

ISMA INFORMĀCIJAS
SISTĒMU
MENEDŽMENTA
ANNO 1994 AUGSTSKOLA

ISMA University of Applied Sciences

International scientific conference

**INTERACTION BETWEEN SCIENCE
AND TECHNOLOGY IN MODERN
CONDITIONS**

November 3–4, 2022



IZDEVNIECĪBA
BALTIJA
PUBLISHING

2022

International scientific conference «Interaction between science and technology in modern conditions» : conference proceedings (November 3–4, 2022. Riga, the Republic of Latvia). Riga, Latvia : “Baltija Publishing”, 2022. 128 pages.

HEAD OF ORGANISING COMMITTEE

Romans Djakons, Dr.sc.eng., Professor, Academician, President of ISMA University of Applied Sciences.

Each author is responsible for content and formation of his/her materials.

The reference is mandatory in case of republishing or citation.

CONTENTS

INFORMATION SYSTEMS AND TECHNOLOGIES

Choosing a content management information system for building an educational site Dmytriienko O. O.	6
Data transmission networks modeling process Kyrychek H. H., Tiahunova M. Yu., Latyshev A. V.	10
Analysis of conditions and factors affecting cyber security in the special purpose information and telecommunication system Koval M. V., Vozniak R. M., Shknai O. V.	14
Rationale for the connection of the relational database with the concept of n-array relations Poperechniuk L. M., Mosiychuk V. S.	18
Research of the creation of a distributed scheme virtual reality video stream delivery Protsenko A. M.	22
Comprehensive methodology for assessing information and analytical supply in decision support systems Sova O. Ya., Protas N. M., Velychko V. P.	25
Analysis of cognitive modeling methods states of real-time dynamic systems Shyshatskyi A. V., Artabaiev Yu. Z., Dorofeev M. V.	29

APPLIED MECHANICS

Research of the benefits of learning programming languages for modern mechanical engineers Kravtsova D. Yu., Fraimovych A. V.	33
To calculate the drives of screw combined conveyors for transporting waste from mechanical industries and agricultural industry Chasov D. P., Beyhul V. O., Romaniuk Ya. O.	38

MATERIALS SCIENCE

Structure evolution in Al ₇₀ Si ₂₀ Ni ₁₀ rapidly-quenched alloy Nykyruy Yu. S., Mudry S. I., Prunitsa V. V.	41
--	-----------

AVIATION, ROCKET AND SPACE EQUIPMENT

Relaunch of Ukrainian Aerospace in Cooperation with Extended AUKUS and EU Partners is Vital for the Euro-Atlantic Security Los O. V.	46
---	-----------

ELECTRIC POWER ENGINEERING, ELECTRIC ENGINEERING AND ELECTROMECHANICS	
Monitoring of electromechanical processes of the cold rolling mill taking into account the variation of the inertia moment Nazarova O. S., Vasiliev B. V., Punda M. S.	50
Methodical provisions of multifactorial modeling of forecasting of demand for electricity in industry Teslenko O. I.	54
HEAT POWER ENGINEERING	
Restoration of the temperature field on the surface of a metal sample during cooling in liquids Moskalenko A. A., Razumtseva O. V., Protsenko L. M.	58
AUTOMATION AND TOOL ENGINEERING	
Synthesis of the system of functional diagnostics of the technical state of object Pukhalska O. M., Kryva V. I., Chesnova H. O.	62
CHEMICAL TECHNOLOGIES AND ENGINEERING	
Electrolyser design upgrade for electrochemical synthesis of dilute sodium hypochlorite solutions based on the hydrodynamic simulation results Brovin O. Yu., Kovalenko Yu. I.	66
Investigation of the process of dyeing fabric with dispersed dyes using treated wastewater Koval M. G., Holub A. V., Shnaider S. M.	69
ELECTRONICS AND TELECOMMUNICATIONS	
Analysis of possible options for influencing the healing process of infected wounds in order to accelerate it Mospan D. V., Volovyk A. Yu., Lychmanenko V. V.	74
FOOD TECHNOLOGIES	
Study of the foaming process in model systems based on skimmed milk and its UF concentrates Zolotukhina I. V., Skrynnik V. I.	80
TECHNOLOGIES OF CONSUMER GOODS INDUSTRY	
Design of children's denim clothes on the basis principles of upcycling and patchwork technology Vodzinska O. I., Bilotska L. B., Gorbach V. I.	84

Patchwork as a type of apcycling in the creative works of students Lozovenko S. Yu., Bilotska L. B.	87
ARCHITECTURE AND CONSTRUCTION	
General principles of technical inspection of buildings and structures Avramenko Yu. O., Zyhun A. Yu.	92
Architecture and Design for Higher Education in BIM-Archicad Levchenko O. V., Kosarevska R. O.	96
The development of surveying instruments as an impetus to the introduction of «end-to-end technologies» in transport construction Matiash V. M., Shapovalov O. V.	102
TRANSPORT	
Analysis of characteristics and operational features of alfa-laval fresh water generators Dolganov Iu. A., Ruzhynskiy O. L.	106
Activities of Ukrainian airports in conditions of uncertainty Maliarenko D. L.	109
Truck and adverse road conditions Petrov L. M., Kishianus I. V., Petryk Yu. M.	111
GENERAL ISSUES OF ENGINEERING SCIENCES	
Environmental-economic feasibility of a new technology for low-waste coal mining of thin seams Petlovanyi M. V., Sai K. S., Malashkevych D. S.	117
Justification of the parameters of the centrifugal-pneumatic grain cleaning machine Petrenko D. I., Lisoviy I. O., Raichenko D. P.	121
Justification of machine parameters for surface application of fertilizers Rutkevych V. S., Lisoviy I. O., Kachurivskiy M. M.	125

DOI <https://doi.org/10.30525/978-9934-26-264-7-6>

**COMPREHENSIVE METHODOLOGY FOR ASSESSING
INFORMATION AND ANALYTICAL SUPPLY
IN DECISION SUPPORT SYSTEMS**

**КОМПЛЕКСНА МЕТОДИКА ОЦІНЮВАННЯ
ІНФОРМАЦІЙНО-АНАЛІТИЧНОГО ЗАБЕЗПЕЧЕННЯ
В СИСТЕМАХ ПІДТРИМКИ ПРИЙНЯТТЯ РІШЕНЬ**

Sova O. Ya. Сова О. Я.

*Doctor of Technical Science, Senior Research Fellow,
Head of the Department of Automated Control Systems
Military Institute of Telecommunications and Informatization named
after Heroes of Kruty Kyiv, Ukraine*

*доктор технічних наук, старший науковий співробітник
начальник кафедри “Автоматизованих систем управління”
Військовий інститут телекомунікацій та інформатизації імені Героїв Крут
м. Київ, Україна*

Protas N. M. Протас Н. М.

*Candidate of Agricultural Sciences, Associate Professor
Associate Professor at the Department of Information Systems and Technologies
Poltava State Agrarian University Poltava, Ukraine*

*кандидат сільськогосподарських наук, доцент, доцент кафедри інформаційних систем і технологій
Полтавський державний аграрний університет
м. Полтава, Україна*

Velychko V. P. Величко В. П.

*Lecturer at the Department of Automated Control Systems
Military Institute of Telecommunications and Informatization named
after Heroes of Kruty Kyiv, Ukraine*

*викладач кафедри “Автоматизованих систем управління”
Військовий інститут телекомунікацій та інформатизації імені Героїв Крут
м. Київ, Україна*

The basis of any management is the decision of the manager (boss), which represents a certain order and methods of performing the assigned tasks. Preparation and decision-making is one of the most important functions of a manager (supervisor) in object management [1].

The analysis of works [1–5] showed that the vast majority are based on the use of general scientific methods, such as systematic, comparative, structural and functional analysis, the method of expert evaluations, the methodology of scenario analysis of socio-economic systems and the theoretical and informational approach.

For this purpose, it is proposed to develop a methodology that would allow for the evaluation of complex information and analytical support in decision making support systems, would have a flexible setting, and would implement direct and reverse evaluation within the framework of a single model.

The purpose of the research is to develop a comprehensive method for evaluating information and analytical support in decision making support systems using fuzzy logic. This will make it possible to take into account a larger number of factors that affect the efficiency of information and analytical support, and also have different units of measurement and nature.

Presentation of the main research material

The method of comprehensive assessment of information and analytical support in decision making support systems consists of the following sequence of actions.

1. *Input of initial data.* At this stage, the initial data about the state of the object is entered. The number of sources of information, the type of initial data and their volume are determined.

2. *Determination of the degree of uncertainty of the initial data.* At this stage, the degree of uncertainty of the initial data is determined based on the authors' previous research. The degree of uncertainty of the initial data is as follows: complete uncertainty; partial uncertainty and full awareness [2–4].

3. *Calculation of criteria and definition of development options.* The method being developed is intended for solving the tasks of both direct and reverse planning of the development of the research object. The value of the input parameters $\{X_i\}$ and the structure of the system-dynamic model determine the dynamics of the A_i value over time (i is the number of the computational experiment).

4. *Determination of system reaction time.* For the further calculation of the criteria, it is necessary to take into account the initial speed of the development of the event – A_0 , the maximum achievable speed of the development of the event A_{\max} and the time of reaching A_{\max} , which is equal to t_{\max} .

The parameters and results $\bar{X}_{req} = \bar{X}_j; \bar{Y}_{req} = \bar{Y}_j$ of the j -th computational experiment, for which the obtained value of the criterion is the maximum, are sought: $K_{r_j} = K_{r_{\max}} = \max(K_{r_i})_{i=1, \dots, N}$.

6. *Setting the target state of the object.* Using the obtained values of the required parameters, the K_{ri} criteria are calculated for each scenario, taking into account the weights of the indicators ($0 < w_{es} < 1$) set on the basis of user preference, which characterize the effective management of the development of the analysis object:

7. *Analysis of options for influencing the object of analysis*

The parameters and results $\bar{X}_{req} = \bar{X}_j; \bar{Y}_{req} = \bar{Y}_j$ of the j -th computational experiment, for which the obtained value of the criterion is the maximum, are sought: $K_{r_j} = K_{r_{max}} = \max(K_{r_i})_{i=1, \dots, N}$.

8. *Obtaining intermediate target states of the analysis object.* The search on the time axis of the point t_{req} of the effective transition to the next phase of the development of the object of analysis is carried out by conducting another series of simulations taking into account the change at each point $[t, t^+]$, determined with some step Δt . As a result of the calculation of the criteria for the newly obtained options, the desired t_{req} point is determined.

If necessary, a new set of values \bar{X}' can be specified at the t_{req} point. The point of transition to the next phase t_{req} is determined according to a similar scheme, but with a change in the structure and possibly the parameters of the model at the t_{req} point.

9. *Determination of options for the development of the analysis object*

The system of states for determining options for the development of the object of analysis is a final weighted directed graph Gr . The vertices of the graph mutually uniquely correspond to the states of the system, characterized by the current speed of the event (A_b), the arcs are the control determined by a set of parameters (\bar{X}_b), the weights of the arcs w_b are the costs of the corresponding transitions,

10. *Checking the value of the efficiency of the made decisions*

At this stage, the permissible decision-making time in the task of assessment and forecasting of the state of the analysis object is determined. Criterion of efficiency of the decisions taken T_n .

The conclusions:

1. In the research, the development of an algorithm for the evaluation of information and analytical support in decision making support systems was carried out. This makes it possible to increase the effectiveness of the taken decisions due to: the consistent solution of forward and reverse planning problems using simulated modeling of the dynamics of the object of analysis; providing a set of development trajectories of the analysis object at each phase;

analysis of possible options for the development of the assessment object in each phase of development and moments in time when it is necessary to carry out structural changes that ensure the transition to the next phase; taking into account the uncertainty about the state of the analysis object.

2. An example of the application of the proposed method in the analysis of the enterprise state is presented. According to the results of the analysis of the effectiveness of the proposed method, it is clear that its computational complexity is 10-15% less, compared to the methods used to evaluate the effectiveness of the made decisions.

Bibliography:

1. Romanenko, I. O., Shyshatskyi, A.V., Zhyvotovskiy, R. M., Petruk, S.M. The concept of the organization of interaction of elements of military radio communication systems. Science and Technology of the Air Force of the Armed Forces of Ukraine. 2017. No 1. pp. 97–100.

2. Романенко І. О., Животовський Р. М., Петрук С. М., Шишацький А. В., Волошин О. О. Математична модель розподілу навантаження в телекомунікаційних мережах спеціального призначення. Системи обробки інформації. 2017. № 3. С. 61–71.

3. Nalapko, O., Sova, O., Shyshatskyi, A., Protas, N., Kravchenko, S., Solomakha, A., Neroznak, Y., Gaman, O., Merkotan, D., & Miahkykh, H. (2021). Analysis of methods for increasing the efficiency of dynamic routing protocols in telecommunication networks with the possibility of self-organization. Technology Audit and Production Reserves, Vol. 5, No. 2(61), pp. 44–48. <https://doi.org/10.15587/2706-5448.2021.239096>.

4. Sova, O., Shyshatskyi, A., Nalapko, O., Trotsko, O., Protas, N., Marchenko, H., Kuvonov, A., Chumak, V., Onbinskyi, Y., & Poliak, I. (2021). Development of a simulation model for a special purpose mobile radio network capable of self-organization. Technology Audit and Production Reserves, Vol. 5, No. 2(61), pp. 49–54. <https://doi.org/10.15587/2706-5448.2021.239472>.

International scientific conference «Interaction between science and technology in modern conditions»

November 3–4, 2022

Izdevniecība «Baltija Publishing»
Valdeķu iela 62 – 156, Rīga, LV-1058
E-mail: office@baltijapublishing.lv

Iespiests tipogrāfijā SIA «Izdevniecība «Baltija Publishing»
Parakstīts iespiešanai: 2022. 7. novembris
Tirāža 100 eks.