leads to unnecessary costs for switching between threads, the number of executed instructions remains the same. Android systems provide multithreading more often to avoid blocking the main thread, or so-called user interface thread.

Key words: Handler, Looper, Multithreading, Asynchronous Tasks.

16. Костючко С., Чабан В. Метод допоміжної параметричної чутливості виконавчих об'єктів систем керування

THE METHOD OF AUXILIARY PARAMETRIC SENSITIVITY OF ACTUATING OBJECTS IN CONTROL SYSTEM

Sergiy Kostiuchko, Vasil Tchaban

Lviv Polytechnic National University, S. Bandery Str., 12, Lviv, 79013, UKRAINE,
E-mail: siriussk@mail.ua

In this article are analyzed and systematized the existing study methods of parametric sensitivity of actuating object of computer control system. The algorithms are based on common mathematical tools to analyze the parametric sensitivity of the studied devices. It is made by using the parametric sensitivity auxiliary model.

Calculation of the parametric sensitivity of actuating object of computer control system is the final stage of problem of analyse, which is building a bridge to the problem of synthesis. Stages of calculation of transient and steady-state processes and determination of the static stability of derived steady-state processes precede this stage. To solve the complete problem of analysis is proposed a common algorithm that is based on the general theory of nonlinear differential equations. Two-point boundary value problem is solved on the basis of ordinary differential equations of the electromechanical state.

Firstly it was necessary to construct a mathematical model of the device. This model is made on the basis of monodrama matrix and simulation of transient and steady-state process, and on investigated steady-state parametric sensitivity at the same time.

To show the real possibilities of the proposed method of constructing a mathematical model of electrical device parametric sensitivity was chosen executive electromechanical device in which there are:

- non-linearity, caused by movement and saturation magnetic circuit;
- Physical processes of different nature are interacting;
- Coefficients of the differential equations depend of time;
- There are available variables with different frequencies in the steady-state.

This device is asynchronous electric motor.

Based on the general theory of nonlinear differential equations, as an example of three-phase induction motor, for the first time were developed mathematical models of investigation of parametric sensitivity of these devices.

Differential equations of parametric sensitivity are linear and it eliminates the need to construct a Newton's iteration. As a result, we obtain the final solution in first iteration.

Key words: control systems, parametric sensitivity, actuating component.

17. Кравець П. О. Ігровий метод синхронізації подій в мультиагентних системах

GAME METHOD OF EVENTS SYNCHRONIZATION IN MULTIAGENT SYSTEMS

Petro Kravets

Information Systems and Networks Department, Lviv Polytechnic National University, S. Bandery Str., 12, Lviv, 79013, UKRAINE, E-mail: krpo@i.ua

The processes of the events synchronization in the multiagent systems which function in the conditions of uncertainty are the research object. The synchronization is necessary for the coordinated work maintenance of the multiagent systems components, for the message transfer between agents, for the self-organization conditions maintenance when the distributed system behaves as a complete artificially generated organism.

The stochastic game model for the events synchronization in the multiagent systems is the research subject. The game events synchronization in the multiagent systems is the topical scientific and practical problem not studied enough yet. Unlike the synchronization of oscillators networks, which are described by the systems of the differential equations, the stochastic games of the multiagent systems investigate the difficult behavior of the intellectual agents' networks with various models of decision-making in the conditions of uncertainty on the basis of artificial intelligence methods.

The design of the stochastic game method of the spatially-distributed synchronization of systems processes is the purpose of this work. To achieve this purpose, the stochastic game problem formulations are established, the recurrent method is offered and the algorithm is developed for its solution, the results of computer modeling of the stochastic game are analyzed.

The essence of the game method consists in the delays alignment of the approach of an event by each player on the basis of the actions supervision of the next agents. The values of players' pure strategies define time intervals between two adjacent oncoming moments of some approaching event. The pure strategies of players are discrete random variables which are generated with the probabilities which are the part of the players' mixed strategies. The vectors of the mixed strategies dynamically change in time on the recurrent method constructed on the basis of the stochastic approximation method. After the termination of the pure strategies choice, each player receives the current penalty, which is estimated as the current deviation of the approaching events time within the local players' coalition. The game purpose is to minimize the functions of losses averaged in time.

During the stochastic game agents self-learn to choose the optimum pure strategies, reconstructing their own vectors of the dynamic mixed strategies. Under certain conditions, which are defined by the parameters of environment, in the parameters of a game method and the criteria of the decisions variants choice, the self-learning of stochastic game provides the agents' strategies synchronization.

The considered game method, given appropriate adjustment of its parameters, provides the multiagent systems events synchronization. Theoretically, the base conditions of the stochastic approximation should satisfy the value of such parameters. In practice, the value of parameters, which provide convergence of a game method to one of the collective optimality points, can be specified as a result of the computer modeling.

The efficiency of the method is estimated by means of the characteristic functions of the average losses and the average quantity of agents with the synchronized events. The convergence of a game method depends on the quantity of players, the quantity of strategies and the interrelations of the method parameters with the multiagent systems parameters.

The results received in this article made it possible to define the optimum values of the game method parameters for the problem solution of the events synchronization in the multiagent systems within the shortest time.

The reliability of the received results is confirmed by the repeatability of the calculated characteristics values of the game method for different sequences of random variables.

In the offered model of synchronization of systems the intellectual level of agents is limited to the possibilities of the theory of stochastic automatic machines with the variable structure. The increase of intellectuality of agents can be carried out applying methods of the artificial intelligence, for example, the artificial neural networks, the Bayesian networks of decision-making, the fuzzy logic, the reinforcement learning and etc.

Key words: multiagent systems, events synchronization, stochastic game, self-learning recurrent method, uncertainty conditions.

18. Кушнірецька І. І., Кушнірецька О. І., Берко А. Ю. Аналіз інформаційних ресурсів системи динамічної інтеграції слабоструктурованих даних у Web-середовищі

ANALYSIS OF INFORMATION RESOURCES IN DYNAMIC SEMI-STRUCTURED WEB DATA INTEGRATION SYSTEM

Irina Kushniretska¹, Oksana Kushniretska¹, Andriy Berko²

¹Information Systems and Networks Department, ²General Ecology and Ecoinformation Systems Department, Lviv Polytechnic National University, UKRAINE, Lviv, S. Bandery street 12,
E-mail: ¹presty@i.ua, ²berkoandriy@yandex.ua

This paper describes the analysis of the information resources in the dynamic integration system of the semi-structured data on the Web.

The aim of this work is to apply the existing technologies to the formation of the analysis procedure of the common features definition of information resources and relationships identification between them in order to create the system model that allows the finale users to extract the unified information from the multiple heterogeneous data sources.

The object of the research is the definition process of the information resources common features and the relationships identification between them in the dynamic integration system of the semi-structured data on the Web. The subject of the research is the application of the rules of the "black box" method to creating the object adapter identifying common features of information resources and recognizing relationships between them and agent-oriented approach for creating the structural-dynamic model of the data domain of the mash-up application in the specified time.

The scientific novelty and the practical value are in the usage of the combination of rules of the "black box" method and the agent-oriented approach in the dynamic integration system of the semi-structured data on the Web.

The process of creating the object adapter of the common features of the information resources identification and the relationships recognition between them using the rules of the "black box" method has been considered, based on the model of the general definition of the resource description language and the rules of the access to resources. The object adapter

consists of two subsystems: the object component and the configuration component of the transformation resource description. The object component performs the multiple extractions of objects or system migrations according to the resource and map information and automatically generates re-used objects or the transformed system. The configuration component is used to generate the resource description and the mapping rules that the object component needs.

Key words: information resource, dynamic integration, mash-up application, wrapper of information resource, “black box” method, agent-oriented approach.

19. Мельникова Н. І. Особливості оцінювання якості результатів прийняття рішень в медичній галузі

THE FEATURES OF DECISION MAKING QUALITY EVALUATION IN MEDICINE

Natalia Melnykova

Information Systems and Networks Department, Lviv Polytechnic National University, S. Bandery Str., 12, Lviv, 79013, UKRAINE, E-mail: melnykovanatalia@gmail.com

This article is devoted to the features of the quality evaluation of the medical decision making. The developed method takes into account the requirements of the standard ISO. It helps to improve the quality of medical decisions when the doctor chooses the treatment strategy by determining the value change of the complex criteria of the patient's condition.

Today the decision taken by the doctor in the treatment of the patients with a surgical pathology is assessed on the basis of the determination of the patient's state in accordance with the analog scales, the descriptive systems that cannot always be considered objective. Such inaccuracies may reduce the validity of the results of this treatment. Many assessment tools indicate the relevance of the problem and the lack of the complex approach to its solution. Modern standards are based on the tools that do not provide a clear and objective assessment of information products concerning their professional life. Thus, there is an urgent need to develop the universal method that could serve as a "gold" standard. The solution of the method optimization task of assessing the quality of the medical devices presupposes an objective analysis of the medical data and their correct interpretation.

To improve the effectiveness of patients' treatment, it is necessary to implement the quantitative criteria for evaluating the patient's state. According to these criteria, a qualitative approach will be applied in the decision-making about the treatment determination. On its basis, the complete examination of the patient's state and then the assessment of his/her general condition is conducted. The evaluation of the patient's overall condition is based on the comprehensive assessment of the number of indicators that characterize the consciousness state, the motor activity and the social dependence.

The method for evaluating the quality of the patient's state by formalizing the quality indicators according to ISO 14155:2011 is developed. In contrast to expert estimates it allows improving the quality of medical decisions when choosing the treatment strategy by identifying the changes in the value of the complex criteria of the patient's state.

The conducted quality evaluation of the medical decision-making that takes into account the social status of the observed, determines the predictions as to the illness duration, as well as the correction and the prevention of the risk factors. The verbal and the quantitative evaluation of the results of the quality personalized schemes realization allows verifying the correct application of the personalized treatment scheme by the GP expert chosen as a result of analyzing the general condition of the patient. This indicates the increase in the completeness and the adequacy of the personalized data processing, as well as in the quality of the health care services, which results in the formalization of the integrated criteria of the patient's general condition evaluation.

Key words: quality evaluation of results, decision making, general condition of the patient.

20. Пасічник В. В., Шестакевич Т. В. Структурне моделювання процесів інклюзивного навчання осіб з особливими потребами

STRUCTURAL MODELING OF INCLUSIVE EDUCATION PROCESSES FOR PEOPLE WITH SPECIAL NEEDS

Volodymyr Pasichnyk¹, Tetiana Shestakevych²

Information Systems and Networks Department, Lviv Polytechnic National University, S. Bandery Str., 12, Lviv, 79013, UKRAINE, E-mail: ¹vpasichnyk@gmail.com, ²tshestakevych@gmail.com

The necessity to improve the persons with special needs' training, education, professional development and social adaptation forms the basis for the development and the improvement of education in the modern information society. The inclusive education is one of the most effective ways of the adaptation in the society for those who have special educational needs.

It is necessary to form the appropriate structural model with the aim of developing the information system and the technological support of the inclusive education for persons with special needs. The preliminary analysis of the specifics of the education acquisition process by persons with special needs allowed to distinguish the structural elements and to determine the main functional stages of this process. The education for persons with special needs, generally, is a complex, iterative process that involves a large number of variables and preliminaries, and largely consists of four consecutive stages.

The implementation of each stage of the inclusive education is the sequential realization of certain educational tasks related to the organization and the support of persons with special needs. Formally, the array of such educational tasks with the specified order of their execution may be conveniently presented in the form of the corresponding partially ordered set with the preset strict order. The strict order on the set of educational tasks in the structural model displays the order of the educational tasks that implement the basic characteristics of the inclusive learning.

The use of the partially ordered sets allowed us to identify the specific educational tasks of each stage of the education for persons with special needs. When forming a structural model, the basics of the successful implementation of the inclusive learning principles were complied, and the significant number of the critical factors was considered. This, in turn, is important for the individual planning, the implementation and the verification of the specific learning processes.

Key words: person with special needs, inclusive education, structural model, the methodological foundations of inclusive education, partially ordered set, strict order.

21 Різник В. В. Моделі оптимальних інформаційних систем на двовимірних комбінаторних конфігураціях

MODEL OF OPTIMAL INFORMATION SYSTEMS ON TWO-DIMENSIONAL COMBINATORIAL CONFIGURATIONS

Volodymyr Riznyk

Automated Control Systems Department, Lviv Polytechnic National University, S. Bandery Str., 12, Lviv, 79013,
UKRAINE, E-mail: rvv@polynet.lviv.ua

This paper in systems engineering is aimed at improving the qualitative indices of the vector data information technologies (e.g. 2D vector data coding design) with respect to the reliability, the precision and other significant operating characteristics of the systems based on the combinatorial configurations theory, namely the Ideal Ring Bundles (IRB)s. Some problems of the computer engineering and the information technology, which deal with the profitable use of the mathematical models and the methods for optimization of the systems based on the two-dimensional combinatorial configurations, such as 2D Ideal Ring Bundles (2D-IRB)s are regarded. The properties of underlying models are favorably, since these methods and their results are generalized to improve and optimize a larger class of the engineering devices or the information systems. The optimization has been embedded in the underlying combinatorial models. One-dimensional graphic model of the system with the optimal placement of the structural elements in spatially distributed systems for the ring topology sequences of the positive integers is depicted. Also, the two-dimensional model of such systems with the optimal placement of the elements using the vector ring sequences is described. For example, these design techniques make it possible to configure the 2D vector coding systems using fewer code combinations than at the usual systems, while the code size is maintained using the high speed corrected coding system. The special attention is paid to the geometric interpretations of the two-dimensional Ideal Ring Bundles and its transformation groups using the theoretical relation of the 2D-IRBs with the reference to the cyclic difference sets theory. To illustrate the underlying mathematical models of the system for constructing the optimal 2D arrangement of elements over 2×3 and 3×4 references, the graphic charts of these models are given. The set of examples show the possibility of optimizing the two-dimensional vector code systems based on 2D-IRBs. The proposed models are shown to provide the design of the high performance vector data coding and the control systems using the combinatorial optimization. Besides, these methods are developed for the synthesis of the non-uniformly spaced thinned antenna arrays with the low level of side lobes.

Key words: information technology, mathematical model, system, combinatorial configuration, optimization, structure, vector data coding, two-dimensional Ideal Ring Bundle, control system, antenna array.

22. Савчук Т. О., Петришин С. І. Інформаційна технологія ідентифікації проблемних ситуацій та їх станів в складних технічних системах

INFORMATION TECHNOLOGY FOR IDENTIFICATION OF PROBLEMATIC SITUATIONS AND THEIR STATES IN COMPLEX TECHNICAL SYSTEMS

Tamara Savchuk, Sergiy Petrishyn

Vinnitsa National Technical University, UKRAINE, E-mail: savchtam@gmail.com

The fuzziness and the unstructured data problem situations and their states in the complex technical systems necessitate the development of the relevant information identification technology for their analysis, based on the characteristics of the studied subject. In this article:

- The problem of the identification of the problematic situations and their states in the complex technical systems is defined. The task is about identifying such situations and their current status (causes, conditions and

factors) with the ones that cannot be known in advance. The problem per se is reduced to partitioning the sample problem situations in complex technical systems and their states into disjoint subsets, that is, to clustering;

- The classification features and the basic functions of the developed information technology are defined;
- The information technology, identifying problematic situations and their states in the complex technical systems is proposed. It is based on the appropriate method of identifying such situations and their states using the cluster approach, based on the information model identification process aforementioned situations and modified clustering algorithm for FOREL and K-MEANS .

The application of the developed information technology enhanced the identification quality of such situations by 5,2 %.

Key words: information technology, cluster analysis, identification, problematic situation.

23. Шаховська Н. Б., Кордіяк Д. А. Архітектура медичної системи діагностування у стоматології

THE ARCHITECTURE OF MEDICAL DIAGNOSTIC SYSTEMS IN DENTISTRY

Natalya Shakhovska¹, Dariy Kordiyak²

Information Systems and Networks Department, Lviv Polytechnic National University, S. Bandery Str., 12, Lviv, 79013, UKRAINE, E-mail: ¹natalya233@gmail.com, ²d.kordiyak@gmail.com

The intellectual medical diagnosis system is described in the article. The informative model of such system is projected. Goals, objectives and the scope of such a system are defined.

The application "DentExp" is designed for either dentists or patients to help them make decisions about the possible disease and conclude the diagnosis based on the patient's complaints.

The main objective of the dental clinic is to provide the quality care and timely detection of diseases of the teeth. The process of the diagnosis is one of the most important tasks and the processes of the dental clinic, as results of diagnostics, determine the direction and the treatments in the future. Given the trends in the mobile phone market, the PS "DentExp" was developed under the operating system iOS 7.0 and later (since version 6.1 and earlier were only 15% of the smart phones). Nowadays there is the system Rapid like the TxDent, but it does not support mobile platforms and does not include additional inspections. The PS "DentExp" allows the dentist to establish the diagnosis based on the patient's complaints.

The information is processed, represented as the Boolean values (presence / absence of complaints).

The inference is based on the production rules, which at the entrance will receive a set of Boolean values of all symptoms, and the output characteristics give a percentage of each probable disease. The source input information system is the set of the interface elements called triggers that are able to have the value true or false, depending on the user's selection.

The characteristic feature of the program is the possibility to be used by the dentist to help determine the diagnosis and the average patient to acquire knowledge about their disease.

Key words: rules, dentistry, intelligence system.

24. Shportko A. V., Kapshii O. V. Using differential color models in lossless RGB-images compression tasks (Використання різницьових кольорових моделей для стиснення RGB-зображень без втрат)

USING DIFFERENTIAL COLOR MODELS IN LOSSLESS COMPRESSION OF RGB-IMAGES

Alexander Shportko¹, Oleg Kapshii²

¹Rivne State Humanitarian University, ²Karpenko Physics and Mechanics Institute of NASU, UKRAINE, E-mail: chportko@yandex.ru

In the paper several methods of the determination of the optimal differential color model for the lossless compression of the RGB-images based on the predictors use are considered. Such optimal differential model allows the parameters of the compression of the context-independent algorithm to be improved.

The research topicality is based on the fact that the modern lossless compression formats of the RGB-images work with the pixels in the fixed color model. For example, BMP and PNG formats use RGB-model, the format of WinRAR packer uses the model R-G, G, B-G. But they do not use the possibility of the selection of the effective color model that can decrease the entropy as much as possible taking into account the correlation between different components of an image, presenting them as the data with geometrically and spaciouly similar structures. Thus, the goal of this paper is to describe and to prove the algorithm of building and using the alternative differential color models with non-adaptive predictors in lossless compression formats of RGB-images.

In this publication the algorithm for the determination and the use of the differential color model with the integer coefficients is shown. The efficiency of it is proved and confirmed by experiments.

Research conclusions:

1. The compression rate of the images based on the three-components color models can be improved not only by the correlation of the data of the independent components, but by the inter-components correlation as well.

2. If the non-adaptive predictors are used for the image lossless compression, the use of the differential color models will improve the compression rate at above 4.5 % in average. For natural images the compression rate can be improved at above 12 %. The effectiveness of the differential color models use for natural images increases with decreasing % of unique image colors. The building of the differential color models corresponds to searching the colors that have minimal energy of the color differences. In practice, it is best to use the differential color models with the integer coefficients. Although such models do not have the best compression rate, they provide the best coding and decoding speed.

3. Differential color models give a possibility to improve effectiveness of lossless compression of three-component natural images in formats that use non-adaptive predictors. Therefore, the models can be included into next versions of the formats as standards.

In the future, for obtaining better compression rate, it is planned to develop the algorithm of the image partitioning into areas of the same differential color models and the algorithm of compact storage of the areas.

Key words: lossless compression, differential color model, predictors.

25. Яковина В. С. Прогнозування відмов програмного забезпечення з використанням нейронної мережі на основі радіально-базисних функцій

SOFTWARE FAILURES FORECASTING USING RADIAL-BASIS FUNCTIONS OF NEURAL NETWORK

Vitaliy Yakovyna

Software Department, Lviv Polytechnic National University, S. Bandery Str., 12, Lviv, 79013, UKRAINE, E-mail: vitaliy.s.yakovyna@lpnu.ua

Reliability, as a science that studies patterns of failures of technical systems arise in the mid-twentieth century with the advent of complex electronic and information systems, automated control systems for transport, energy, technological processes, military systems, performing extremely complex and vital functions. Development of methods for reliability modeling is driven by increased requirements for reliability of estimate of reliability parameters of complex systems.

The most common traditional approaches to software reliability modeling and estimation use models that process the results of software testing while software is considered to be a black box. These models contain priori assumptions about the distribution of random variables such as time between failures or defects quantity. However, in addition to traditional approaches there are approaches that use non-parametric models, which do not require a priori knowledge of the functional dependence of the software reliability growth over time. One such approach is the use of artificial neural networks, since the last decade, it has been proved that neural networks can be a universal approximator for any nonlinear continuous function with arbitrary precision.

Neural network based on radial-basis function (RBF) is a new class of neural networks that have a high-speed training and has been successfully used for approximation problems of unknown functions. RBF network contains no recursion and is characterized by the following features: a single hidden neurons layer, only hidden layer neurons have a nonlinear activation function, synaptic weights of the hidden layer neurons are equal to unity.

This article investigates the impact of neural network activation functions on forecasting effectiveness of revealed software errors presented in the time series form. Because the task of forecasting is a case of regression task the radial-basis neural network (RBF) was selected for this study, and the four most common activation functions were used: Gaussian, Multiquadric, Inverse Multiquadric and Mexican Hat. The software implementation of RBF neural network was used for the experiments, which allows us to change the basic network settings like activation function, the number of neurons in the input and hidden layers and the number of learning epochs. Software implementation of RBF neural network module has been developed using the Encog library. As input data for training the neural network and forecasting the results of open source Chromium browser testing were used. Public reports on 870 days of testing were used, during which about 1000 errors were revealed. For network training the time intervals, for which there are failures data, should be equally distributed, so the studied input data were normalized. There were two series of experiments, each of which included one experiment with each activation function. In the first series the neural network with 10 neurons in the input layer and 30 neurons in the hidden layer was constructed. In the second series of experiments a neural network containing 30 neurons in the input layer and 10 in the hidden one was used. Training a neural network was carried out to achieve error of 0.005 or up to 5,000 training epochs, depending on what occurred before. To assess the effectiveness of forecasting the following parameters used: the number of learning epochs that characterized the rate of neural network training was used; squared Pearson's correlation coefficient and standard deviation between predicted and experimental data. It is shown that the optimal activation function is Inverse Multiquadric with 10 neurons in the input layer and 30 neurons in the hidden one (square of Pearson correlation coefficient is 0.997 and mean deviation is 14.4).

Key words: software reliability, time series, RBF neural network, activation function.

COMPUTING AND MATHEMATICAL LINGUISTICS

26. Андруник В. А., Бекеш Р. Р., Чирун Л. Б. Структурне моделювання процесів аналізу та синтезу технічного тексту

STRUCTURAL MODELING OF ANALYSIS AND SYNTHESIS OF TECHNICAL TEXTS PROCESSES

Vasyl Andrunyk¹, Rostyslav Bekesh², Liliya Chyrun²

Information Systems and Networks Department, Lviv Polytechnic National University, S. Bandery Str., 12, Lviv, 79013, UKRAINE, E-mail: ¹phottt@ukr.net, ²rostyslav.bekesh@gmail.com, ³lchirun@mail.ru

The peculiarity of modern Ukrainian scientific and technical terminology development is an increased interest in its authenticity, as historically this terminology has become unavailable to users. The thing is such terminology has been removed out of official dictionaries and textbooks. Prohibited dictionaries were sent to the special storages of libraries and they were given only by special permission. Until today the dictionaries dated by 1920-1930 years exist in the form of single copies, or are not reached at all – they were lost or destroyed. Even the very existence of many terminological dictionaries is now known only to a narrow audience of industry specialists.

It is estimated that approximately 90 % of the new words, which appear in each language, are terms. Modern Ukrainian terminology is also actively being updated with the new units – in most cases, they are borrowings from English or linguistic calques from Russian. Despite the fact that the Ukrainian language partially assimilates words of others, it is still a large number of borrowed words which constitute a threat to the national terminological system clarity and often negatively affect the rate of the learning process. Flattering is the fact that Ukrainian equivalents arose before the emergence of specific new borrowings in Ukrainian terminology, for example: трастове товариство – довірче товариство (trust company), апроксимація – наближення (approximation), детектор – виявляч (detector) etc. In case such tendency continues, the majority of “modern” borrowings will become passive; the subject matter terms will remain. The terms are not translated as the regular words from one language to another. The optimal way of terms translation should be as follows: “concept -> Ukrainian term” rather than “foreign-language term -> Ukrainian term”; in this case, source language doesn't play a role (V. Morhunyk). In other words, equivalent word searching begins with the analysis of new concept properties. Unfortunately, in most cases, the translation of terms into Ukrainian is done through “calques”.

The purpose of this work is intelligent system development for modeling analysis and synthesis processes of texts of a technical nature, such as: checking the correctness of terms usage in articles according to the generally known rules and the possibility of these articles ontology's constructing. The established system is based on morphological analysis algorithms, namely: it is based on the modified morphological analyzer. The difference of the established system from already existing morphological analyzers is its narrow specialization while searching terms in technical texts, especially in articles. The object of this work is to study morphological systems of text analysis. The object of study is the algorithms of morphological analysis, stemming and automated constructing of ontology's. Theoretical significance of the work lies in the analysis of already known algorithms of morphological analysis, stemming and ontology's constructing methods. Practical significance of obtained results lies in the realization of methods composition of morphological analysis and stemming in order to improve the efficiency of searching incorrect words and phrases in the text, and the possibility of ontology's constructing.

Structural intelligent system of process analysis modeling and technical texts synthesis was developed. In order to provide the design and implementation of system structural analysis the environment All Fusion Process Modeler 7 was used; with the help of which a system functional diagram as well as data flows diagram and operations sequence logical diagram were created. All components and functional parts of the system were developed by means of visual programming environment C ++ Builder 6.0, using SQL-queries. Database designing was carried out in My SQL Workbench environment. Literature data analysis and research in the field of automated processing of texts and morphological analysis were conducted; the existing systems (similar in functionality) were considered. The developed system of modeling analysis and synthesis processes of texts of a technical nature performs the search of incorrect words and phrases in the text of a technical nature, especially in articles. Keyword searching function, which is based on Zipf's law, is additionally provided in the system. The found keywords can be used for constructing an article ontology in the form of XML-documents, which is a very important fact because this format has become a standard for data exchange between applications. In order to automate the validation stage it would be more efficient to use third-party dictionaries and thesauruses, which may lead to the development of WordNet Ukrainian equivalents.

The result of system operation is finding out an incorrect word or phrase as well as a list of words or phrases that can replace it. The system also displays a list of keywords mentioned by the author of the article as well as a list of keywords founded by the system, and the result of checking their matches. Despite the functionality of the system, it also has some drawbacks. Since the whole operation of the system depends on the dictionary content, first of all, the replenishment of the terminological base should be performed. Deprivation of the developed system drawbacks could

be the first step in its further development. In particular, the work of the system should be continued in the direction of improving algorithms of irregular words and phrases searching, e. g. searching algorithm implementation, which is based on neural networks. In order to increase the efficiency of keyword searching algorithm, it is necessary to implement the possibility to perform keyword searching not in the single file, but in multiple files related to the similar subject for the purpose of discarding words, which are typical for the texts with a similar subject, but not crucial. The distinctive feature between created and existing systems at the current stage of its development is narrow specialization of the system in specific subject texts (especially in technical articles). So, the developed system of modeling analysis and synthesis processes of texts of a technical nature is a simple tool for searching incorrect words and phrases as well as for ontology's constructing, and may be used for non-commercial purposes.

Key words: generative grammar, structured scheme sentences, computer linguistic system.

27. Висоцька В. А. Концептуальна модель процесу формування семантики речення природною мовою

CONCEPTUAL MODEL OF SENTENCES SEMANTICS FORMATION IN NATURAL LANGUAGE

Victoria Vysotska

Information Systems and Networks Department, Lviv Polytechnic National University, S. Bandery Str., 12, Lviv, 79013, UKRAINE, E-mail: victana@bk.ru

This paper presents the generative grammar application in linguistic modeling. Description of syntax sentence modeling is applied to automate the processes of analysis and synthesis of texts in natural language.

The article shows the features of the sentences synthesis in different languages of using generative grammars. The paper considers norms and rules influence in the language on the grammars constructing course. The use of generative grammars has a great potential in the development and creation of automated systems for textual content processing, for linguistic support of computer linguistic systems, etc.

In natural languages there are situations where the phenomenon that depends on context is described as independent of context (i.e., in terms of context-free grammars). In this case, the description is complicated according to the formation of new categories and rules. The article describes features in the process of introducing new restrictions on data classes through the new grammar rules introduction. If the symbols quantity on the right side of the rules are not lower than on the left then not-reduced grammar is presented. Then at replacement of only one symbol got context-sensitive grammar. In the presence of only one symbol on the left side of the rule context-free grammar is presented. None of these natural constraints on the left side rules are not possible to apply.

The theory of application of generative grammars for solving problems of applied and computational linguistics at the morphology and syntax level allows to create a system of speech and texts synthesis, create practical morphology textbooks and inflection tables, concluding the morphemes lists (affixes, roots), to determine the performance and frequency for morphemes and the frequency of different grammatical categories realization in texts (genus, case, number, etc.) for specific languages. Developed models on the basis of generative grammars for linguistic functioning computer systems designed for analytical and synthetic processing of textual content in information retrieval systems, etc. are used. It is useful to introduce all the new restrictions to this grammar, getting narrower of their classes. In describing the complex range of phenomena there is a limit of used description means set, and considering these features, which are served in general, is obviously insufficient. Research begins with minimum means. Whenever there are not enough (smaller portions) new means are gradually introduced. It is possible to determine exactly what means can or can not use in the description of a phenomenon for understanding its nature.

Key words: generative grammar, structured scheme sentences, computer linguistic system, content, content analysis, information resource, content system management.

28. Давидов М. В., Лозинська О. В., Пасічник В. В. Інфологічна модель концептів української жестової мови

ENTITY-RELATIONSHIP MODEL OF UKRAINIAN SIGN LANGUAGE CONCEPTS

Maksym Davydov¹, Olga Lozynska², Volodymyr Pasichnyk³

Information Systems and Networks Department, Lviv Polytechnic National University, S. Bandery Str., 12, Lviv, 79013, UKRAINE, E-mail: ¹mdavydov@adva-soft.com, ²kanmirg@gmail.com, ³vpasichnyk@gmail.com

The modern science development, society computerization, use of multimedia and Internet technologies have created conditions for creation of computer communication systems for people with impaired hearing. Automatic translation means help these people to communicate and to overcome language and cultural barriers. The urgent task is to develop software tools that help in the study and translation of Ukrainian Sign Language (USL). For easy communication

with deaf it is enough to create a system of sign language translation into text and vice versa. The complexity of automatic translation system development of Ukrainian Sign Language is strengthened by the lack of large dictionaries and corpus of USL. The absence of such corpora for the Ukrainian Sign Language requires the use of an alternative approach - the introduction of semantic concepts (concepts of the subject area) and study of the relationship between semantic concepts. Based on the analysis of linguistic relations between concepts of the Ukrainian Spoken Language and Ukrainian Sign Language entity-relationship model of concepts for building a translation system of the Ukrainian Sign Language is developed. Adequacy of the entity-relationship model of parallel sentences "Ukrainian Spoken Language - Ukrainian Sign Language" is investigated. In order to evaluate the effectiveness of the system operation the following assessment are considered: Word Error Rate (WER) and Position Independent Error Rate (PER). The evaluation quality of the translation system using the entity-relationship model concepts shows a reduction in the percentage of incorrectly translated words in those sentences that contained concepts, from 42,83% to 34,58% WER and from 18,35% to 14,65% PER. The disadvantage of the system is the small amount of data for testing (220 sentences and 50 concepts). In the result of the research in order to translate Ukrainian Sign Language is generated grammatically correct constructions of spoken language, that reproduce the content of sign expression.

Key words: Ukrainian Sign Language, bilingual corpora, concept, entity-relationship model, grammar.

29. Каніщева О. В., Медведська А. В., Панчул А. О. Визначення типів емоційного мовного вираження у додатках автоматичного опрацювання текстів

IDENTIFICATION OF EMOTIONAL LANGUAGE EXPRESSION TYPES IN AUTOMATIC LANGUAGE PROCESSING APPLICATIONS

Olga Kanishcheva, Anna Medvedskaya, Anastasiya Panchul

National Technical University "Kharkiv Polytechnic Institute", UKRAINE,

E-mail: olya-kanisheva@rambler.ru

The paper deals with the means of emotions expression in the language of the Internet and the comparative analysis of different approaches to extract the emotional elements. The main purpose of research is to develop a system for automatic selection of emotional elements in emails, which will help to analyze the tonality of the text better (Sentiment Analysis).

In this paper, the object of research is e-mail messages of the Internet. In the paper the existing methods of emotional elements extraction in the text and also systems that implement the Sentiment Analysis were analyzed. Described features of emotional elements, by means of which they are defined in the text were described. The use of notation of Backus-Naur form to highlight these elements was proposed in the paper. Proposed approach was implemented using the Java programming language. The approaches will automatically mark out by the appropriate tags incoming text messages. The research results can be used by linguists, analysts, experts in the field of Sentiment Analysis, and also other experts and specialists in the systems that allow automate natural language processing. Thus, the use of Backus-Naur notation and selection of features of emotional speech of the Internet allowed creating an efficient approach to the automatic selection of the emotional elements in email messages.

Key words: automatic natural language processing, Sentiment Analysis, emotional elements, tonality, the Backus-Naur form.

30. Кульчицький І. М., Лукач М. О. Формальна модель відображення семантичних характеристик у словниках

FORMAL MODEL OF REPRESENTATION OF SEMANTIC CHARACTERISTICS IN DICTIONARIES

Ihor Kulchytskyi¹, Mariya Lukach²

Applied Linguistics Department, Lviv Polytechnic National University, S. Bandery Str., 12, Lviv, 79013, UKRAINE,

E-mail: ¹bis.kim@gmail.com, ²mariya.lukach@gmail.com

In recent decades, in the world, linguistic technology as a field of science is actively developing with the focus on the creation of various applications of natural language mechanisms in computer systems. In Ukrainian linguistics there is practically no industrial software for dictionaries creation with the help of computer, whereas for many world languages the main tools for processing of natural language texts, which use strong computer dictionaries, were created. Thus, there is need for creation of new dictionaries of various types on the basis of Ukrainian lexicon and corresponding lexicographical programs.

Formalization and modeling of language became the issues of particular importance for linguistics. One of aspects of modeling the linguistic phenomena is modeling of lexical semantics, in particular, the semantics of verbs. For the Ukrainian language the creation of semantic dictionary is a matter of topical interest. In order to automate the

process of creating semantic dictionary of the Ukrainian language – its formal model should be developed first. The purpose of the article is to create the formal model of representation of semantic characteristics of verbs in dictionaries on the basis of the information theory of lexicographic systems.

It is in the dictionaries where the theoretical problems of linguistics, including the problem of describing the word meaning, find their solution, are implemented and the results of the theory are validated. It is expedient to present the semantic characteristics of verbs in dictionaries of an explanatory type, since the structure of entries of explanatory dictionaries implicitly contains the structure of most monolingual philological dictionaries.

In the article on the basis of the information theory of lexicographic systems of V. A. Shyrovkov the formal model of representation of semantic characteristics of verbs in dictionaries is built. The elementary lexicographic model is the representative formal model of representation of semantic characteristics of verbs. This model can be used, in particular, for semantic markup of verbs in a corpus of texts.

Key words: modeling, formal model, semantic markup, information theory of lexicographical systems.

31. Литвин В. В., Черна Т. М. Проблема автоматизованої розбудови базової онтології

THE PROBLEM OF AUTOMATED BASE ONTOLOGY DEVELOPMENT

Vasyl Lytvyn, Taras Cherna

Information Systems and Networks Department, Lviv Polytechnic National University, S. Bandery Str., 12, Lviv, 79013, UKRAINE, E-mail: vasyll@ukr.net

The purpose of this article is to develop the method of automated designing base ontology and evaluating its quality. The idea that underlies in the automated development of ontology is that the processed texts with the knowledge of subject area are used to obtain data to complete the existing ontology. At the same time, the intermediate ontology is used for text processing of subject area. The result is a recursive process that can be considered as self-education of the system. Learning can be both automated and semi-automated with the help of a teacher. In process of education of the system, the need for a teacher will disappear and the process will be completely automated. The initial ontology with the basic concepts of subject area and commonly used terms should be defined a priori.

Ontology in OWL provides the conceptual framework of the top-level and of the subject area. Top-level ontology provides new knowledge inference, fills up received messages with a context; verifies the truth of received messages; assesses probability of sources messages; Ensures logical integrity of Database.

Machine Learning is realized by Java API Protégé-OWL means. These means have their Library Classes where methods of work with OWL-structures are done: reading and additions. In this way, Machine Learning means work in interaction with OWL-ontology, taking her models of grammatical and semantic structures for statements recognition (logic predicates of 1st order) in investigational and/ or educational texts and adding to OWL-ontology new elements as a result of such recognition. Link Grammar Parser (LGP) is used for this procedure, which divides an affirmative English grammatically correct written sentence to semantically linked word pairs. LGP provides table of compliance between grammatical English structures and types of syntactic and semantic links between words (concepts). API LGP allows to link this table with OWL-ontology, and due to which the table can dynamically adopt to the suggested subject field in the learning process.

Key words: ontology, learning ontology's, automatic development, knowledge base, text document.

32. Лозицький О. А., Кунанець Н. Е. Система опрацювання технічних текстів українською мовою з метою їх адаптації для людей з вадами зору

SOFTWARE SYSTEM OF UKRAINIAN TECHNICAL TEXTS ADAPTATION FOR PEOPLE WITH VISUAL IMPAIRMENTS

Oleksandr Lozytskyi¹, Natalia Kunanets²

Information Systems and Networks Department, Lviv Polytechnic National University, S. Bandery Str., 12, Lviv, 79013, UKRAINE, E-mail: ¹netexpo@yahoo.com, ²nek.lviv@gmail.com

The scientific paper is dedicated to the description of the developed computational methods and software of the computerized data processing and presentation for people with a visual impairments system.

There are a lot of scientists who research the problem of information accessibility for visually impaired and totally blind people. Considerable contribution to the creation of information technologies for blind people was made in Sweden, Japan, Germany, USA, France, Canada, Denmark, England and other leading countries. Unlike the leading countries the information accessibility for blind remains problematic and painful in Ukraine. Solution of this problem will allow blind to realize them selves in everyday life.

The author developed an applied programmed system of Ukrainian technical texts processing that consists of a set of processing and conversion methods for automatic reading of mathematical formulas and symbols of the Ukrainian language, which are written in a variety of formats. Unlike prior methods, it is more directed towards the segmentation and reading by the rules rather than streaming audio.

As a result it was developed an automatic reading system for the set of different complexity of mathematical formulas (read correctly: 92.5%). The system can be used by visually impaired people for studying the basics of mathematics, physics, astronomy, etc. Also, the author adapted information technology of DAISY (Digital Accessible Information System) books produced for the Ukrainian language. It can help to make DAISY math's books that can be studied by the blind people. It was created automation equipped working places for Ukrainian people with visual impairments. The main results of the research implemented in Lviv consulting center for special needs children are based on "School-gymnasium "Syhivska", boarding school №100 for the blind children, Lviv regional organization "Ukrainian Union of Disabled - USI" and Lviv Regional Fund for Social Protection and Rehabilitation of the Blind when developing an applied programmed system of computer data processing and presentation for people with visual impairments.

Key words: visual impairments, blind, special needs, applied programmed system, Ukrainian technical text processing, mathematical formula, visual impairment, syntax tree, sounding, automation equipped working place, DAISY, MathML.

33. Сєров Ю. О., Ковальчук М. В. Консолідований інформаційний ресурс навчальної літератури бібліотек

CONSOLIDATED INFORMATION RESOURCE OF EDUCATIONAL LITERATURE OF LIBRARIES

Yuriy Syerov, Maryna Kovalchuk

Social Communication and Information Activities Department, Lviv Polytechnic National University, S. Bandery Str., 12, Lviv, 79013, UKRAINE, E-mail: syerov@ridne.net

The role of libraries in the information society significantly was increased, because libraries retain the accumulated information and knowledge, and provide access to them. Nowadays the library science requires serious technological solutions in general. In connection with rapid development of advanced information technology and telecommunications, modern libraries activate their own electronic resources (electronic catalogs, databases, digital libraries, depositories) are created and the access to remote resources are organized.

The aim of the paper is to the development of a consolidated information resource that will systematize and consolidate all educational literature of school libraries, including electronic resources, according to library principles and erect information about them to the same format. To achieve this goal systematic analysis of the subject area is realized and means for website and database development is selected.

For the consolidated information resource modeling means of structural analysis such as Data Flow Diagrams and Entity-Relationship Diagrams are selected. The project of the consolidated information resource using the programming language PHP is created. As a DBMS for work with database project is used MySQL, which is a free system managing relational databases; primarily for creation of dynamic web pages is used, because it has excellent support by various programming languages and is considered as a good solution for small and medium applications.

The main functions implemented by consolidated data source are the following:

- disclosure of own school libraries funds;
- replenishment of school libraries funds with electronic documents by obtaining the full-text documents;
- provision of complete and accurate information to libraries users about all publications that are available in the libraries;
- promotion of cooperation and collaboration between Kuznetsovsk school libraries;
- promotion of the development of librarianship and ensuring the rights of library services users for high quality and timely library and bibliographic information service.

Key words: consolidated resource, school library, library collection, information technology, database.

34. Сопрунюк О. О. Метод оцінювання якості туристичної документації

EVALUATION METHOD OF TOURISM DOCUMENTATION QUALITY

Oksana Soprunyuk

Information Systems and Networks Department, Lviv Polytechnic National University, S. Bandery Str., 12, Lviv, 79013, UKRAINE, E-mail: oksana-soprunyuk@mail.ru

Nowadays intensive development of the tourism industry causes growth of the information base and the quantity of tourism activity subjects. Therefore, it is necessary to provide tourism product consumer with the important, accurate, and truthful information by developing a comprehensive information resource in the form of so-called travel documentation. The need continually to improve the quality of tourism documentation stipulates the importance of developing its quality evaluation taking in consideration consumer needs. This is a topical scientific-applied task.

In order to organize the process of tourism services delivery it is firstly necessary to present the information in the homogeneous form for the solution of formation task of high-quality information support. For this purpose it is important to develop the formal model of tourism documentation, to bring all the documents to homogeneous form. The presentation of tourism documentation structure in the form of the model gives the opportunity to identify those information blocks that need to be filled with information.

Tourism documentation is a specific type of document, which must meet the needs of tourism product consumer. Therefore, to assess the information content quality of tourism documentation were used existing standards for assessing the software quality, such as ISO 9126 and ISO 25010.

The paper describes the developed evaluation method of the tourism documentation quality based on the open web- resources. In order to evaluate the quality of tourism documentation considering its features have been chosen the following evaluation criteria: functionality, practicality, pleasure during the use. Information content peculiarities of tourism documentation and the appropriate quality evaluation standards were described, formal model of the tourism documentation structure were described and its graphical representation were presented, evaluation criteria and determining parameters of tourism documentation quality were defined.

Therefore, for continuous improvement of the quality of tourism documentation it was necessary to develop the method of its evaluation by using the quality standards, which allows to take into account the needs of each tourism product consumer.

Key words: tourism documentation, information quality, formal model, quality criterion.

35. Пелешак Р. М., Скотна Н. В. Колективні ефекти при формуванні громадської думки в межах моделі Ізінга–Вайдліха

COLLECTIVE EFFECTS OF PUBLIC OPINION FORMATION WITHIN ISING-VAYDLIH MODEL

Roman .Peleshchak, Nadiya Skotna

General Physics Department, Applied Psychology Department, Drohobych Ivan Franko State Pedagogical University,
I.Franko Str., 24, Drohobych, 82100, UKRAINE, E-mail: peleshchak@rambler.ru

In this work the mathematical model of public idea forming within the framework of Ising-Vaydlih model has been constructed. An analogy with Ising-Vaydlih model is caused by that parameter of order in this model, that is z - the component of spin variable, takes on two possible values depending on direction of spin ($+1$ - yes, or -1 -no). Except it, in the model, of public opinion forming a collective parameter that acts part thermal energy in a physical model is set. The external fields act as part of parties influence. Within the limits of the mentioned above Ising-Vaydlih model the degree of public determination of collective opinions in relation to that or other issues taking into account external parties influence or mass medias on the formation of public idea is investigated. It is shown, that in the case when external influence of party or mass media supports the minority opinion, a relative number of people who had the opposite opinion under the act of external disturbance monotony grows and at the defined critical value of external action ($\geq 10\%$) abruptly grows and public opinion will reorientation on the opposite one. Such phenomenon is observed when a sum of the internal hidden political position parameter of individual and parameter of public opinion pressure is anymore after 1.

Key words: Ising-Vaydlih model, public determination degree of collective opinions (order parameter), the hidden political parameter of individual position, public opinion pressure parameter, internal advantage influence parameter, political parties and the media influence on public opinion.

PROGRAM AND PROJECT MANAGEMENT

36. Алексеева К. А., Пелещин А. М. Застосування неповних і неточних даних в управлінні комерційними Web-проектами

APPLICATION OF INCOMPLETE AND INACCURATE DATA IN COMMERCIAL WEB-PROJECT MANAGEMENT

Kateryna Aliksieieva¹, Andriy Peleshchyn²

Social Communication and Information Activities Department, Lviv Polytechnic National University, S. Bandery
Str., 12, Lviv, 79013, UKRAINE, E-mail: ¹kateryna.alekseyeva@gmail.com, ²apele@ridne.net

Commercial web-project supposes creation by the developer of some Internet-resource booked by client for further direct profit making or main business support. Internet-resource commercial functions may be of various kinds – own or partnership advertising, marketing tasks, electronic commerce, content selling, main business support tasks. Various web-projects have one common feature. That is such: success of Internet-resource, its commercial tasks implementation directly

depends on project execution organization level, made decisions correction and its quality. One of the principal features of commercial web-projects is orientation on the use of its results by a wide range of end consumers. So, the commercial part of project success depends on many internal and external factors. At the same time, values of such factors may not always be set or defined with adequate degree of accuracy and authenticity. In this case, necessity of decision is making, project planning and project actions execution taking into account the absence, incompleteness or its inaccuracy arise.

The purpose of this work is definition of ways and development of methods of incomplete and inaccurate data usage in project decision making for commercial web-project management. Methods and procedures of decision making in commercial web-project management under conditions of incompleteness or inaccuracy of some project features are described in the paper.

Principal project features which predetermine project decision making were defined based on the analysis of number of commercial web-projects developed by the authors of the paper. The analysis of principal data required for decision making process has been executed; nature of indefiniteness, which appears in the set of web-project characteristics, has been defined. Primary reasons of project data of commercial web-projects incompleteness and inaccuracy are explored and ways for its level reducing are described. Procedures for application of incomplete or inaccurate values of web-project features based on means of fuzzy logic are developed.

Key words: web-project, Project Management, data uncertainty, Project decision making.

37. Басюк Т. М., Василюк А. С. Особливості проектування високорейтингових Інтернет ресурсів

DESIGN FEATURES OF HIGH RATING INTERNET RESOURCES

Taras Basyuk¹, Andrii Vasyliuk²

Information Systems and Networks Department, Lviv Polytechnic National University, S. Bandery Str., 12, Lviv, 79013, UKRAINE, E-mail: ¹btaras@rambler.ru, ¹basyuk.ism@gmail.com, ²zoso81@mail.ru

The purpose of the publication is to determine the design features of high rating resources on the Internet. The study will provide the means to implement a comprehensive website analysis leading towards a mechanism to provide recommendations for its improvement with a view to entering into the top search engine ranking positions. To achieve this goal it is necessary to solve the following main tasks:

- To analyze known techniques of estimation and to determine their possible application in the study of the problem;
- To analyze known architecture building resources and their uses; identify the factors that carries the greatest influence on the process of building a high rating resource.

Object of study - the process of entering online resource of top search engine ranking positions.

The subject is the methods and means of creating high ranking resources.

Scientific novelty is to study features of information architecture website and the definition of "bottlenecks" that arise in the process of designing high rating resources.

The practical value of the work is to build the parameters that will be used in the design of system compliance automation process of building high rating resources.

The authors developed a methodological framework for building decision support systems in optimizing Internet resources and their subsequent entry in the top search engines:

- Analysis of known tools and techniques shows the absence of mechanisms that provide guidelines for designing high initial rating of resources;

- Investigation of search engine optimization indices allows reasoning their use in the construction of Internet resources;

- Description of data architecture creation features and identification of "bottlenecks" that arise in the process of designing websites were done.

Key words: web metrics, internet resources, ranking, architecture.

38. Бойко Н. І. Методи та інструменти моделювання інформаційних процесів

METHODS AND TOOLS OF INFORMATION PROCESSES MODELING

Nataliya Boyko

Information Systems and Networks Department, Lviv Polytechnic National University, S. Bandery Str., 12, Lviv, 79013, UKRAINE, E-mail: natkaboiko@rambler.ru

The article presents the sense of modeling that is an investigation method of various phenomena and processes, development of management decisions variants. The issue of modeling role in the process of enterprise activity is discussed. It is based on replacement of real objects by their conditional samples, analogues. The article describes the use of modeling method for the description of the object structure (static model), the process of its functioning and development (dynamic model). Also, the publication presents models properties, connections, trends

of the studied systems and processes that allow evaluating their condition make predictions and a reasonable decision. Modeling forms depending on structural models types and applications sphere are highlighted. The article considers the subject and symbol modeling. The subject one concedes the creation of models, that provide spatial-temporal, functional, structural and other properties of the original (concrete scientific models). By the symbol one means a representation of the object parameters using symbols, diagrams, formulas, language sentences (logical-mathematical models). Epistemological sense of modeling forms the basis for the transference of results obtained in the process of models study on the original. The aim of this article is to compare the features of existing modeling methods and tools and determine how to use them to build a methodological basis of information processes study.

Examples of the use of management and production activities to name modeling objects in a modern modeling practice are presented. For this purpose the term "information process" is suggested. The article analyzes the ways of information processes modeling in practice for a wide range of tasks, which is an important part of their reorganization projects. Nowadays there is a problem of choosing adequate methods and modeling tools that generate their diversity and lack of common standards, tools and modeling techniques.

The article proves theoretical concepts, proposes methodological and practical recommendations that can improve the effectiveness of information system functioning. Analysis of the basic principles and methods of information processes modeling and methodology of information system formation are presented. System approach that allows to take into account the overall strategic association objectives and to generate models and restrictions for receiving and interpreting decision support system are formed.

Key words: methods, tools, methodology, modeling, information, information processes, information systems, systems approach.

39. Волощак О. В., Марковець О. В. Концертуальна модель ресурсу для організації туристичних подорожей

CONSOLIDATED INFORMATION RESOURCE FOR ORGANIZING TOURIST TRIPS

Oksana Voloschak, Aleksandr Markovets,

Social Communication and Information Activities Department, Lviv Polytechnic National University, S. Bandery Str., 12, Lviv, 79013, UKRAINE, E-mail: san_markovets@ua.fm

Nowadays the activity of modern travel companies is unimaginable without the Internet. The internet is used in almost all of its basic business processes, from searching and attracting customers as a communication and marketing tool, and ending with the formation of services range.

The organization of tourist trips using consolidated resource will not only reduce the cost of communications, but with also get a real opportunity to develop work for all market participants as a single tourism office. Working with global reservation systems through the Internet allows a travel agency not only to provide all the market participants with timely and accurate information on pricing and portfolio at any given time, but also allows to monitor the passage of the order at all stages of its implementation.

Creating a consolidated information resource for the organization of tourist services offers new opportunities for effective solution of the basic tourism problems. Exploitation of resource will allow travel companies to implement resource conservation programs by reducing the operating costs of maintaining communication systems, increase productivity, improve quality of services, work and enhance the competencies of the employees of travel companies. It could also facilitate and simplify resource potential customers organize your holiday. Given the current state of the tourism market to provide services, the article suggested the possibility of organizing tourist trips using a generated consolidated resource. Use case diagrams, sequence diagrams and context, with which you can visualize the process of consolidating information market of tourist services were presented.

Key words: tourism business, information technology, consolidated information resource, website, tour trip.

40. Голошук Р. О., Москалюк Ю. Інформаційне моделювання консолідованого ресурсу офісної документації ПАТ «Іскра»

CONSOLIDATED INFORMATION RESOURCE OF OFFICE DOCUMENTATION AT ISKRA CORPORATION

Roman Holoshchuk, Yulia Moskaliuk

Social Communication and Information Activities Department, Lviv Polytechnic National University, S. Bandery Str., 12, Lviv, 79013, UKRAINE, E-mail: holoshchuk@vlp.com

At the present rate of increase in the complexity of production and the widespread introduction of computers in research, production and management processes of any enterprise is a special importance of ability to collect, consolidate, store and process information effectively. The concept of consolidation of information resources is tied to the need to make effective decisions using the latest information technology, and with the requirements of

databases that store information about the main activities of the company. Management process is always based on a variety of systems in which the key role is played by the documents. If workflows are organized effectively, productivity and efficiency of work of employees increases, costs associated with the functioning of the administrative department are reduced. Database technology enables you to implement the necessary record keeping functions effectively: registration of documents and their rapid search, consolidated data in the form of reports, certificates and more. For remote access to the necessary information and company's database of office documents we should develop and implement a corporate website with content management technologies.

The relevance of computer facilities and content management system techniques while working with the office documents is discussed and the creation by designing a database for the office documentation using MySQL open-source software product is proposed in this article. Also, the importance of creation of an Internet web-site to provide to company information resources for users is considered. The research is devoted to the problem of creating the effective information system with consolidated document data and using it regardless of the employee's current location. The research should help provide more precise and adequate recommendations for the design of the information system so that this system can be implemented successfully and contribute to the improvements in organizational effectiveness.

Creation of a unified consolidated resource of office documents containing information of different types of documents and correspondents allows us to generate relevant information to queries and represent it in a convenient way for user is recommended to implement using DBMS technology and web technologies. The use of modern opportunities of web technologies gives an ability to accumulate information in a database without time delay and territorial restrictions.

Key words: consolidated information resource, document, relational database management system, queries, registration of documents, web-site, content management system, personified access.

41. Григорович В. Г., Єгорова В. В. Генератор проєктів системних трансформацій освітніх комплексів, зорієнтованих на дітей з особливими потребами)

GENERATOR OF PROJECTS OF SYSTEM TRANSFORMATIONS OF EDUCATIONAL COMPLEXES, TARGETED TO CHILDREN WITH SPECIAL NEEDS

Viktor Grygorovych¹, Valery Egorova²

Information Systems and Networks Department, Lviv Polytechnic National University, S. Bandery Str., 12, Lviv, 79013, UKRAINE, E-mail: ¹viktor.grigorovich@gmail.com, ²changable92@gmail.com, ²ehorova.valeriya@gmail.com

The paper describes the principles of designing and building of intellectual information system to generate prognosis, plans and recommendations as to provide high-quality conditions of education of children with special needs in comprehensive school. The analysis of open sources showed that there is no existing similar systems publicly available – both paid or free.

The need of such development is conditioned due to the fact that under the current legislation of Ukraine, The Head teacher can not forbid the student with special needs to go to school, if it does not harm other children, but in many cases, most of the heads of educational institutions do not know how to provide the necessary facilities for students with special needs. One way to ensure education of people with disabilities is to establish various support software and hardware to the workplace of the student. But most existing software tools (tools for distance learning) can provide only studying for people with disabilities of the musculoskeletal system, while people with disabilities of hand movements, of vision and hearing will still need the help of other people or hardware. The computer voice control and voice typing software are developed for people with defects of vision. The paper describes the authors' intelligent information systems to generating projects of inclusive education of students with disabilities in general educational establishments designed for directors, head teachers, teachers and schools, high schools and other educational institutions of secondary education.

Classes of potential users and their roles are proposed and justified according to the structure of the system. Specified requirements for the construction and operation of machine logical algorithms output sequence of actions in the process of installation, verification, integration and administration of Intelligent Information Systems. The system provides the opportunity to provide detail recommendations of the construction of school and further education of teachers in the case study in ordinary schools for children with special needs. The system is implemented means CLIPS.

Key words: education, children, special needs, expert systems.

42. Катренко А. В., Магац А. С., Магац Д. С. Ймовірнісні та імітаційні моделі планування та управління в мультипроектному середовищі

PROBABILISTIC AND SIMULATIONAL MODELS FOR PLANNING AND MANAGEMENT IN MULTI-PROJECT ENVIRONMENT

Anatoliy Katrenko¹, Andriy Mahats², Dmytro Mahats³

Information Systems and Networks Department, Lviv Polytechnic National University, S. Bandery Str., 12, Lviv, 79013, UKRAINE, E-mail: ¹anatolkatrenko@gmail.com, ²a.mahats@gmail.com, ³eric7eric7@gmail.com

The main goal of this work is a critical analysis of project portfolios' formation models and models of resource allocation between projects of portfolio, proved imitation approach to solving these problems.

The importance of solving the problem of planning and managing of project portfolios associated with following factors: higher requirements of investors in the projects included in the portfolio; there is a need to develop such tools for selecting projects that would take into account the strategic aspects of development provide competitive ability of project-oriented companies; existing approaches to portfolio management is rather fragmentary and in many cases does not correspond to real projects.

This paper considers the Agile-management - iterative method of planning and control of processes and projects that focuses on short development cycles, operational updates according to changes in customer needs and focuses on achieving personal, technical and organizational success. Thus, modern development methodologies and techniques help to reduce uncertainty when performing the projects and directed to ensure that the diverse requirements and coordination of all project participants are met.

One of the major components of the portfolio characteristics is its risks, and in the case of innovative projects generally known that most of them won't be successful. Portfolio risk – is the risks of projects, of which portfolio consist, that are considered together to achieve synergy in the implementation of strategy.

The review of following project portfolios' formation models is considered: Badri-Davis (essentially a boolean integer programming model), Radulesku (forming portfolio from the set of competing) and resource allocation model. As a result of critical analysis of project portfolios formation models and resources allocation between portfolio's projects in terms of risk and uncertainty models conducted by the authors, found that existing methods are rather fragmentary and not sufficiently cover the problems of planning in multi-project environment. Developed imitation model of the overall planning structure in a multiproject environment, which consists of three basic models - project model, project portfolio formation model and planning model, implementation of which will accumulate the necessary statistics, imitate the possible consequences for the conditions of various risks and obtain the necessary information.

Key words: probabilistic model, imitation model, agile, software development, optimization, project management, planning, extreme programming.

43. Катренко А. В., Пастернак О. В. Системні аспекти інвестування в галузі інформаційних технологій

SYSTEM ASPECTS OF INVESTMENT IN THE DOMAIN OF INFORMATION TECHNOLOGIES

Anatoly Katrenko¹, Olena Pasternak²

Information Systems and Networks Department, Lviv Polytechnic National University, S. Bandery Str., 12, Lviv, 79013, UKRAINE, E-mail: ¹anatolkatrenko@gmail.com, ²summery17@gmail.com

Informational technologies are the most important part in the process of the society informational resources use. In today's world, the computer is the main technical means of information processing technology, so information technologies have become quite profitable investment goods. The decision to invest can afford the company to win new market position and gain a competitive advantage over other companies. The competitive advantage in the market is appearing by providing customers with a product that gives more value for the same price (diversification) or provides an equivalent value, but at a lower cost (low cost). Determining the relationship between investment in IT and the value of the company is a major problem for researchers of information systems. IT company shares are usually of different volatility. The dynamics of courses may differ from the dynamics of the market in general - because investing in IT is a challenge.

This article deals with the peculiarities of investment in the information technology field, the state of information technology market and its development trends. The system analysis of the peculiarities and the main trends of investment development in the IT sphere are the main issues of this paper. The system analysis allows to structure the main target and form the distinctive features of investment (strategies, methods), to receive the investment quality criteria and research the level of its influence on the main goal reaching. The paper describes basic kinds of investments in IT: own resources, credits, seed capital, venture capital investment, private equity

professionals, strategic investment, and stock capital. The advantages and disadvantages of all listed investments were systematized and structured in the table. The most popular methods of investment valuation to IT and objective tree, which describes the conditions for the investments maximum efficiency, were provided.

Key words: investment, information technologies, objectives tree, algorithm, evaluation method, IT market, profit (income), risk.

44. Кравець Р. Б., Ковалик Л. П., Думанський Н. О. Подання діяльності молодіжних громадських організацій України в Інтернет

CONSOLIDATED RESOURCE OF REPRESENTATION OF YOUTH NGOS IN UKRAINE

Ruslan Kravets¹, Lilia Kovalyk², Nestor Dumanskyi²

Social Communication and Information Activities Department, Lviv Polytechnic National University, S. Bandery Str., 12, Lviv, 79013, UKRAINE, E-mail: ¹rkravets@ua.fm, ²nestor81@mail.ru

Competitiveness of any organizational structure depends on the quantity and quality of information that it represents. Today, with the development of post-industrial society, the issue of ownership with reliable and timely information along with the ability to effectively use appropriate methods of collecting, analyzing and providing a basis for the success of the companies and organizations of any legal form. And youth organizations as one of the most important institutions of civil society do not remain aloof.

In Ukraine there are a lot of various developed youth associations, which differ in business issues and ideology. In this regard, there is a problem of rather scattered information about them in the community or lack of awareness about their activities. To find the necessary information on the Internet the young person needs to see a large array of sites on the web. The solution to this problem is to create a single web resource with information about youth organizations operating in Ukraine. This requires the collection, analysis, processing, sorting and presenting all the necessary information that will satisfy the young people needs. This article discusses an efficient way of popularizing public organizations of Ukraine's population, accompanied by scientific research by developing a means of interaction between youth organizations and society.

The survey analyzed the basic principles of activities of civil society organizations. It was a classification and separation of activities, presented new research in solving the problem of constructing a model of centralized repository of information on civil society organizations with the ability to create a reference site. We describe the overall structure of the organization of the websites of NGOs. Posted new approaches to the organization of citizen's interaction with youth organizations on the basis of consolidated information resource. Youth NGO is a definite source for the formation, development and enhancing of democratic values among young people, responsibility, leadership and organizational skills, critical thinking, forming their own position with respect to any process in the state and society. But among young people there is a low level of awareness regarding the activities of such organizations. It is therefore particularly important for today to create a consolidated information resource representation of youth NGOs in Ukraine.

Key words: consolidated resource, youth public organization, information activities, consolidation of information.

45. Кунанець Н. Е., Малиновський О. Б. Особливості ефективної роботи електронних бібліотек

SPECIAL FEATURES OF EFFECTIVE FUNCTIONING OF DIGITAL LIBRARIES

Natalya Kunanets¹, Ostap Malynovskyi²

Information Systems and Networks Department, Lviv Polytechnic National University, S. Bandery Str., 12, Lviv, 79013, UKRAINE, E-mail: ¹nek.lviv@gmail.com, ²malostap@gmail.com

The aim of the paper is to analyze the aspects of digital libraries functioning in the formation and processing of their collections and providing access for the users.

The task of the paper is to present the main features of the formation of an effective digital libraries functioning to meet the information needs of users.

The object of study is the digital library as the main source of high-quality and proven information.

The subject of study is the features of the functioning organization of digital libraries.

Scientific novelty lies in the complex formation and outlining the ways to improve the processes and methods of a digital library effective functioning for relevant information service to users.

Scientific results of this study allow forming the practical approaches for an effective functioning of digital libraries in the processing of documents and providing them convenient to user requests.

The contribution of authors is a complex and system analysis of formation features of a quality functioning of a digital library, as well as identifying methods and means of providing the information services to users by documents in

convenient formats. The creation and establishment of digital library is an important factor in the implementation of the effective and qualitative changes in information and library services. It is noted that digital libraries provide a convenient access to scientific information using information technology. Also, it was emphasized that the basic processes in the digital libraries are associated with collecting, processing and providing access to information. The basic principles of organization of information service to users in an electronic library were considered.

Key words: electronic library, information technology, documents of information, information retrieval, digital library, information service, easy access to information.

46. Марковець О. В., Шенгера О. І. Інформаційне моделювання роботи канцелярії в органах державної влади

**SIMULATION OF OFFICE DEPARTMENT WORKFLOW
IN LVIV REGIONAL COUNCIL USING CONSOLIDATED RESOURCES**

Aleksandr Markovets, Olena Shenhera

Social Communication and Information Activities Department, Lviv Polytechnic National University, S. Bandery Str., 12, Lviv, 79013, UKRAINE, E-mail: san_markovets@ua.fm

Activities of state and local government related to documentation and organization of work with documents is one of the key factors influencing the course and outcome of the administrative process. The problem of efficient simulation modeling of institution office department workflow as a necessary component of government bodies operations plays an important role in ensuring adequate solution of key challenges of documents circulation in terms of dynamic changes in business processes and circuits of electronic documents processing. Using GPSS simulation system in the office of the institution allow to determine; the workload of one secretary; the time processing of an input document; the number of documents that the secretary can work out during the day; the need to increase/decrease the number of employees of the department and others. In order to achieve the maximum efficiency of the office, it is necessary periodically use simulation modeling methods, because it is the most multipurpose method of systems study and quantitative evaluation of characteristics of their functioning. Since, in the simulation modeling the dynamic processes of the original system are substituted by processes simulated in the abstract model, but complied with the basic rules of operation of the original. In the process of simulating are fixed the determined events and conditions or are measured initial effects, with the help of which are calculated the quality characteristics of the system.

The result of the simulation is ready to use consolidated information presented in a form of report obtained during the modeling by GPSS system, showing the necessary data for making decisions for the improvement of the office. Simulation in management will allow the employee at any level to predict the activity of the institution when exposed to various controlled and uncontrolled factors in the external and internal environment.

Key words: simulation modeling, department of office, consolidated resource, document circulation, GPSS, system modeling.