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DEVELOPMENT OF MEDICAL DIAGNOSTIC DECISION SUPPORT SYSTEMS AND THEIR ECONOMIC EFFICIENCY

page 4–10

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The object of research is the diagnostic decision support system (DSS). One of the most problematic areas in medical diagnostic systems is the formation of a knowledge base based on expert rules, which provides a recommendation for the disease. The methods of designing medical diagnostic systems have been studied. Methods for applying the potential of artificial intelligence in medicine in the form of fuzzy rules or conducting diagnostics on the basis of Bayesian networks are considered. Intellectual computing tools in the form of expert systems based on rules and fuzzy logic, applied to neural networks and genetic algorithms performed in medical diagnostics are considered.

To develop a decision support system for a pediatrician, a method to build a knowledge base on the basis of logical rules «If ..., then ...» was chosen. Using this method allows to create initial conditions for input data in the system, and speed up their processing in the knowledge base. Although the knowledge base is quite cumbersome, this does not reduce the performance of the system.

In the process of research, the development of a medical diagnostic system for decision support by a pediatrician for the design stages is described. The application of this system allows to automate the process of document circulation for a pediatrician and to speed up the stage of preliminary assessment of the patient's condition.

The built-in pediatrician electronic pediatric module not only automates the workflow process, reduces the doctor's work time with papers, but also allows to obtain complete information about the patient.

The calculation of economic efficiency from the DSS introduction by a pediatrician is performed. The system cost is to be recouped within 1 year.

The prospect of adding modules to the system for individual diseases and forming an electronic record from the moment of birth with the prospect of transferring data to the system for adults are advantages over analogues of this software product.

Keywords: medical decision support systems, software development, economic efficiency.

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DEVELOPMENT OF THE TECHNIQUE OF EXPERT ASSESSMENT IN THE DIAGNOSIS OF THE TECHNICAL CONDITION OF BUILDINGS

page 10–15

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The object of research is methods and technologies for diagnosing buildings using the tools of the theory of fuzzy sets. One of the most problematic areas is the lack of a system of intelligent diagnostic methods based on the accumulated knowledge of experts and current information on the condition of buildings. In the course of the study, expert assessments of the survey of the technical condition of the facilities are used as the basis for predicting their reliable operation. The technique of expert assessment is obtained in the survey of the technical condition of buildings. The proposed methodology has a structure that involves the formation of signs of damage through ranking, the formation of an expert group, the formation of rules for the work of the expert group, assessing the degree of agreement between experts, quantitative assessment of signs of damage. With this approach, it becomes possible to obtain reasonable results about the presence and extent of damage and the possibility of comparing the results with the initial ones that characterize previously conducted technical condition surveys. The proposed approach contributes to the certainty in the recognition of building structures in conditions of limited statistical data from instrumental surveys and inaccurate information based on directive research methods. In comparison with probabilistic approaches and methods of the theory of fuzzy sets, the approach uses the theory of measurements and mathematical statistics and gives confidence to the expert in substantiating the necessary assessment of the state of structures. In the developed methodology, the degree and depth of expert assessment of building structures with the purpose of bringing the entire system to a normal technical state is made through an intuitive-logical analysis of problems with qualitative and quantitative judgments and formal processing of results. It is possible to solve the assessment tasks in the absence of a part of important information.

Keywords: diagnostics of buildings technical condition, computerization of diagnostic methods, expert assessment.

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SIMULATION OF WATER PURIFICATION MACHINE FOR VENDING CYBER PHYSICAL SYSTEMS

page 16–21

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The object of research is a water purification machine for self-service systems. The need for purified water is at the self-service washers, coffee vending machines, and water wending machines. As a rule, such systems are located in geographically scattered places. One of the most problematic places is the selection of the correct configuration of the machine to the location. Another problematic place is high maintenance costs. Most of the existing water purification machines, which are produced today, do not have a monitoring system in their composition, results in an inefficient operation of the service department. These problems lead to a decrease in the number of users of self-service systems.

To solve these problems, it is proposed to design a water purification machine that will operate as part of a 5-level vending cyber-physical system.

The structure and operating principles of the water purification machine based on the reverse osmosis membrane are described. In the course of the study, Monte Carlo simulation methods were used, which allowed to select the configuration parameters of the machine in accordance with the users' requests. Critical parameters of the equipment influencing the performance of the water purification machine are determined. Based on the simulation results, two typical configurations of the TW30-1812-100 and XLE4040 membrane-based machine are selected.

In addition, the software model of the water purification machine is integrated into the analytical system, which generates recommendatory solutions for the service department. The analytical system recommends not only the current replacement of functional units (filters, membranes), but also is able to predict the need for changing the configuration of the machine. This approach allows to optimize service routes and increase the efficiency of the service.

Keywords: vending cyber-physical system, simulation, reverse osmosis membrane, analytical system.

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DEVELOPMENT OF HARDWARE AND SOFTWARE OF THE COMPLEX FOR HYPOXYTHERAPY

page 22–28

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The object of research is medical hardware and software for carrying out hypoxytherapy. One of the more problematic areas is the automation of assessing the condition of hemodynamics and the patient's respiratory system during sessions.

During the development of the complex for carrying out hypoxytherapy, modern hardware (oxygen, carbon dioxide, pulse oximetry, etc.) and software methods for filtering signals are used. When developing software for medical staff, modern tools and programming technologies (C#, MySql, CLIPS) are used.

A fundamentally new automated software and hardware complex designed to diagnose and treat patients is obtained. This is due to the fact that the proposed complex has a number of features for the implementation of its main blocks. In particular, the automated workplace of a specialist in hypoxytherapy is a dynamic expert system that receives data from the microcontroller in real time during sessions, so expert evaluation is done immediately. The system has a complete knowledge base for assessing diagnostic sessions and procedures for patients who already have developed hypoxia (e. g., with chronic obstructive pulmonary disease) and without it.

This ensures:

– the possibility of obtaining the values of the patient's condition indicators (heart rate, blood saturation, respiration volume, respiratory rate, minute respiration volume) and the composition of the inhaled gas mixture (concentration of oxygen and carbon dioxide);

– provision of expert evaluation of the patient's condition.

In comparison with the known hypoxicators (Borey, Alti-Power, CellAir One, ReOxy, etc.) developed hypoxicator provides such advantages:

– automated diagnostics and evaluation of the effectiveness of hypoxytherapy course;

– small overall dimensions for convenient use even at home;

– low and affordable cost of the complex for private and public hospitals, polyclinics, medical centers and sports complexes.

Keywords: automated software and hardware complex, expert system, diagnostics of the patient's condition during hypoxytherapy.

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DEVELOPMENT OF THE MULTI-PROJECT FORMING METHOD IN SHIPPING COMPANY'S DEVELOPMENT

page 29–34

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The object of research is the processes of shipping company's multi-project content managing. The subject of the study is the method of multi-project management of the development of shipping companies. One of the most problematic places is the formation of a strategy for the development of a shipping enterprise. The strategy of a shipping company involves setting long-term goals of the company, identifying resources for their achievement and technology development strategy. It is proved that the formation of a competitive shipping strategy for a shipping company is a rather complex and lengthy process. The purpose of this process is the choice of development projects that will enhance the company's long-term business performance.

During the study, methods of system analysis were used, which allowed to determine that:

– in conditions of fierce competition and dynamic environment, shipping companies operate in a number of areas;

– there is a need to plan a large number of parallel projects and rational use of company resources.

The method of optimizing of the multi-projects' content is obtained. It allows forming a multi-enterprise development project, taking into account not only the constraints on resources, but also the conformity of the results of the multi-project to the strategic goals. The point is that proposed method has a number of features, namely:

– the two-tier nature of planning and management: at the level of individual projects and at the level of strategy in general;

– structuring of the strategic planning process in the distribution of resources, time, profit;

– development of the potential of the shipping company.

It provides the opportunity for rational allocation of company resources. Compared to similar well-known methods, it provides the following benefits: achieving all strategic goals, linking strategy to development projects, optimal allocation of resources.

Keywords: method of the shipping company's content forming, development of shipping company, strategy of the shipping company, multi-project management.

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OPTIMAL PLANNING OF TRIP AND ROUND TRIP CYCLE TIME ON AN URBAN ROUTE

page 34–42

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The object of research is the public urban passenger transport route. One of the most problematic places in the organization of transportation on a fixed city route is the establishment of the planned trip duration and/or round trip. Difficulties arise because the trip duration on a city route is usually a random variable, which must be taken into account when establishing its planned values, used later when scheduling traffic. This, on the one hand, makes it possible to increase the efficiency of the use of route vehicles by reducing their unproductive outages, and on the other hand, to improve the quality of passenger service by reducing the waiting time for the last transport at stops.

During the research, the method of stochastic optimization of the planned trip duration is used. This makes it possible to find a compromise in terms of value between the efficiency of using route vehicles and the quality of passenger service. A feature of the proposed optimization method is the consideration in the generalized costs of unproductive idle times of route vehicles, the lost profit of the transport operator and the cost of transport time for passengers.

The application of the developed method for the conditions of the trolleybus route No. 14 of the city of Zaporizhzhia (Ukraine) allows, in comparison with the existing planned indicators, to reduce the total costs by 12 %.

Now the technical possibilities of collection, accumulation and processing of empirical information on the conditions for performing transportation on urban routes using satellite systems of global GPS positioning have significantly expanded. In such conditions, using the developed method, it is possible to take operational account of the operational and socio-economic factors in the planning of passenger traffic in which these transportations are carried out.

Keywords: urban public transport, waiting time, trip duration, generalized expenses.

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SYSTEMS AND CONTROL PROCESSES

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DEVELOPMENT OF METHODOLOGICAL PRINCIPLES OF SUPPORT-PRESERVATION ENGINEERING WORK

page 43–49

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The object of research is the account of the peculiarities of color rendering in the process of publication preprint preparation. One of the most problematic places is manual color management, which is often done empirically, using simple tests and errors, which adversely affects the quality of the product.

Methods of analysis and synthesis are used in research. The characteristic features of color are determined in terms of the work of the prepress engineer. It is found out that the main points which always need to be taken into account when conducting preprinting are the regime of consistent rendering of paint and the printing mode overlay.

The technology of mixed color management is proposed.

The result of the implementation of this technology ie the following recommendations:

– for the creation of gradient fills and other similar effects with the transition «in white» as the final value of white, the initial mixed color with the value Tint=0 %;

– to create gradient fills and other similar effects with the transition in «transparent» it is more reliable to apply the transition mode «in white» with the installation of the printing attribute with the overlay;

– to create complex interactions between triads and blends should be used combinations of objects using the overprinting attribute.

An algorithm for recording the characteristics of color rendering is created. As a result, the main contradictions concerning the use of color are resolved, and the methodical recommendations for the support of the prepress engineer are received taking into account the correct color reproduction. Automation of the process of determining the parameters of trapping is carried out. This automation gives the prepress engineer the following capabilities:

– creation of a database, operational information files for color rendering;

– obtaining recommendations for the analysis of individual objects at different stages of work;

– further use of the information support system as a guide.

This provides an active tool for maintaining prepress processes and getting some effects from the introduction into production. In particular, the productivity of the technological process of prepress preparation and its cost reduction may be increased.

Keywords: methodical principles of support of the prepress engineer work, information support system, quality control of color rendering.

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ANALYSIS OF THE RESOURCES PROVISION OF STOPPING POINTS OF TRANSPORT-TRANSFER STATIONS OF URBAN PASSENGER TRANSPORT

page 50–56

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It is proposed to consider the efficiency of the operation of transport-transfer stations in terms of the effect of resource provision of stop points on the duration of the stay of passengers in them. Based on the principles of stabilizing the work of urban public passenger transport and the conditions for sustainable development of the urban environment, the structure of the contour connection of technological solutions is identified. The functional task is ensuring the level of organization aimed at maximizing the service-resource potential of routes and neutralizing the negative consequences of the work of transport and transfer units. The presented connection is based on taking into account the multilevel representation of the results of the work of the elements of transport and transfer stations on the service-resource potential of urban public passenger transport routes and the social sphere of the urban environment. The proposed communication allows to substantiate the general form and structure of the criterion for assessing the efficiency of transport-transfer stations. The presented efficiency criterion takes into account the limitations of the influence of the operation organization of

stop stations on the time of the passengers' movement through the TTS, the quality of traffic on the adjacent section of the road network and the urban environment.

On the basis of experimental studies, the characteristic dependence of the influence of the resource supply of stop points on the efficiency of their operation has been established. The obtained form of the function of the influence of resource provision of stopping points on the duration of dwell time of vehicles in the queue, the level of blocking of the roadway of the road network and the environment has an exponential dependence. For the selected stopping point it is established that the acceptable level from the point of view of providing service quality is the reserve capacity level in the range of 0.1–0.4. With an increase in the reserve capacity from 0.1 to 0.4:

– the average total dwell time of vehicles is reduced by 1.6 times (from 3.9 minutes to 2.4 minutes);

– the average dwell time in the queue is reduced by 5.7 times (from 0.4 minutes to 0.07 minutes);

– the specific weight blocking the roadway is reduced by 3.6 times (from 0.65 to 0.18).

The obtained dependences allow to establish the allowable values of the reserve provision parameters for the stopping points of the transport and transfer stations. Based on the presented methodology for assessing the efficiency of transport-transshipment stations, it is possible to evaluate the feasibility of implementing optimization management measures aimed at streamlining the arrival of vehicles at stop points.

Keywords: transport and transfer station, urban public passenger transport, stopping point, capacity.

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DEVELOPMENT OF THE INFORMATION PLATFORM MODEL FOR THE NEUTRALIZATION OF POTENTIALLY DANGEROUS UNDERWATER OBJECTS

page 57–62

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The object of research is the processes of managing the creation of information support for projects to neutralize potentially dangerous underwater objects. In such projects, complex information flows circulate at all phases of their life cycle, so structuring and defining the components is an important part of the project product. One of the most problematic areas is the lack of scientifically grounded recommendations for creation of an information platform for projects to neutralize potentially dangerous underwater objects, which complicates project management both at the planning stage and at the implementation stage.

In the course of the research, a list of participating organizations involved in projects for neutralization of potentially dangerous underwater objects is developed on the basis of attracting successful practices in managing complex equipment projects and the main consumers of information for these projects are identified. This forms a scientific and methodological basis for developing an information platform model for projects for neutralization of potentially dangerous underwater objects and for structuring the main types of their information support.

The model of the information platform for project management of potentially dangerous underwater objects is proposed as part of technical, technological, organizational and economic information platforms. Together they form the instrumental basis for creation of applied software for the management of projects for neutralizing the water areas of the state from potentially dangerous underwater objects.

The scientific methodology for the development of the information platform model simplifies the planning of the information component of such projects as tasks of national importance.

In comparison with similar well-known approaches to the management of complex projects, this forms a full set of stakeholders and ensures that information needs of all participants in projects for neutralization of potentially dangerous underwater objects in the water areas of the state are taken into account.

In general, the proposed model of the information platform for project management for the neutralization of potentially dangerous underwater objects makes it possible to simplify the planning of information support for such projects and improve the overall effectiveness of their planning and implementation.

Keywords: project management, underwater vehicles, information models, means of marine robotics, neutralization of potentially dangerous underwater objects.

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