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“INFORMATION SYSTEMS AND NETWORKS” BULLETIN INFORMATION SYSTEMS, NETWORKS AND TECHNOLOGY

1. Астраханцев А. А., Вовк О. О. Аналіз ефективності вейвлет-перетворення в задачах прихованого передавання даних.

EFFICIENCY ANALYSIS OF WAVELET TRANSFORM IN HIDDEN DATA PROBLEMS

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The embedding of digital watermarks is gaining wide spread recently, and primarily allows to achieve a number of tasks in the field of protection of digital intellectual property.

Among the methods of hiding, the most prevalent are methods based on wavelet transform recently. These methods are popular because they do not introduce significant distortions into the images, have sufficient capacity and are resistant to a number of deliberate attacks and distortions in communication channels.

At the same time, despite the significant spread of such methods there are no recommendations for selecting the type of wavelet embedding region in the literature. Also the issue of comparative analysis of methods based on discrete wavelet transform (DWT) and the combined use of discrete wavelet transform and discrete cosine transform (DWT - DCT) are not disclosed. This work is devoted to solving these issues.

The most favorable terms of wavelet transformation in hidden data systems were evaluated in this work. To determine the optimal wavelet by the maximum criteria of hidden information with minimal image distortion Coiflet, Battle Lemanye, asymmetric Daubechies and Daubechies with minimal phase wavelets were analysed.

Scientific novelty is that for the first time the effectiveness of the use of different types of wavelets for secure data transmission were evaluated. Also for the first time the data about the wavelet transform subbands usage was acquired and the best type of wavelet were defined by the criterion of maximum capacity with minimal image distortion.

The impact of the message length on qualitative and quantitative characteristics of stego-container was estimated. The results showed almost directly proportional deterioration of performance with an increase in the size of concealment. The certain threshold size for embedded messages was determined.

Investigation of distortion of the message and the bandwidth depending of embedding method showed that the method of changing DWT coefficients enabled more sustainable performance, and embedding method based on double conversion DWT - DCT had advantages of individual winnings.

The effectiveness of different wavelets was rated and quantitative indicators for embedding in different wavelet decomposition areas were calculated for the first time. Studies have shown that various types of wavelets no clear relationship between themselves and behave differently with change indicators.

After researchs, quantitative calculations and comparative analysis of the most common methods was determined that the best results was shown by Daubechies wavelet with minimal phase and the changing the value of its coefficients allowed to find the best options into average values. As for the embedding region, the subband choice didn't make significant impact on the quality of concealment. It should be noted that these experiments was relevant exactly for these types of graphics, and embedding.

The practical significance of the results is to improve the efficiency of secure data transmission by using the proposed type of wavelets with specified parameters and determined embedding area.

Keywords – steganography, digital watermarking, wavelet transform, discrete cosine transform, embedding subband.

2. Басюк Т. М. Забезпечення процесу візуалізації даних у середовищі відкритих систем.

PROVISION OF DATA VISUALIZATION PROCESS OF OPEN SYSTEMS ENVIRONMENT

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Increased productivity of computer systems provides new possibilities for modeling a plurality of objects, the analysis of which requires processing large amounts of information. At present, the available hardware that perform information processing at the speed of several petabytes per second based on the computers with productivity of

dozens of Gflops. Given that, the withdrawal of such amount of information require the possibility of its transformation into specialized graphics, because in many cases the content is understandable only being visually represented.

The purpose of the publication is the development of software process of data visualization presented in the graphs form in open systems environment. When using standards of open systems the construction of specialized software for data visualization is to build profiles in accordance with the standards of open systems.

The study will provide means for constructing graphs on the plane according to known display criteria. In order to achieve this goal it is necessary to solve the following main tasks:

To analyze known methods of data visualization and determine their possible application in the study of the problem;

To develop methods for the transformation matrix view to the graph structures with the provision of display criteria;

To develop the structure of open information system of data visualization.

The results of the work done in its entirety solve an actual problem of software process of data visualization in open systems environment.

The object of the study – the process of constructing an image of the graph according to the display criteria.

The subject of the study – methods and means for data visualization in heterogeneous systems.

Scientific novelty lies in improving the method of placement of graph model points, whereby each point image line located from the center to borders with decrease of number of arcs of each point, which provides higher visibility of images; improvement methods of even permutations in which pairs of points within each row are being selected taking into account the number of arcs and the availability of mutual intersections that require few permutations that known methods have.

The practical value lies in the fact that on the basis of the developed methods the structure of software tool is based according to the standards of open systems, which helped ensure its functioning in a heterogeneous environment.

The structure of open data visualization system consists of two interacting parts: functional and object. The functional part includes applications that implement algorithms for data mapping and object part - ensure their implementation specified structure of open information system to allows determine the interfaces and interaction protocols between applications within the same system and between programs of two or more interacting systems. The fact that any information system can enter into a relationship with such entities, with the user and the environment is taken into account. Interaction with the environment is realized by a group of interfaces (EEI - External Environment Interface), which define interoperability of application with systems.

The author developed a methodological foundation for construction of support systems for decision making in the field of data visualization in accordance with formed visual criteria:

- the analysis of the known methods of visualization that showed lack of correct display of data generated adjacency matrix on a plane is conducted;
- the display methods of identification tags, the modeling of vertex distance between the plane of the screen and the location of the graph point with the provision of display criteria are developed;
- the structure of data visualization system according to the standards of open systems is developed.

Keywords – visualization, matrix, open system, ID tags, top graph, profile.

3. Василюк А. С. Интеллектуальный анализ структуры данных та математичного забезпечення редактора формул алгоритмів.

INTELLIGENT ANALYSIS OF DATA STRUCTURES AND MATHEMATICAL SOFTWARE OF FORMULAS EDITOR

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Objects of algebra of algorithms described as formulas that can be transformed, for example, to minimize, as well as replaced minimized and deploying algorithms formulas. This theory has specific features operations such as sequence, elimination, parallelling and cyclic operations are shown as special characters that are not among the known mathematical symbols. In order to simplify the process of editing a set of formulas and algorithms necessary to create a data structure and software of the formula editor algebra algorithms.

This article discusses the structure of data and mathematical formula editor software algorithms. Data structures and mathematical software tools for adaptation of formulas of algebra of algorithms, collapsing and expanding of formulas which depend on the geometric parameters and orientation formulas algebra algorithms. We describe hierarchical-modular model formula editor algebra algorithms. We describe the function module, the module generation of unitherns, module additional operations, system module and module of organisation of editor. These

modules are divided into initialization module editor module, help the user module, resource operations module, configuration of the operating field, conversion module, function module, the module information generation module of unitherns, module data editor module generation module objects and editing marks operations.

The data structure formula editor abstract algorithm describes options such formulas algorithms or unitherns: a unique identifier formula type of formula (sequence, elimination, parallelling, cyclic sequence, cyclic elimination, cyclic parallelling and unithern) identification of basic formulas abstract algorithm identifier first inserted formulas ID, the second formula, geometric parameters (coordinates) of the object, geometric parameters of upper and lower indices of unitherns, content of three components of unithern, the content indexes separator between the inserted formulas of unitherns, content of variable of unithern (for cyclic operations), unithern name, ID of unithern branch tree formula abstract algorithm, font type, color of sign of operations font color, type font style.

Another important aspect is synthesized and minimized mathematical formula editor software with an implementation adaptation processes, collapsing and expanding of formulas which depends of geometrical parameters and the orientation of inserted unitherns. The data structure is described in the connections between unitherns formula which in turn will track structure formulas to perform adaptation process formulas of algebra of algorithms.

Keywords – unithern, algorithm, mathematical model.

4. Годич О. В., Пасічник В. В., Прокопів Ю. О., Чайківський Н. Б. Фрактальні об'єкти як засіб уніформного проектування функцій інформаційних систем

UNIFORM APPROACH TO MODELLING INFORMATION SYSTEM FUNCTIONS WITH FRACTAL OBJECTS

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Significant number of enterprise software systems fail while still at the development stage or fail to deliver on their promise from the business perspective. Recognising the fact that this problem has multiple causes (e.g. organisational, requirement management), authors specifically emphasise the aspect of software construction, which has a significant influence on both the initial system development as well as the change support of the deployed system. Software construction should explicitly incorporate the domain ontology at all of its levels – design, language, coding, testing, integration etc. In order to achieve this, a relevant theoretical and practical framework is required.

Constructing reliable enterprise software systems remains one of the most difficult problems in Software Engineering. Our experience is such that from the engineering perspective this is attributed to an impedance mismatch between software architecture at the micro (objects) and macro (system components) levels, and from the utilisation perspective -- to an impedance mismatch between the business domain model and its perception by different system's stakeholders. We argue that these two factors are related, and can be resolved at the level of information systems architecture. Fractal Objects is an approach to software architecture with the domain orientation and holistic object-oriented architectural style at its core. It formalises a way for designing and provides technical means for constructing resource-oriented software systems with a transparent domain (ontological) model. The domain model transparency empowers all system stakeholders (including end-users and developers) to better utilise and support evolution of an enterprise software system.

This paper outlines the most important principles and technological innovations behind Fractal Objects. The use of Fractal Objects for implementation of active and informative functions is also presented. The uniform development model and architecture raise the conceptual level of programming, providing a way for software developers to concentrate on developing business solutions instead of dealing with low-level technical details. A complete application development life-cycle starting with creation of data structures and finishing with UI construction and deployment follows a uniform system of concepts, which is a critical requirement for a computing platform. The exposure and uniform use of the business domain model at both the development and user interface levels establishes a ubiquitous language for communication between software developers, domain experts and users.

This paper discusses a holistic approach that provides a domain-oriented way for implementing software systems specifically from a perspective of informative and active functions. Authors present core principles and an overview of the developed approach from the Enterprise Engineering Paradigm perspective.

Keywords – domain ontologies, information system architectures, information systems design, information systems development.

5. Гринчишин Т. М. Формування та цифрове опрацювання сигналів в комп'ютерних системах з відкритими оптичними каналами

**FORMATION AND DIGITAL SIGNAL PROCESSING
IN COMPUTER SYSTEM WITH OPEN OPTICAL CHANNEL**

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Clear atmospheric optical channel is an information environment in which the carrier signal is light. Compared with other types of communications, optical channel transmits data bandwidth and in accordance with the speed. The advantage FSO-technology is the lack of restrictions on the purchase of licenses for lasers in the atmosphere, as many radiation frequency of laser systems is far beyond the 400-600 GHz. Open Range optical systems directly depends on the optical signal propagation in the atmosphere and is, in the absence of noise, to 7 kilometers at a speed of reception and transmission to 622 Mbit/s.

For all devices used in a computer network that connected the optical system is not required additional communication protocols or changes/additions to these protocols. Transmission of signals in a wireless optical connection in the same way as in optical fiber systems. Differ only environment in which the beam spreads. Some models have laser modem interface to the Ethernet. The most important feature of wireless optical communication - a high degree of protection against unauthorized access channel. Making unauthorized interception difficult, as it requires precise orientation of the beam and use a unique model for each method of encoding information pulses of radiation. Further improvement of optical channels in telecommunication systems determines the relevance of developing new methods of transmission.

Architecture of modern computer networks with open optical systems studied and as a result found that such systems include the following four classes that are different parameters and system architecture.

High-speed distributed computer network is generally used for merging two remote networks that serve some distributed objects management. The most important requirement for such a network - the maximum transmission speed in duplex mode at relatively small distances between optical repeaters, not exceeding one kilometer. The main limitation of massive use of distributed networks is the high cost of equipment, equipped with powerful laser emitters.

Medium-speed distributed network organized in a ring relay architecture is promising for a wide class. The data transfer rate in such networks can be limited to 10 Mbit / s, and the distance between repeaters - 3km. The main limitation of the widespread use of open networks such as optical channels is tough climate optical devices operation, small size and low cost.

Ring and extensive low speed networks organized based on the scanned optical modulator provides self-tuning transmitter and receiver optical signals with large angular movements and linear modulator. This allows you to place such systems for high-rise buildings, towers. The main restriction on the transfer rate is the bandwidth of the optical modulator.

The special perspective of the development of multi-formation and cultivation methods multysignals.

Advantages of optical architecture that simultaneously using two lasers when transmitting data, solve the problem of eliminating the influence of multiplicative noise in optical channels.

The distributed computer networks based on open optical channels are well adapted to provide the information distributed geographically remote and special OC, so the solution of problems of their creation should be settled promptly investigate problems OC as sources of information and the development of information models.

The feature background of the biopsy channel of communication is the realization of the principles of differential reception signals. To implement such an optical system data be taken into account attenuation of optical signals in the air, which has an exponential character.

Theoretical background of the biopsy signals in a uniform atmospheric environment can establish Compensation multiplicative noise caused by atmospheric phenomena and alignment accuracy of information signals. Solving this problem allows the use of optical signals at the differential receivers, which significantly increases the speed and range of information transfer in the acceptable probability of errors in communication channels.

Key words – optical channel , optical active repeater (UAR) , distributed computer network (RCM).

6. Грицик В. В. Базові системні структури синтезу систолічних систем опрацювання даних в реальному часі

**DATA PROCESSING SYSTOLIC SYSTEMS SYNTHESIS
IN REAL TIME TASKS IS RESEARCHED**

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The basic system structures of synthesis of complex computer systems for the implementation of information-analytical systems in real time tasks are studied in this paper. Namely, hardware-based video streaming method, the method of determining the classes of functions that allow parallelization and the method of synthesis of parallel data processing are described.

The main (conveyor) processing of information method in general is studied. The concept of pipelines (conveying) information processing is summarized in the article. The concept of associative processing information is described in this work.

Author shew parallelization for data parallel processing systems algorithm and proposed an approach to the synthesis processing elements as tier-parallel form. Article contains:

- A systematic approach to computer vision data processing is proposed.
- Considered parallelization processing of information in the synthesis of complex systems of data processing at level of tier-parallel structures algorithm for the main methods of data processing application in implementation process. This approach makes it possible to configure the system for implementation of tasks in a given mode processing of incoming data. It is important to choose the major operators that allows realize system configuration in this approach. Studied and the method of synthesis of parallel processing configuration data. The basic operations and transactions cascade connection (“o”), parallel connection operations (“+”) and inverse operation circuit connection (“F”), which are the basis for the synthesis and implementation of complex description language systems are proposed and studied.

- The classes of systems were defined and proposed algorithms for parallel synthesis and data main processing. There are a some of examples.

- Using the proposed method of thermal recording of functioning of data processing systems, author have shown the possibility of implementation of problem-oriented and specialized structures for are problems of artificial intelligence in real-time processing.

- the method of synthesis of functional description and configuration of the most common data processing are investigated and shown capabilities to implement complex systems such nanostructures.

1. The concept of the algorithm in terms of computational functions and explored the possibility of parallelization process of functions calculation regarding the functions of a given class.

2. The properties of the thermal representations of various computing functions obtained by operators in superposition and primitive recursion relatively parallelization processing information in their terms are studied. Thermal representations of primitive recursive functions can be parallel calculate relatively functions belong to a given class are received in the paper.

3. Classes of algorithms that allow deep parallelization of processing of information are studied. The classes of algorithms that allow trunk circuit processing of information are defined. They can be effectively implemented on systolic structures, homogeneous environments.

4. An thermal representation, which is the most generalized concept of hierarchy and meet parallelization algorithms on different levels are received. These structures represent inherent to the algorithms by which to describe any “chain”, branched physical and natural processes and tasks and data processing algorithms for computer vision are received too.

Keywords – paralleling synthesis algorithms, data processing, uniform computing environment, providing real-time, Impact of parallel information technologies.

7. Камінський Р. М., Нич Л. Я., Шаховська Н. Б. Формальне подання діяльності користувача з виявлення інформаційно-значущих об’єктів

**FORMAL PRESENTATION OF USER INFORMATION
WITH DETECTION MEANINGFUL OBJECTS**

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The main direction of the article is to build a mathematical model of intellectual activity guide when searching for information and meaningful objects to solve specific problems.

In information retrieval systems of human interaction - the computer is a specific combination of mental and physical and functional characteristics of man and opportunities of modern computer technology. The purpose of this interaction is to find the right information in distributed databases and the Internet, as well as local and special

libraries and repositories data. In problems of finding information and documents from important objects in particular to the specific and original task, the main role belongs to the user. First of all it is the correct wording of the request, as well as the selection of relevant and pertinent analysis of the documents received in issue.

User Activity formally presented as a set of mathematical models, including cognitive model of the user obtained from the search documents. The structure of this activity has three components: query formulation, analysis of the documents and the decision. Each component is represented by the relevant model in terms of set theory. Together, these models describe the search process, taking into account the main points of user interaction and information retrieval system.

In addition, separate user activity considered as functioning dynamic system proposed model and cognitive analysis of the results by the user, which is based in the partition of documents received three subsets: relevant, pertinent and not relevant documents.

This article presents the results of experiments with different search engines. Tests were carried out with such information and search engines: Google, Yandex, Aim, Rambler, Yahoo. For this same query was used in each of these systems. The results showed that different search engines give different ratio between the number of documents with important information and all the objects obtained at issue, found in the search.

For the evaluation of information search Simple expressions, such as: the ratio of relevant and pertinent documents to all received.

Thus, the proposed approach and the mathematical model of user interaction with intellectual information retrieval systems are new research results, and the results of experiments and assessment methods derived in issuing with substantial practical value.

Keywords – information system, information retrieval, search activity, pertinent, relevance, user model, cognitive process, intellectual activity.

8. Козлов П. Ю., Висоцька В.А., Чирун Л. Б. Сучасні технології управління Web-ресурсами в інформаційній системі аналізу сервісу цифрової дистрибуції

MODERN TECHNOLOGY MANAGEMENT WEB-MEDIA RESOURCE SERVICE SYSTEM ANALYSIS DIGITAL DISTRIBUTION

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Information technology are developing in all spheres of life and activity. The Internet opens many new opportunities in the field of business: e-shops in high demand. Creation of information system for service digital distribution profitable content producers and companies that deal with distribution. The big advantage is that digital distribution service can operate around the clock, seven days a week. Virtual space is unlimited and you can place any number of goods.

In the digital distribution service is appropriate to improve the look of the store design and ease of use. The most effective research in this area can be considered not improve the technical side of the service, and, for example, sociological research on the field of use of services and benefits users in some questions about the service, which also conveniently combine work-service, integrating some polls on the website store.

Research purpose is an analysis of digital distribution services, viability and efficiency of these services, their differences from conventional stores and from online stores other types. The main objective is to develop an information system that will be the primary means for user interaction with the shop. In the article the new feature accurate selection of content for the sentiments and wishes of the user based on surveys, reviews and personal data of users for the selection of books.

The system differs from existing greater complexity, breadth and number used criteria analysis. Put rate matching found the product user request, as determined by the analysis of user data and content characteristics for the selection of goods for the needs of the user. The system should have a simple interface and easy management. Further changes can implement mechanisms unique data, organize a number of security measures to register the agreement using the product with the user, develop rules for use of the service users, develop a system of chat and correspondence.

Electronic store (digital distribution service) must be “friendly” on search engines. This will help reduce the costs of promotion and advertising. Ease of navigation and intuitive catalog - the main road to successful sales, because not every buyer will want to spend much time figuring out the system. A characteristic feature of the online store is full automation of order processing system, allowing you to work individually with each client registered. For practical purposes completely rather choose the payment systems and register them.

The majority of information systems have a set of organizational and technical means for storing and processing information in order to provide the information needs of users, providing search, collection, processing and transmission of information. They differ by the presence of certain features, information transfer protocols, design, means and methods they were implemented, the rules of their use, so use policy.

The main disadvantage is the complexity of the use of the new service users who are not familiar with this type of receiving services. There is a large accumulation of features and functions that can complicate use. The interface of these services are not always user friendly.

As a result, the definition of methods and means of solving the problem was carried out review, analysis and study of selected methods and means - namely selected platform (operating system), made the choice of programming language and integrated development environment tool to visually design databases. The algorithm of search products by desires and moods user selected sorting algorithms and encryption. As a means of creating and managing databases was chosen DBMS MySQL. In developing the chosen strategy of development of existing product related services, as there are products on the market-counterparts.

Keywords - information resources, commercial content, content analysis, content monitoring, content search, electronic content commerce systems

9. Кучковський В. В., Висоцька В. А., Нитребич С. З., Оливко Р. М. Застосування методів інтернет-маркетингу для аналізу Web-ресурсів в межах регіону

**APPLICATION OF INTERNET MARKETING METHODS
FOR WEB-RESOURCES ANALYZING WITHIN THE REGION**

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Active development of the Internet has increased the need for operational data production/strategic design and implementation of new forms of information services. Documented information prepared in accordance with the needs of the users of an information product or commercial content, and the main object of processes of electronic content commerce. Issues of design, creation, implementation and maintenance of electronic content commerce system (ECCS) is relevant, taking into account such factors as the lack of theoretical justification of standardized methods and the need for the standardization of software tools to process information resources. There is a mismatch between the methods and means of the processing of information resources and the principles of ECCS. A practical factor in the processing of information resources in ECCS linked to the problem of growing volumes of content in the Internet, the rapid development of electronic business, the rapid spread availability of the Internet, expanding the set of information products and services, the demand for commercial content. Principles and techniques of electronic content Commerce is used when creating the online stores (selling eBooks, Software, video, music, movies, picture), systems on-line (Newspapers, magazines, e-learning, publishing houses) and off-line distribution of content (copywriting services, Marketing Services Shop, RSS Subscription Extension), cloud storage and cloud computing. Work in this area is the world's leading manufacturers of means of processing of information resources as Apple, Google, Intel, Microsoft, Amazon. The theoretical factor processing of information resources in electronic content Commerce is associated with the development of methods and means of formation, management and maintenance of content. In the scientific papers of D. Lande researched and developed mathematical models of electronic information flows. G. Zipf proposed an empirical law distribution of word frequencies in natural language. In the works B. Boiko, S. McKeever, A. Rockley described the life cycle of content. J. Kaiser, Glaser, H. Lasswell, Holsti O. methodology of content analysis was founded and developed. EMC Corporation, IBM, Microsoft, Alfresco, Open Text, Oracle and SAP have developed specifications Content Management Interoperability Services for Web services interface that enables interoperability between content management systems e-business.

The aim of this work is to develop methods and software tools for the processing of information resources to improve the efficiency of electronic content commerce through the increased sales volume of commercial content.

The studies were conducted according to the plan of research works of National University "Lviv Polytechnic" in the framework of the state budget theme "Development of methods, algorithms and software for modeling, design and optimization of intelligent information systems based on Web technologies "WEB" (number of state registry. 0102U001171). The study is part of research projects of the Department of Information systems and networks of National University "Lviv Polytechnic".

The content has several interpretations according to the direction of application. In the field of computer science content is information create content (e.g., texts, graphics, multimedia) information resource; the set of all values and quantities, which operates an information system; some generalized notion of data without predetermined patterns. Accordingly, the information resource is a collection of structured and/or unstructured arrays of content in the information system, for example, libraries, archives, repositories, collections, websites, handbooks, dictionaries, banks/bases/data warehouses, systems e-commerce etc.). The market of content distribution provides the technological process of preparation of the operational content available through information resources and dependent on perception, display, conservation of its values. To study and solve a range of tasks moderators information systems formalize, analyze, format and structure the content. Structuring process is the definition of a unit of content, methods and the order of their combination with each other and the formation of large content items from small. Formed the content entered in database/data warehouse, where determine its direction and subject matter, for example, electronic

publications with a large coefficient of demand from visitors and users of the information resource. Structured content is concentrated, for example, in ERP/CRM and unstructured content in e-mail, working papers of arbitrary format and tools to ensure teamwork and stored, for example, ECMS.

Content lifecycle is a complex process, which passes the content while driving through different stages or phases of a publication with a set of properties, such as collaboration, records management, digital assets, and for other various IT. Existing toolkits for e-Commerce gives the administrator or the moderator system various options for management of content (form, formalize, organize, add, edit, delete), but not solve the problem of automatic processing of information resources. Therefore, for the implementation of the life cycle of content, you need a Toolkit that implements the automatic processes of formation, administration and support of content. The content is characterized by the time of renewal or modification and has a set of specific properties. The amount of content measured in units of the amount of information (bits/byte). The quantity and quality of content describing the degree of user's interest in information resources, where he placed.

Web content is the content, text, visual, audio or a part of the experience of the medium. Economic content is an element of the economic activity of the subject of the e-business. Content market on the basis of the Internet with the it knowledge management are the means that contribute to the functioning of e-business with the proliferation of commercial content and the growth of its profitability for the subjects of e-commerce.

Commercial content is the object of purchase/sale between the participants of e-commerce, for example, information blocks, which are divided into syndicates (exchange rates, weather block), other announcements of topics/resources (with reference), reference information (holiday dates, event announcement, timetable), entertainment information (the joke of the day), advertising, buttons and links media partners, the statistics button. Managing business processes is an important stage in the life cycle of commercial content. To determine the relevance/accuracy of commercial content (the latest information on a particular issue) it is necessary to clearly manage business processes through workflow (automation processes control the flow of work in information systems).

E-Commerce is a special case e-business, for which commercial content is a valuable asset. For fast business growth account effective policies e-Commerce: protection of intellectual property; interactive trust (protection and privacy of content); free/open trade; active investments in its infrastructure.

1. All forms of trade goods/services through electronic means, including the Internet, which gives you the opportunity to develop new markets, but the question of information security and intellectual property that solves Digital legal management.

2. A wide range of interactive methods of conducting the delivery/sale to consumers of goods/services.

3. Any form of business transactions, where the parties interact through it, and not in the process of physical exchange/contact. For example, an electronic data interchange, EDI – a set of processes for creating, processing, managing, transmitting, receiving, storing, use and destruction of content, which are carried out with integrity and with confirmation, if necessary, of the fact of its receipt.

4. The use of electronic communications and technologies, the electronic data to establish and modify relationships, value creation between organizations and individuals.

5. Doing business online in the following areas: direct sales of goods and services; banking and billing (payment system); the safe placement of content; corporate procurement.

To implement ECS is difficult because of such problems as cost, value, safety, interoperability. The Internet provides alternative and complementary way of doing e-business, but ECS must be integrated with other systems to avoid duplication of functionality and maintaining their applicability, current work and reliability. When the ability of the ECS to automatically share content business reaches reduction of cost, improved performance, and increase agility-chains of added value.

The system of electronic content commerce, ECCS is an information system automated support of processes of processing of information resources e-Commerce and promote the commercial content in global markets.

Prospects of development of ECCS due to a combination of economic, social, technology, legal factors, significant among which are the multifunctionality of the Internet; economic liberalization and the globalization of the economy; organizational and technical availability and economic efficiency of e-commerce for market participants. Depending on the range of content, level of information technology, status, way of creating ECCS divided into universal/specialized/ independent/niche; the elements of traditional publishing; corporate, private and rented. Content is an important factor of reference e-business with such features: a significant increase in the demand for content; the introduction of a fundamentally new technology through the rapid development of e-Commerce; the rapid expansion of the software to create SICK. The number of content streams is considerably greater than the movement of goods in industrial enterprises.

The consumers of content satisfy the information needs in these ways: visit the information resources or database/data warehouse; periodically receive content by e-mail; connect to specialized systems/networks. Among the tasks of providing content highlight the insolvency of debtors, increased cost, minimization of tax payments, sales of products on the market. The main areas of research is the improvement and development of methods of improvement and strategic planning e-business; introduction of quality management systems, personnel and contentname flows and technologies of e-Commerce. Content consist of easily formalized and automated procedures.

The core of the process of content sharing is ECCS. Processing of information resources in ECCS is a powerful and effective means of conducting e-business. ECCS is the main effective tool of e-commerce to implement practically any operations on the resource through a user-friendly interface. Information resource in ECCS is the link between users and the system. Administration system provides processing of information resources in ECCS (settings routines, administration of users/groups, management communication). ECCS mounts to information resources in a variety of applications, such as advertising, search engine optimization and special programs.

Internet marketing involves the use of strategies and directions of traditional direct response marketing and special areas of research that apply to e-business the Internet space. Internet marketing is not only the trade of content, but also information space, software, business models and so forth. Google, Yahoo, and MSN lifted to a new level and have segmented the market of Internet advertising, offering e-business services for local advertising. Through automation of the process of audience research is increasing, and costs are reduced. The number of streams of content more than the movement of goods in industrial enterprises. A major proportion of the content consists of easily formalized and automated procedures. The main problem is the lack of a common approach to process modeling, design and development of electronic content Commerce.

This article presents the content analysis techniques for online newspapers. The model describes the processing of information resources in content analysis and simplifies automation technology of content management. In this paper the basic problem of the syntactic and semantic analysis of content and functionality of content management services is analysed. The fast growth of global networking and online content-commerce simplified process of publishing and moderation of articles. As a result Marketing Intellectual System for Online Publishing was proposed. The article discusses the development of unified methods and software tools for processing information resources in the Internet systems. A new approach to application and implementation of business processes is formulated for the construction of these systems. The methods of content and information resource processing are developed. Software tools for content processing are developed.

Keywords – content, information resource, content analysis, business-process, content management system, content lifecycle.

10. Кушнірецька І. І., Кушнірецька О. І., Берко А. Ю. Проектування системи динамічної інтеграції слабоструктурованих даних на основі технології Mash-Up

DESIGNING THE SEMISTRUCTURED DATA DYNAMIC INTEGRATION SYSTEM USING MASH-UP TECHNOLOGY

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This paper describes the process of designing the semistructured data dynamic integration system using Mash-Up technology.

The aim of this work is the usage of research analysis of functioning, construction principles and main features of dynamic data integration Mash-Up systems in order to describe the process of designing the semistructured data dynamic integration system using Mash-Up technology, to develop of recommendations for the creation of such systems and semantic processing of information resources in such a system.

The relationships between the functional and operational requirements for systems integration and different areas of architecture, such as application systems and technology architecture have been considered. Functional requirements describe value that the system has in terms of implementation functions of the organization (business value). Operating (or operational) requirements to a software system specifies aspects such as reliability, manageability, performance, security, and interoperability. The technological architecture is the architecture of infrastructure of hardware and software that provides the application and implementation of operational system (not functional) requirements submitted to the architecture of application systems and data. It describes the relationship between the structure and used technologies and how these technologies ensure compliance with operational requirements of the organization. The functional requirements to dynamic data integration system based on Mash-Up technology have been developed, which are depicted using Use case diagram.

Using the method of determining the structure and content of the received input information is designed Shares and Discounts Mashup - search system of discount on the purchase of good, service provision, and so on. The system performs automated mapping information stored in heterogeneous web-information systems that are integrated in the ontological model that is later used to search information resources according to the user's query. Implementation of the system of semistructured data dynamic integration in a web-system is a set of completed modules that can be used to build other systems. Input data of the system of semistructured data dynamic integration based on Mash-Up technology Shares and Discounts Mashup is a source of information resources, which the has system access and the user's query. The user sets the request and receives a response to it in the form of a mashup of information resources available sources that match user's query.

According to the method of determining the structure and content of the received input information the algorithm ontological models construction of all integrated systems has been proposed. Using the method of determining the structure and content of the received input information the algorithm of information resources getting from the integrated system has been proposed. The architecture and functional principles Shares and Discounts Mashup system of semistructured data dynamic integration has been considered. Information system architecture is a concept that defines the model structure, performed functions and relationship between components of information systems. When designing the system interface the ergonomic properties, simplicity and compactness display on the screen, easy access to major modes of system control, ensuring of reliable operation of the system have been considered.

The object of research is the process of designing the semistructured data dynamic integration system using Mash-Up technology. The subject of research is the usage of the method of determining the structure and content of the received input information and Mash-Up technology for designing the semistructured data dynamic integration system.

Scientific novelty and practical value are in the usage of the method of determining the structure and content of the received input information and Mash-Up technology for designing the semistructured data dynamic integration system.

Keywords – dynamic integration, Mash-Up technology, Mash-Up system designing, Mash-Up system architecture.

11. Лур'є І.А., Осипенко В.В., Литвиненко В.І., Таїф М.А., Корніловська Н.В. Гібридизація алгоритму індуктивного кластер-аналізу з використанням оцінки щільності розподілу даних

HYBRID ALGORITHM FOR INDUCTIVE CLUSTER ANALYSIS USING DENSITY DISTRIBUTION DATA EVALUATION

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The problem of clustering - a special case study problem without a teacher that comes down to splitting the available set of data objects into subsets so that the elements of a subset of significantly different properties set on some elements of all other subsets. There are many different algorithms for clustering. Some of them share set in advance a certain number of clusters, some automatically choose the number of clusters.

Алгоритм DBSCAN (Density Based Spatial Clustering of Applications with Noise - щільнісний Algorithm DBSCAN (Density Based Spatial Clustering of Applications with Noise closeness algorithm for clustering spatial data with the presence of noise) algorithm with automatic selection of the number of clusters. It is based on the assumption that the density of cluster points inside than outside the clusters. This algorithm allows to find clusters of arbitrary shape. The algorithm was proposed Ёster Martin, Hans-Peter Kryhel and colleagues as partitioning solution (first spatial) data on clusters of arbitrary shape. Most algorithms create clusters that form close to spherical, so to minimize the distance of objects from the center of the cluster.

Authors DBSN, experimental showed that their algorithm is able to recognize clusters of different shapes. The idea underlying the algorithm consists in that within each cluster there is a typical density of points (objects), which is considerably higher than the density externally the cluster and density in areas with lower noise density of each of the clusters.

In the article analyzed the advantages and disadvantages DBSCAN algorithms and inductive cluster analysis. Has been proved that the use of homogeneous techniques to solve complex problems do not always lead to success.

Combining different approaches can circumvent the shortcomings inherent in each separately. Hybrid algorithms typically consist of various components combined in order to achieve the goals. Integration and hybridization of different methods and information technologies can solve complex problems that can not be solved on the basis of any specific techniques or technologies. In the case of the integration of diverse information technologies should expect synergy effects of a higher order than the union of different models within the same technology.

The comparative experimental research with other clustering algorithms that proved the high quality of the developed hybrid clustering algorithm.

In this article a new clustering technique was proposed, which is based on two methods: density algorithm DBSCAN and inductive objective clustering algorithm. Experimentally proved that the combination of two these methods can solve the problem of recognition of clusters of different nonlinear form, and greatly increase the accuracy in the detection of complex objects.

Keywords – Density-based spatial clustering, DBSCAN, objective clustering algorithm, inductive methods of self-organization models, GMDH, hybrid clustering methods.

12. Мельникова Н.І. Особливості опрацювання медичної інформації для систем підтримки прийняття лікувальних рішень

**SPECIFICS OF PROCESSING OF MEDICAL INFORMATION
FOR SYSTEMS OF SUPPORT MEDICAL DECISION MAKING**

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The article have analyzed the main approaches to the processing of personalized medical information for medical decision making and as a tool of implementing its have proposed the system of support medical decision-making, the architecture of this system and have done the analysis of the results. Here presented the main stages of analysis of medical information by tools of medical decision support solutions. That enables the decomposition of control process and describes the relationship between management of streams and detalisation of sequence of using of methods of presenting data in the system.

Experience in the use of information systems in medicine based on knowledge, makes it possible to argue about the prospects of intelligent systems for the development of medicine. Processing of many factors and the complexity of the process of interactions in the decision making medicine, where decisions are often based on statistical studies, so applying intelligent information systems is extremely difficult. The situation reinforces the lack of standardization of terminology, format the scales of measurement. Medical information systems are nowadays more versatile, but they do not provide a personalized approach when processing medical information. Currently existing methods of representation of medical knowledge is not enough flexible in making decisions in solving this class of problems. Intelligent decision support systems that assist physicians in the tasks of selecting option of treatment destination today is the least illuminated branch of artificial intelligence that creates the basis for further research in solving this problem.

Based on existing mathematical tools being developed expert systems, which are aimed at processing received data or their representation in the form of spectral characteristics of results, maintaining a database of patients and others. Existing expert systems generally based on models of knowledge representation using semantic networks, which established a hierarchy of inheritance. Support decision making using semantic networks is realized through the relationship between elements, however, they contain the menace of appearing contradictions. The aim of systems of such kind was to study strategies of medical diagnostics, based on psychological and functional models of disease. A major disadvantage of such systems is complicated process explanations of their decisions.

For conducting scientific research is carried generalized and statistical analysis of results of collecting and processing information about the patient's condition. Working parameters common determines the character of condition of the patient medical care and medical decision-making on correction of treatment. There is a need to define a single algorithm description of patient's condition and the appropriate structured description of its characteristics, which in volume of information having the quality features that evaluate the patient's condition is subjective. Implemented processing of patient's parameters as input signals that have the influence on the results of output signals and determine the presence of internal states of system. Based on this a model of systems of support medical decision making can be represented based on the concept of Mealy automata theory, confirming the existence of the function outputs depends on the set of system states and input signals as patient's parameters.

The processing of medical information should include the main stages involving application: theory of finite Mealy machine for processing and analyzing incoming information and determine state of the patient at a time, which makes it possible to correct treatment by assessing the current state of the patient and determine the weight of the outputs MLS2 - machine, namely weight therapeutic schemes; theory of decision tree for considering relationship between input parameters and evaluation function, the values of which are crucial when choosing a personalized scheme; requirements of ISO 14155: 2011 on the formalization of quality indicators that are derived from expert evaluation and make it possible to improve quality of medical decisions when choosing a treatment strategy based on the definition of their impact on of a comprehensive criterion of patient's state. Symbiosis application of the proposed approaches to medical data processing is a system of medical support decision-making that take into account particular features of personalized incoming and outgoing information.

Keywords: support decision making system, treatment expert system, architecture of information technology.

13. Микіч Х. І, Буров Є. В. Методи подання та опрацювання знань у системах зі ситуаційною обізнаністю

**METHODS OF KNOWLEDGE REPRESENTATION
AND PROCESSING IN SYSTEMS WITH SITUATIONAL AWARENESS**

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This article describes and analyzes the concept of situation awareness as part of a decision support system. Situation awareness is a key element in decision support systems. In most cases, if the situation is properly evaluated, it automatically determines the sequence of actions you want to initiate.

In current conditions, characterized by ever more development and implementation of intelligent systems, including the Internet of Things (IoT), the task of achieving situational awareness modified with decision support software provider to completely autonomous decision-making intelligent system in a dynamic environment. Solving this problem needs a deep study of existing and development of new principles and methods formalization of knowledge for problematic situations, models of their processing, creating organizational, informational and software-related decision support. All these factors indicate the topicality of the work.

The aim of this work is to analyze existing methods and tools for situational awareness and identify areas of their development taking into account the problems of building autonomous intelligent systems.

Analyzed and formalized the concept of situation because it is not possible to conduct analysis and reach a correct understanding of the concept of situational awareness without analysis of the concept of the situation.

This article describes the theory of situations (Situation theory as a mathematical theory of meaning (semantic theory), where the behavior of the agent is determined and depends on a set of situations. For the mathematical representation of situations in semantic theories Barwise offered infons (discrete information elements).

The large number of scientific articles devoted to issue of situational awareness led to a different interpretation of the meaning of the term. Various authors interpreted situational awareness as a structured set of data, process, or product. To avoid such ambiguity was proposed for the process of getting situational awareness to use the term "Situation assessment" and for the product of this process - the term "Situation awareness". To determine the components of situational awareness and its place in the process of solving cognitive tasks was developed a number of models "Situation awareness". This article describes Endsley model, and Fusion Model.

For operation of the system that performs the functions of SAW, is necessary to be based on a specific domain model. One way of building this model is the using of ontologies. Before using ontology models were built for each domain separately. It was inconvenient to modify the system and re-use knowledge of the situation. This caused the feasibility of using ontologies.

It was reviewed and made comparative characteristics of four upper ontologies relevant to the evaluation framework, as there are only a few upper ontologies originating from the area of situational awareness, and approaches from the field of contextual awareness.

Basic ontology that has the ability to adapt to different subject areas was described.

Keywords- situation, situational awareness, core ontology, framework.

14. Пасічник В. В., Артеменко О. І., Попик І. В. Геоінформаційні технології, зорієнтовані на потреби різних груп туристів

**GEOINFORMATION TECHNOLOGIES FOR VARIOUS
GROUPS OF TOURISTS TRAVEL SUPPORT**

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In this paper the analysis of researches and developments of geographic information technologies for tourist's decision support was provided. The necessity for development of geographic information technology tools was proved to provide personalization, optimization and support for tourist in all phases of their travel using mobile technologies of combined with GIS functionality.

The tourism industry has quite a lot of research and application problems in the solution of which it is necessary to decide on the relative position of objects in space, routing, determining their length and complexity, optimal route selection etc. Modern analysis of facilities spatial distribution based on the use of geographic information technology (GIT).

The main tasks solved with the help of travel GIT are: creation of electronic versions of popular tourist destinations; definition of tourist's location, facilities, vehicles, etc.; forming of a tourist's route; maintenance of tourist travel; trip planning; virtual tourism, 3-D versions of tourist sites; thematic digital maps; dissemination of

information on touristic facilities; analysis of tourist flows and spatial distribution of tourism resources; search diverse information in the field of tourism.

Different categories of tourists can use a variety of GIT at all stages of the trip:

- During preparation for the trip using GIT one can search data on touristic services, destinations, tourist infrastructure facilities; make planning a trip routing.
- When traveling with a mobile tourist application based on GIT are available options such as location tracking, search tourist facilities, maintenance and adjustment tourist route.
- After traveling touristic GIT allow you to perform data analysis on tourist flows, the formation of reviews and evaluations, the exchange of experience (in many mobile applications are tools for creating voting and rating the quality of services, etc.).

Trends that trace the markets of travelling information technologies identify personalization and information-technological support for tourist at all stages of his journey, information and cognitive tourism thematization and adaptation to individual wishes of its financial and tourist opportunities as main directions of development.

At present, the information technology market gives no touristic GIS, which could be equally effective to provide information support and accompany tourists in different regions of the world. As a result of the analysis a number of problems that can and must be effectively and comprehensively implemented with GIS tools can be highlighted. These include in particular: the picking of the tourist's route; maintenance and tourist's navigation on the route; adjusting the route to the current location of the user and his chosen mode of transport; the optimal selection of transport (route number for public transport).

One should note the relevance of creating an integrated system using GIS tools to promote tourist at all stages of his journey, which should include:

- details of touristic and other facilities location;
 - thematic information about the type and characteristics of various infrastructure facilities (dining, accommodation, entertainment, service departments, etc.);
 - selection of infrastructure facilities for the tastes and wishes of the user;
 - augmented reality in the form of 3D-models of streets, buildings and other facilities;
- presence of digital maps, additional information as text, photo, video and audio materials.

Keywords – tourism, GIS technologies, tourist, recommendation system, mobile application.

15. Пасічник В. В. Савчук В. В. Інтелектуальна система “мобільний інформаційний асистент туриста”: функціональні та технологічні особливості

INTELLECTUAL SYSTEM “MOBILE INFORMATION ASSISTANT OF THE TOURIST”: FUNCTIONAL AND TECHNOLOGICAL FEATURES

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The main objective of the article is to present general description and statement of purpose, content, functional and technological features of software and algorithmic complex that implements the concept of intelligent system “Mobile information assistant of the tourist”, developed by scientists from the National University “Lviv Polytechnic”.

About two-thirds of today's tourists use information technology to plan and support their journey, while a significant part of them using mobile computing devices and telecommunication devices [3], this in turn generates the need to create good quality mobile travel information technology to provide the user a wide range of appropriate information-technology services for the full planning, maintenance, support and analysis of a travel-based integrated full-featured software and algorithmic application, implemented on a mobile platform.

The aim of the project “Mobile information assistant of the tourist” (MIAT) is the development of innovative endowed with the intellectual features software and algorithmic complex aimed at IT support of the tourist at all stages of the trip (before, during and after its implementation).

In the work the basic problem situations that arise in the process of creating intellectual information system of this class and methods and ways to overcome them are presented and analyzed. The formal description of the project MIAT is presented in notation UML, information on the status and prospects of developed modern mobile information applications oriented to the needs of tourists are also presented.

The authors have identified a number of essential functional features of the system MIAT, and have formed the basic requirements for the methods and means to be used in its design and algorithmic implementation.

The authors designed the system architecture and its “engine”, identified the role of the main classes of users described and depicted process of user interaction with the system depending on the purpose.

The main users of the system are tourists, so there will be a possibility to support family and group tours, taking into account the individual characteristics of every traveler.

The system will has very complex and extensive architecture and require considerable technical and information resources. Its main components are the database and knowledge base, navigation mode and “audio guide”, planning travel routes, virtual tourism mode, augmented reality mode, budget calculations, generating

recommendations for choosing a tourist destination, booking or reservation of accommodation and transport etc.. The proposed structure will generate good quality and up-to-date recommendations to the user to support him at all stages of the trip. All the components are generally described in the article.

The proposed implementation of the processes of tourists interactions with the system aims to make MIAT system easy to use by simple and advanced users of mobile applications.

According to the study the following resources will be needed for the implementation of the system MIAT: a mobile device with access to the Internet, and powerful GPS antenna and a server with a storage capacity of more than 1 TB.

Considering the presented project of the system the development of algorithms of the system is among the priority tasks facing scientists from the National University "Lviv Polytechnic". Such algorithms are: the scheduling algorithm optimal personalized route algorithms generate personalized information, calculate the exact user's location based on data from GPS, GSM, WiFi and images obtained by the camera device, automated generation algorithms tour diary, navigation, calculating budget travel, etc.

Keywords – tourism, trip and route planning, information and technological support, tourist mobile applications, information systems, designing information systems, intelligent information technologies, decision support systems.

16. Приймак М. В., Маєвський О.В., Мацюк О. В., Шимчук Г. В. Моделі та інформаційні технології дослідження стохастично періодичних потоків

MODELS AND IT RESEARCHES OF STOCHASTICALLY PERIODIC FLOWS

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Some questions of stochastically periodic flows are considered in the article, connected with creating of their models and with statistical research methods. Attention is paid to principal difference in acquiring of experimental data for caring out of statistical analysis of Poisson flows from one hand, from the other one – stationary or periodically correlated processes: increments of their realization on some time intervals are used for the flows; for stationary or periodically correlated processes the values of the realizations are used. Taking into account this feature of the flows, from the variety of Poisson periodic flows it is proposed to separate some classes of the flows, that have "simplified" forms of periodicity of intensity, which allow working out the methods for the construction of assessment of their intensity. In this direction Poisson periodic piecewise stationary and piecewise linear flows are separated, which may be used as models of many real stochastically periodic Poisson flows. For setting periodically piecewise stationary Poisson flow it is necessary to set its period, intervals of the stationarity of the flow during the period and values of the flow's intensity at these intervals. In the case of piecewise linear flow, it is necessary to set the period, intervals of linear alteration of the flow's intensity and the linear functions of this intensity. Depending on which parameters for these flows are known and which are not, proper problems of mathematical statistics for their assessment arise. For periodical piecewise stationary Poisson flows some of the problems have been formulated, which may arise in engineering practice. For one of such problems, when the period of the flow and the intervals of the stationarity are known, assessment of the flows' intensity is built on these intervals. For the assessment the elements of the assessment of the expected value of stationary and periodically correlated random processes were used.

As to the flows with limited aftereffect, it is known that they are defined as the sequence of random intervals (gaps) of time between two adjacent events of the flow. Herewith each interval of the flow is defined by proper function of the distribution. For recurrent flows, as subclass of the flows with limited aftereffect, all the flow's intervals are equally distributed. But for such setting the flows with limited aftereffect there was not possible to consider their stochastic periodicity. For realization of this possibility there was introduced new type of random processes – interval flow (process). For traditional defining of the flow with limited aftereffect function of distribution of its intervals is set in discrete time moments of appearing of the flow's event, but interval flow with some its modifications will let us to define the distribution function of the intervals in any moment of the time axis. In this work the partial case of the interval flow is considered – recurrent interval flow. There are defined two partial its cases – stationary recurrent interval flow and periodic recurrent interval flow. For stationary recurrent interval flow parameters of its distribution functions are constant, for periodic recurrent interval flow parameters change periodically. Availability of periodical recurrent interval flow enables grounding of the models of real stochastically periodic recurrent flows with taking into account the distribution function of the intervals. As an example of the model of recurrent stochastically periodic flow the periodic recurrent interval flow with even distribution is discussed. Obtained results are the basis of the development of simulation methods and methods of statistical analysis of stochastically periodic flow (Poisson, recurrent etc.)

Keywords – Poisson flow, periodic Poisson flow, piecewise stationary Poisson flow, flow's intensity, assessment of the flow's intensity

17. Шаховська Н. Б., Висоцька В. А., Чирун Л. В. Методи та засоби дистанційної освіти для заохочення і залучення сучасної молоді до самостійних наукових досліджень

**METHODS AND MEANS OF DISTANCE LEARNING
FOR THE MODERN YOUTH PROMOTION AND INVOLVEMENT
TO INDEPENDENT SCIENTIFIC RESEARCH CONDUCTING**

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New information, telecommunication technologies contribute to the optimization in the management of studies. This paper is devoted to the implementation of innovative approaches to improving the curriculum of higher education. The method of finding and attracting students including girls for scientific and practical work through and their participation at team competitions and joint Interuniversity scientific-practical projects are proposed. This work has considered a problem of distance education and involvement in her adaptive learning system. Improving scientific literacy of students by finding innovative solutions to address the problems of projects are proposed. Simplify the process of obtaining a scientific career for interuniversity projects participants. The questions of mathematical models of processes of distance education (remote training) are highlighted in this article. Creation of the integrated net oriented informational-educational environment is based on them. The indicated questions are actualizing in connection with implantation of technologies of distance learning and inextricably related with didactic and methodological aspects of the educational process.

Work objectives.

- Implementation of innovative approaches to improving the curriculum of higher education.
- Finding and attracting students including girls for scientific and practical work through and their participation at team competitions and joint Interuniversity scientific-practical projects.
- Improving scientific literacy of students by finding innovative solutions to address the problems of projects.
- Simplify the process of obtaining a scientific career for interuniversity projects participants.

The curriculum should include subjects from the classical school (I level). This will improve the professional and practical skills of students and reduce the number of subjects during the semester. After the monitoring stage, the student is enrolled to study a number of subjects depending on the course complexity and the his/her specific competence (II-III level). The course is organized by the portal, where students' education relised in the form of games, which helps participants:

- to gain knowledge from the subject area,
- enjoy the time, spent on the course,
- maintains communication in the team,
- encourages team members to demonstrate organizational and leadership skills,
- increases communication skills,
- teaches teamwork,
- nurtures the enthusiasm about gaining new knowledge,
- gives practical training in communicating Business English,
- improves competitiveness in their area of expertise.

The goal is to create a multidimensional educational tool that will encourage students to gain knowledge and conduct a research. Develop an innovative program through the introduction of new integrated courses that will be taught to students at various partner universities. Thus, teachers will share research and professional experience. Students will deliver joint projects and get experience in working with diverse team, which will be international and interuniversity (absence of borders and issues with language and race, sex and age).

Innovative teaching approaches to the practical tasks and assessment methods creation should be introduced, namely:

- organize team competitions at the first level of the course for team spirit cultivation, improving competitiveness in the area of expertise and communication skills development;
- practical management forms to be organized in several universities, which will introduce a new strategy of student learning results assessment, where winners will receive higher scores;
- attracting more females through their mandatory presence in a team and bonus evaluation system of the competition (as a whole team and individual participants through their personal contribution to the result) during scientific projects.
- continue research on next levels for students with high scores according to projects evaluation;
- using the principle of competitiveness between teams to increase their interest and motivation to continue learning;
- use by students or teams the developers tools for independent creation of games and contest elements on the second level;
- use by students or teams the developers tools for independent creation of full games and contests or for old versions improvement on the second level;
- graduate students explain learning material to the junior students.

Students, who get good studying rates, take final testing, the result of which together with the whole student's learning history helps to form the suggestions on the further postgraduate studies and advice to choose the appropriate university. Participation in international conferences that will contribute active scientific work of students and expand their research.

The evolution to an information society, as well as socio-economic changes in Europe, requires major changes in many areas of the country. First of all, it concerns education reform and innovation in the learning process. The trend of using information and communication technologies means building a system, that can not only process and analyze information, but also can create conditions for the efficient management of distributed e-learning process, and be the effective environment for learning process shaping, management and maintenance. This fact opens an opportunity to create a universal pattern of educational process for planning and preparing teaching materials for different forms of educational and training programs and for various institutions. The use of information and communication technologies should optimize the learning management and create an efficient organizational structure. Providing educational process with technical, informational, intellectual and software innovations is extremely important for the management of modern distributed educational process.

The complexity of data flow and the amount of information, which is transmitted in the intelligent information system of logistics analysis of the institutional structural units, require the additional aids of intellectual navigation, information processing, cataloging and planning. Most of the administration and management tasks of these units are assigned to the secretary-agent, which can be considered intellectual core of institutional structural units. This is not just a tool that simplifies the process of interactive dialogue with the system, but an active participant of its activities, unique interface agent, which follows the user instructions about manual planning, communication and management.

Keywords – information technology, data mining, Interuniversity scientific-practical projects, distance learning, distance education, e-learning, information and communications technology, electronic textbook, virtual learning environment, integrated net oriented informational-educational environment, scientific career, interuniversity projects participants.

COMPUTER AND MATHEMATICAL LINGUISTICS

18. Бігдай М. О. Лексикографічна база даних на основі лексико-семантичних груп дієслів української мови

LEXICOGRAPHIC DATABASE ON THE BASIS OF LEXICAL-SEMANTIC GROUPS OF VERBS OF THE UKRAINIAN LANGUAGE

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In recent decades, there is more and more research related to solving the linguistic problems with the help of computers. This is due to the fact that, in particular, using different software programs one can examine and handle very big amounts of data quickly and conveniently. Thus, computer lexicography has several advantages comparing to the traditional one, namely: multi-functionality, relevance and dynamism, the use of multimedia, dictionary database of large volume, variability of usage, as well as universality and easy search.

One of the applied areas of linguistics is building of lexicographical databases. Lexical word classes combined with one or more parameters, in particular, the lexical-semantic groups of verbs, are expedient to be presented in lexicographical databases, because in this way their systematic study can be conducted. The purpose of this article — to build lexicographic database based on lexical-semantic groups of verbs of the Ukrainian language. As the basis of the study we took the information theory of lexicographical systems by V. A. Shyrov, as it fully solves the set purpose.

In this article, the lexicographic database of lexical-semantic groups of verbs of the Ukrainian language "VerbSemClass" is built, which is an addition to the lexicographical database "DiesIPPart", developed in the Ukrainian Lingua-Information Fund of NAS of Ukraine. Our lexicographical database reveals the relations between the specific verb-semantic subject and the corresponding lexical-semantic group and lexical-semantic subgroup. In addition, there were also created several queries to the lexicographical database that allow to make the most necessary selections, namely: count number of verbs that belong to the specific lexical-semantic group; count number of verbs that belong to the specific lexical-semantic subgroup; show the studied verbs and the corresponding lexical-semantic groups and lexical-semantic subgroups; show the relations between each lexical-semantic group and the corresponding lexical-semantic subgroup; show verbs that belong to some lexical-semantic group; and show verbs that belong to some lexical-semantic subgroup. The created lexicographical database can be used, in particular, to study the lexical semantics of verbs of the Ukrainian language.

Key words – formal model, lexicographic database, information theory of lexicographical systems.

19. Литвин В. В., Висоцька В. А., Досин Д. Г., Гірняк М. Г. Розроблення методів та засобів побудови інтелектуальних систем опрацювання інформаційних ресурсів з використанням онтологічного підходу

THE METHODS AND MEANS DEVELOPMENT OF INTELLIGENT SYSTEMS BUILDING OF INFORMATION RESOURCES PROCESSING USING ONTOLOGICAL APPROACH

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The article discusses the development of unified methods and software tools for processing information resources. The models of information resource processing are proposed. A new approach to application and implementation of business processes is formulated.

Nowadays humankind increasingly uses information in digital form. And often there is a need for a specific analysis of this information and its structuring. To this end, parse (parsing) in linguistics and computer science is used – the process of comparing the linear sequence of tokens (words) of natural or formal language or formal language with its formal grammar. The result usually is a parse tree (syntax tree). In other words, parsing is a process of analysis or text parsing into components using special software. Parser is a program that analyzes text documents, retains data analysis in its database and then produces them when searching for relevant and current data. Parser can detect a large number of useful information and process it depending on the tasks.

Parsing usage can quickly handle large amounts of data, since manually it is almost impossible to accomplish this. In general, parsing is an effective solution to automate the collection and changing information.

It is found out that parser must provide a quick detour of large amounts of information; competently and carefully separate technical information from the non-technical; accurately choose the desired information and discard unnecessary information; effectively serve and store the data in the desired format.

The aim of this research is to study several algorithms for parsing and analyzing their work.

Analytical review of parsing algorithms was implemented. This article contains information about parsing classification methods. Four types of parsing methods on the basis of classification are defined. They are: classification by the method of parsing, classification by analyzing the sequence, classification by watching forward and classification by the use of repetitions. All these classifications are explained and described in the article.

It is established that any parser consists of three parts which are responsible for three separate processes of parsing: getting text in its original form, the extracting and data conversion, the result generating.

The algorithms were compared according to two criterias: performance of grammar study to presented input text. Each algorithm was implemented on the principle illustrated in a context diagram. The comparing efficiency of algorithms above is presented in the table.

In this research a complete grammatical analysis is not build, but texts with known structure are parsing faster. It is much easier to implement parsing in semi-structured text which are divided into blocks. They can be organized by using metafeatures which are created by using already extracted information. Such features are extracted from the input document and are used for identifying the information. This approach can be used for all sorts of information.

This paper describes the semantic search and data storage of scientific and technical information system.

The aim of this work is the usage of existing technologies for finding problem solution of the semantic data search and data storing of scientific and technical information system by providing the content semantic of the information resource and the designing of mathematical model of the text structural representation of scientific and technical information system.

The process of the semantic search and data storage of scientific and technical information is described in the paper using UML sequence diagram. It is shown that the main objects of the sequence search and document download processes are user, interactive interface, document tree, and downloading module.

The proposals of semantic content structuring of scientific and technical information system with explicitly structured representation of semantic relations between information objects contained in the system have been presented. The main components of the mathematical model of ontology of scientific and technical information system for semantic search and storage of scientific and technical information resource have been determined.

The object of research is the process of semantic search and storage of data of scientific and technical information system. The subject of research is onthology usage for providing the content semantic of the information resource and the designing of mathematical model of the text structural representation of scientific and technical information system.

Scientific novelty and practical value are in the usage of ontologies for problem solving of the semantic search and data storage of scientific and technical information system.

Keywords – content, ontology, information resource, business-process, content management system, content lifecycle.

20. Лозицький О. А. Прикладна програмна система опрацювання українськомовних технічних текстів для людей з вадами зору

**APPLIED PROGRAMMED SYSTEM OF UKRAINIAN TECHNICAL TEXTS
PROCESSING FOR PEOPLE WITH VISUAL IMPAIRMENTS**

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This paper describes the results of O. Lozytskyy's dissertation research, basis on development of new computational methods and software of the computerized data processing and presentation for people with 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 made in Sweden, Japan, Germany, USA, France, Canada, Denmark, England and other leading countries. Unlike the leading countries in Ukraine the information accessibility for blind remains problematic and painful. Solution this problem will allow blind to realize themselves in everyday life.

Based on the analysis problem of understanding mathematical formulas experienced four major stages of processing: scanning formula, recognition and language conversion formula to MathML, formation text to voice, audio recording process or saving into WAV audio format.

Author developed applied programmed system of Ukrainian technical texts processing that consists of a set of processing and conversion methods for automatic reading mathematical formulas and symbols of the Ukrainian language, which 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.

Application system consists of three levels – mapping, applications and data management. Mapping level responsible for interaction blind person with the computer that has installed application system. Applications level consists of software components which solve the problems of input, output and data processing on the computer. Applied programmed system of Ukrainian technical texts processing and other similar systems in conjunction with databases belonging to the level of data management.

As a result it was developed automatic reading system for 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, author adapted information technology of DAISY (Digital Accessible Information System) books producing for Ukrainian language. It can help to make DAISY books with math to study blind people. It was created automation equipped working places for Ukrainian people with visual impairments. The core of DAISY technology is synchronization of text, graphics and audio based around W3C recommendations to meet the needs of people who require diversity of accessibility features of reading materials to share human knowledge. Other developed methods are based on content optimization process to create DAISY books. It based on method of books classification.

Experimentally proved expediency of using mixed methods for creating DAISY books.

Application of mixed methods is based on finding the most important information of the book on special words or fragments of text that voiced by another speaker with other tone. At this stage of the research we used mixed methods and method of searching by the keywords. Depending on the genre and the volume of the book, such elements defined as sections, paragraphs, formulas, separate words.

Searching by the keywords method was chosen to determine the most important information of the book. The search process implemented by special words and fragments of text, after which usually describes the most significant information of the book.

The experimental results showed that the use of mixed methods for creating DAISY books improves memorization of book content by 22 %.

The main results of the research implemented in Lviv consulting center for special need children based on “School-gymnasium “Syhivska”, boarding school №100 for blind children, Lviv regional organization “Ukrainian Union of Disabled - USI” and Lviv Regional Fund for Social Protection and Rehabilitation of the Blind when developing applied programmed system of computer data processing and presentation for people with visual impairments.

Keywords – applied programmed system, Ukrainian technical text processing, mathematical formula, visual impairment, syntax tree, sounding, automation equipped working place, DAISY, MathML.

21. Назаркевич М. А., Сторож О. В., Клойник І. І. Особливості розроблення інтерактивних електронних книг

ANALYSIS OF OPPORTUNITIES DEVELOPMENT OF INTERACTIVE E-BOOKS

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Creating interactive educational book is the layout of text, images, interactive elements and actions that occur due to the use of these elements. The analysis of the development tools of interactive e-books, which can be divided into online services, e-book compilers and program editors. Comparison of the most significant parameters of the tools of interactive e-books and set their weights. When you create books on physical media, including paper-developers are limited in a fixed area. Moreover page design on paper must be made in compliance with all proportions which requires a fixed area of the page. When you create an interactive publication restrictions apply only to the width publication. In addition, interactive elements contribute to the rapid assimilation of the material. It is known that when combining visual and auditory perception and the human attracting to action in the study, 75 % digestible material. Interactive edition only allow text to supplement the explanation visual audio elements. When creating teaching materials is an important means to check the availability of learning. Built-in tools for creating interactive capabilities improve test edition. Typically interactive elements, used in the preparation of the publication are: hypertext links; video clips; navigation elements; texts, buttons; radio buttons. The expediency of using the most popular online services: flipSnack, audi, bookemon, pressBooks, creatavist, simple booklet. The possibilities of e-book compilers: eBook Maestro, HTML Executable, eBookGold, Ebook Maker, eVook Sompiler. Introduced the basic parameters e-book compilers support additional formats like pdf, flash, browsing, interactive setting buttons, menu creation, content protection editions, each with assigned weights. From conducted analysis follows that the compiler HTML Executable is best to create interactive e-books, as it supports multimedia formats, provides a unique opportunity to create their menu items best support Scripting.

The analysis software editors, which include such popular programs as SunRav BookEditor, NeoBook, Adobe Indesign, Apple iBooksAuthor (for MacOS), My Autoplay. These programs, unlike conventional compilers contain a set of tools to create and edit individual elements of the future book and allow you to add special features and control options for interactive elements. The possibilities conservation eBook formats, including EXE, CHM, HTML, PDF, RTF, NeoBook. Comparison of parameters such as the number of program editors file formats import template design capabilities, possibilities text editor, diversity of styles of text, spell checking, hyphenation support, multimedia content, interactive elements and the presence of their capabilities, content protection publication, export opportunities and others. These parameters are entered for software editors such as SunRav BookEditor, NeoBook, iBooks Author, Adobe Indesign, My Autoplay. The books based on Internet Explorer and autonomous with built-in HTML browser can customize the browser user interface, create a sample menu, taskbar, tools, use the search engine to create content. In electronic books is the ability to set a password to run the publication disable parameter set context menu protect against copying, separation, printing, and a limited, trial, users must register published after a certain number of days, and hardware locked publication. From the analysis features of software editors implies that all of the applications support multi-media content, interactivity, with tools for editing text items and publications protect from unauthorized copying.

Keywords – interactive books, online services, e-book compilers, software editors.

PROGRAM AND PROJECT MANAGEMENT

22. Бойко Н.І. Еволюція побудови архітектур інформаційних систем. Перспективи розвитку “хмарної” архітектури

**THE EVOLUTION OF ARCHITECTURES OF INFORMATION SYSTEMS.
PROSPECTS OF DEVELOPMENT OF “CLOUD” ARCHITECTURE**

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Due to the growth of the Ukrainian market of system integration and transformation, today there are a lot of interesting proposals for the use of it infrastructure for effective business management. Extensive use has acquired a distributed corporate information system (CIS), organization of work depends on the smooth operation of locally established data processing centers (DPC). The centers are designed to automate the collection and forwarding of information, its analysis and creation of reports, using economic-mathematical methods, technical means and organisational structure that ensures rational management of complex information objects and processes. With KIS you can solve the problems of primary and operational planning of production, efficient distribution of equipment loading and distributed using the resources of the organization.

Modernity dictates stringent conditions for activities of enterprises and some of them are focusing on “cloud services”. The application services business offers a real chance to increase its efficiency and competitiveness. In conditions of economic instability, companies must tightly control its costs because the quality and value of any innovation must be financially justified. Therefore, the aim of the article is the implementation of information technology systems analysis, which allows to increase economic and managerial benefits of the activities of various architectures of information systems. In this paper we study the feasibility of using cloud computing for the effective operation of dynamic systems.

The article considers evolution of development of architecture of information systems business model. In the process of development of each architectural structure differed more efficient use of resources of the enterprise and was intended to provide reliable, scalable and accessible communication with the communication network at the physical and logical levels. To guarantee the security of network services were taken into account safety requirements for structural and logical levels of configuration. That is, at the stage of designing the architecture of IP is taken into account the requirements for network security. Also important when choosing IP architecture is management system business model.

The article substantiates theoretical principles, methodical and practical recommendations that improve the effectiveness of functioning of the information system. The paper presents the basic models of information systems. Analyzed service process approach to organization of information flow in the cloud. Explains the usefulness of cloud computing for efficient operation of the business structure.

This paper considers a cloud-based approach, which allows to materialize the two main ideas of utility information processing and self-government. Because with clouds, the company acquires a new quality – become the company's next generation (Next Generation Enterprise). Only with clouds and service computing have the opportunity to create an effective architecture, dynamic, network of IP business model of the organization.

Modern cloud technologies are a promising solution and an element of the “third it platform”. Therefore, modern enterprises need to consider a systemic and integrated development of cloud services.

The use of cloud computing due to lower costs of intensification. While cloud solutions are constantly improving and can achieve a high level of security.

Keywords – system, information flow, information processes, “cloud computing,” corporate information systems, information technology.

23. Борис М. М., Шаховська Н. Б. Інтелектуальна система аналізу діяльності архітектурно-будівельної компанії

THE INTELLIGENT SYSTEM OF ANALYSIS OF ARCHITECTURAL AND CONSTRUCTION COMPANY

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Nowadays a large number of multi-storey public buildings - rise buildings, single-family houses, hotels, guest houses, dispensaries, offices are designed and built in our country and abroad. Any architectural and construction design is carried out using specific software. One of the most popular and most used are: Autodesk AutoCAD, 3d studio max, ArchiCad, Grand Smeta, IVK, and others. Article analyzes online resources companies engaged in architectural-construction activities such as PostScriptum, Cascade, Gragda.

Although the software market is filled enough with tools for building design, documentation and project formation estimates, but in analyzed software there is poorly developed aspect of communication with the client and determined the necessary design and construction solutions for layman users. Therefore system that serves to support decision-making about determination main parameters of the structure and the estimate for users is researched.

The article describes the intelligent system's architecture of automation the activity architectural and construction company. The information model of the system is designed. Goal, problems and scope of the system are defined.

Tree of objectives is built to reach the goal of internal structure. It provides correct and incremental steps in the development of intelligent system. The main purpose which is specified with tree of objectives is to develop intelligent system. This problem could be executed only after all the subobjectives. From the top of the tree branch out more threads which share the main objective to subobjectives.

In subobjectives phases: analytical survey of literature and other sources was conducted; the essence of the subject area and their attributes were defined, all the relationships between them were found and as a result a set of diagrams was built; algorithms and methods used to solve this problem were substantiated; software which will elaborate according to the prototype system was chosen; database management system for creating the database which will analyze and modify content was selected.

CASE-tool Enterprise Architect (EA was used for building intellectual model, which makes possible the implementation of UML-modeling and design, especially during the stage of analysis and design layout of the project. Two charts were built using this tool.

In addition, the article describes the mechanism of logical deduction, namely expert systems based on production rules. Production rules were developed in the system to determine: type of material for placement features of designed building; compatibility of materials; parameters of the building (number of floors, functionality); the amount of each type of material; subcontractors based on their professional skills and previous recommendations; compliance with the terms of the customer.

Consequently, the architecture of intelligent system's analysis of the architectural and construction company was described and built in the article. The scope of the intellectual system was defined. The tree of objectives which reveals the internal structure of objectives and ensures correct and incremental steps in the development of intelligent system was built. The conceptual model, namely the class diagram and use case diagram was developed. The mechanism of logical deduction was describes. All this became the basis for further research.

Keywords - rules, analysis of activity, architecture, building, intelligence system.

24. Захарія Л. М. Алгебро-алгоритмічні підходи до опису предметних областей та синтезу програмних середовищ для них

ALGEBRA-ALGORITHMIC APPROACHES IN THE SUBJECT AREAS AND SYNTHESIS DESCRIPTION OF SOFTWARE ENVIRONMENTS FOR THEM

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This article presents the results in creation of mathematical tools and tools for process design algorithms and applications. As a mathematical apparatus selected algebraic tools that formalize experience in creating software products. Initially, these instruments were systems of algorithmic algebras (SAA). SAA - is algorithmic algebra aimed at descending formalized design objects (algorithms, software, abstract data types (ADT) and memory (ATP)) in terms uninterpreted and interpreted partly schemes that are called treatment strategies. Schematic representation of objects forms the knowledge of design and methods of their synthesis. The article outlines the way from the CAA proposed Glushkov, to build clones of various algorithmic algebraic systems such as Yanov clone, clone graph charts Kaluzhnina, clone Kleene. Some of these clones SAA serves as a representative algebra. A clone n-relationships to describe tabular data, which is a generalization of the algebra Codd and can be used as a formal device database design and communication connection with their processing algorithms. To support design schemes SAA was originally created tools Multyprotsesyst, which gradually expanded and modified with the development of new design tools. Today toolkit provides design syntax correct algorithmic (called DSP designers) in dialog for different algorithmic clones.

In parallel with the development of algebraic representation system of algorithms, software, data, memory tools support this algebraic programming. Tools include support in addition to interactive designers syntactically-correct (DSP) parser, synthesizers objects, templates, charts, strategies processing, interpretation, software implementations containers elementary operations and facilities subject area. Note that the synthesis process are known, consists of two stages:

– Fixing containers - basic concepts associated with the chosen subject area (semantic identifiers, interpretation of their implementation, et.);

– Actually generation strategies and processing algorithms are based on these methods of interpretation, reinterpretation and transformation. These methods are based on metarules of convolution (abstraction) sweep (detail), Rolls-sweep (reinterpretation) and transformation (based on equivalent relations, identities). Since these methods provide modified circuits equivalence transformation, we get the semantic correctness new strategies, algorithms, programs.

Keywords – generating programming algorithms and algebra programs, schemes algorithms environment of algebraic programming system of algorithmic algebras clones.