INFORMATION TECHNOLOGIES

DEVELOPMENT OF THE MODEL OF FORCES AND RESOURCES COORDINATION IN HIERARCHICAL SYSTEM OF CIVIL PROTECTION

page 4–10

The paper deals with a hierarchical management structure in the system of civil protection of the population and the peculiarities of the Coordinating control of the system.

It is shown that the hierarchical system of civil protection of the population belongs to a class of semi-complex dynamic systems. Task coordination in this class is intractable and cannot be solved using classical approaches. Therefore, in this paper, we proposed to reduce the problem of the coordination of the civil protection of the population to the problem of support for targeted co-operative decision-making.

The features of the tasks of coordination are considered, subtasks of coordinate decisions and coordinate actions are formulated, implicit and explicit forms of coordination are highlighted.

It is conducted four-level decomposition of management structure that allowed developing the multi-agent model with the regulatory control. The principles of coordination in the hierarchical system of civil protection, implementation of which will develop mechanisms for coordination and synchronization of the objectives, plans and actions of governments at various levels of the hierarchy are proposed

It is shown that implicit coordination on the basis of the proposed model can be achieved through the mechanism of a joint search for solutions to the agents, and a clear coordination — through the mechanism of coordination of plans agents. It is proposed to solve subtask coordination in the planning of the activity of agents and sub-task coordination — in the process of implementation of the plans, dynamically adjusting them under the influence of external disturbances.

The implementation of proposed in this paper mechanisms for solving subtasks of coordinate decisions and actions in the explicit and implicit forms in the multi-agent model of a hierarchical system with a standard controller allows to find the solution of the urgent task of coordinating the forces and means in a hierarchical system of civil protection. The results of this work can be used to create decision support systems in emergencies.

Keywords: hierarchical system, coordination, multi-agent model, regulatory control.

References

1. Kodeks tsivil'nogo zahistu Ukraini vid 02.10.2012 № 5403-VI [Codex of Civil Defense of Ukraine]. (2012). *Ofitsiyniy visnik Ukraini [Official Journal of the Ukraine], № 89*, st. 3589.
2. *DK 019:2010. Natsional'niy klasifikator «Klasifikator nadzvichaynih situatsiy» [National Classification «Classification emergencies»].* (2010). Nakaz Derzhspozhivstandartu Ukraini vid 11.10.2010 № 457. Chinniy vid 01.01.2011. K.: Derzhspozhivstandart Ukraini [State Committee of Ukraine], 19.
3. *Informatsiyna dovidka pro nadzvichayni situatsii, yaki stalisya na teritorii Ukraini protyagom 9 misyatsiv 2014 roku [Memorandum of emergencies that occurred in Ukraine for 9 months of 2014].* Available: http://mns.gov.ua/opinfo/7710.html
4. Pro zatverdzhennya Poryadku klasifikatsiï nadzvichaynih situatsiy tehnogennogo ta prirodnogo harakteru za ih rivnyami [On approval of the classification of emergency situations of technogenic and natural character of their levels]. (2014). Postanova Kabineta Ministriv Ukraini № 368 vid 24.03.2004 r. *Ofitsiyniy visnik Ukraini [Official Journal of the Ukraine], № 12*, st. 740.
5. *Zahist naselennya i teritoriy vid nadzvichaynih situatsiy. T. 7 Robota nachal'nikiv pidrozdiliv i sluzhb Operativno-ryatuval'noï sluzhbi tsivil'nogo zahistu z organizatsiï ryatuval'nih ta inshih nevidkladnih robit. Mozhlivosti avariyno-ryatuval'nih formuvan' Operativno-ryatuval'noï sluzhbi tsivil'nogo zahistu [Protecting the population and territories from emergency situations. V. 7 Work chiefs of departments and services of the Operational Rescue Service of the organization of rescue and other emergency operations. Opportunities rescue units Operational Rescue Service of Civil Protection].* (2010). K.: Vidavnitstvo KiM, 352.
6. Mesarovich, M., Mako, D., Takahara, I. (1973). *Teoriya ierarhicheskih mnogourovnevyh sistem [The theory of hierarchical multilevel systems].* M.: Mir, 344.
7. Aliev, R. A., Liberzon, M. I. (1987). *Metody i algoritmy koordinatsii v promyshlennyh sistemah upravleniya [Methods and coordination algorithms in industrial control systems].* M.: Radio i svyaz', 208.
8. Altunin, A. E. (2000). *Modeli i algoritmy prinyatiya resheniy v nechetkih usloviyah [Models and algorithms for decision making in fuzzy conditions].* Tyumen': Izd-vo Tyumenskogo gosudarstvennogo universiteta, 352.
9. Hodakov, V. E., Sokolova, N. A., Kiriychuk, D. L. (2014). O razvitii osnov teorii koordinatsii slozhnyh sistem [On the development of the foundations of the theory of complex systems of coordination]. *Problemy informatsionnyh tehnologiy [Problems of Information Technologies], № 2(016)*, 25–30.
10. Plyuta, N. V., Gomenyuk, S. I. (2010). Aktual'ni napryamki rozvitku matematichnoi teorii koordinatsii v skladnih ierarhichnih sistemah [Recent trends of development of the mathematical theory of the coordination of complex hierarchical systems]. *Visnik Zaporiz'kogo natsional'nogo universitetu. Seriya Fiziko-matematichni nauki [Journal of Zaporizhzhya National University. Series Physics and mathematics], Vol. 1*, 104–109.
11. Katrenko, A. V., Savka, I. V. (2008). Mehanizmi koordinatsii u skladnih ierarhichnih sistemah [Mechanisms of coordination in complex hierarchical systems]. *Visnik Natsional'nogo universitetu «L'vivs'ka politehnika». Seriya Informatsiyni sistemi ta merezhi [Journal of the National University «Lviv Polytechnic». Series of information systems and networks],* 156–166.
12. Sherstyuk, V. (2013). *Stsenarno-pretsedentnoe upravlenie ergaticheskimi dinamicheskimi obektami [Scenario-case management ergatic dynamic objects].* Saarbrucken, Deutschland: Lambert Academic Publishing, 407.
13. Tarasov, V. (1998). Agenty, mnogoagentnye sistemy, virtual'nye soobschestva: strategicheskoe napravlenie v informatike i iskusstvennom intellekte [The agents, multi-agent system, virtual communities: strategic direction in computer science and artificial intelligence]. *Novosti iskusstvennogo intellekta [News Artificial Intelligence], № 2*, 5–63.
14. Wooldridge, M. (2002). *An Introduction to MultiAgent Systems.* N.Y.: J. Wiley & Sons, 366.
15. Rao, A. S., Georgeff, M. P. (1991). Modeling rational agents within a BDIarchitecture. KR: *Proceedings of the International Conference on Knowledge Representation and Reasoning*, 473–484.
16. Powers, R., Shoham, Y. (2005). New criteria and a new algorithm for learning in multi-agent systems. *In Advances in Neural Information Processing Systems.* MIT Press. Available: http://robotics.stanford.edu/~shoham/www%20papers/PowersShoham_Criteria_NIPS05.pdf
17. Myerson, R. B. (1982, June). Optimal coordination mechanisms in generalized principal-agent problems. *Journal of Mathematical Economics, Vol. 10, № 1*, 67–81. doi:10.1016/0304-4068(82)90006-4

DEVELOPMENT OF MODELS OF INFORMATION SECURITY THREATS FOR EVALUATION OF DAMAGE TO ASSETS

page 10–15

Analysis of information security risks is an important part in design of information security systems. To date, the process of

analysis of information security risks is reduced to the actions of the developers, based on personal experience. The analysis tools that are based on building assessments and conclusions in terms of the theory of probability are existed.

The work is dedicated to the development of systems that will formalize and use the experience of professional designers and managers, and apply when assessing assets and risks of the qualitative assessment, a closer system participants and asset owners. To achieve this goal it is required a multi-step process by which it is constructed the formalized model of risk analysis using the Coras methodology.

The models describing the behavior of the information system in the implementation of the scenarios of threats to information security are proposed. To describe the values of the parameters is used fuzzy linguistic assessment.

For descriptions of the scenarios is used the tools of Petri-Markov nets. To describe the entire process of asset valuation methodology is used the Coras. Collectively it is obtained the model describing the effect of the threat scenarios to assess the system's assets.

Using the developed model, it is possible to use natural assessment of the risks and threats that could reduce the value of the assets of the information system. The basis for this approach is the use of fuzzy linguistic terms as parameters describing the features of the system.

Keywords: asset, threat, Coras methodology, fuzzy knowledge base, linguistic variables.

References

1. Petrenko, S. (2003). Metodika postroeniya korporativnoy sistemy zashity informatsii. *CIT forum*. Available: http://citforum.ru/security/articles/metodika_zashity/
2. Pastoev, A. (2006). Metodologii upravleniya IT-riskami. *Otkrytye sistemy, 8*. Available: http://www.osp.ru/os/2006/08/3584582/
3. Lund, S., Solhaug, B., Stolen, K. (2011). *Model-Driven Risk Analysis*. Berlin: Springer-Verlag, 476. doi: 10.1007/978-3-642-12323-8
4. Ryzhov, A. P. (2013). *Elementy teorii nechetkih mnozhestv i ee prilozheniy*. M., 81.
5. Tishyn, P. M., Gayvoronskaya, G. S., Botnar, K. V. (2008). Nechetkaya mnogokriterialnaya otsenka proektnyh resheniy v mnogourovnevyh ierarhicheskih sistemah. *Visnyk SNU im. V. Dalya*, *8*, 210–214.
6. Shaporin, V. O., Tishyn, P. M., Kopytchuk, N. B., Shaporin, R. O. (2008). Otsenka veroyatnosti provedeniya ataki na setevye resursy s ispolzovaniem apparata nechetkoy logiki. *Elektrotehnicheskie i kompjuternye sistemy, 12*, 95–101.
7. Shaporin, V. O., Tishyn, P. M., Shaporin, R. O. (2015). Lingvisticheskaya otsenka aktivov slozhnoy kompjuternoy sistemy dlya analiza riskov informatsionnoy bezopasnosti. *Elektrotehnicheskie i kompjuternye sistemy, 18*, 28–32.
8. Larkin, E. V., Sokolov, V. A., Kotov, V. V., Kotova, N. A. (2008). Formaty dannyh dlya strukturno-parametricheskogo opisaniya setey Petri-Markova. *Uspehi sovremennogo estestvoznaniya, 1*, 43–47.
9. Nikitina, G. N. (2011). Analiz setej Petri Markova v koncepcii paboty informatsionnoj sistemy. *Izvestiya Tulskogo universiteta, 5–3*, 29–34.
10. Radko, N. M., Skobelev, I. O. (2010). *Risk-modeli informatsionno-telekommunikatsionnyh system pri realizatsii ugroz udalennogo i neposredstvennogo dostupa*. Moskva: RadioSoft, 232.

DEVELOPMENT OF THE SYSTEM FOR CODE GENERATION BY FLOWCHARTS WITH INTERMEDIATE TRANSLATION LANGUAGE

page 15–19

In order to reduce routine labor costs for coding that occur in the software development process, due to generation of executable program code for graphical notation schemes it is conducted analysis of means of GSA presentation and investigated aspects of verification and translation of the original graphic schemes and developed a system for generating executable program code by GSA.

The result of the analysis of means of GSA presentation is the use of UML notation and flow charts to define the source data when generating the executable codes. Also, the necessity of additional types of table variables is proved. The research aspects of the verification and transmission of the original graphic schemes highlighted job error of their structure, semantic errors, and describes means of GSA translation of executable code: the use of high-level intermediate language, translation into the intermediate unified code (such as byte-code in Java) and translation directly into executable code. Preference is given to the first method of translation, where as a high-level intermediate language is chosen Java. The developed system of generating executable program code for GSA can be used both for training and professional software engineering.

Keywords: UML, activity diagram, block diagram, GSA, translation, software code generation, design, software engineering, Java, Pascal.

References

1. Gainullin, R. F. (2014). *Development of methods and tools for analyzing and monitoring of business processes diagrammatic in the automated systems design*. Ulyanovsk, 56–57.
2. Kanzhelev, S., Shalyto, A. (2006). Automatic program code generation using state. *Paths to Competitive Advantage: Software Engineering Conference*. Moscow, 60–63.
3. Englehart, M., Szpak, P.; The Mathworks, Inc. (USA). (30.03.10). System and method for generating source code from a graphical model. *Pat. 7689970 USA*. Appl. № 10/698,820. Filed 31.10.03. 10 p.
4. Orofino II Donal, P.; The Mathworks, Inc. (USA). (16.11.10). Providing graphic generating capabilities for a model based development process. *Pat. 7834876 USA*. Appl. № 11/025,452. Filed 28.12.04. 17 p.
5. Lucanin, D., Fabek, I. (2011). A visual programming language for drawing and executing flowcharts. *MIPRO, 2011 Proceedings of the 34th International Convention*, 1679–1684.
6. Hauser, R. (2010). Automatic transformation from graphical process models to executable code. *Eidgenössische Technische Hochschule Zürich*, 22.
7. Di Bona, D., Lo Re, G., Aiello, G., Tamburo, A., Alessi, M. (2011). Methodology for Graphical Modeling of Business Rules. *2011 UKSim 5th European Symposium on Computer Modeling and Simulation*, 102–106. doi:10.1109/ems.2011.68
8. Ivanov, K.; Software Ag (Germanija). (26.06.12). Systems and methods for transforming modeled business processes into executable processes. *Pat. 8209672 USA*. Appl. № 11/798,587. Filed 15.05.07. 33 p.
9. Aho, A. V., Lam, M. S., Network, R., Ullman, J. D. (2015). *Compilers: Principles, Techniques and Tools*. Ed. 2. Moscow: Williams Publishing House, 443–444.
10. MacKlem, G. V., Wenzel, L., Gosalia, R. H., Juhasz, J. T., Dunia, R.; National Instruments Corporation (USA). (05.06.11). Automatic conversion of a textual language into a graphical program representation. *Pat. 7975233 USA*. Appl. № 11/539,424. Filed 06.10.06. 45 p.

THE ANALYSIS OF APPROACHES FOR THE FUNCTIONAL MODELING OF INFORMATION SYSTEMS

page 19–24

In this paper it is formulated the problem of integration of information systems in modern industrial enterprises. It was defined the basic classes of used information systems. Among these there are 3 classes: accounting, planning and economic class and IS of supporting production process (MES). The latter was chosen for detailed consideration as the least narrow scope.

Analysis of approaches used during functional simulation of IP of MES-class in order to choose the most contemporary approach to build a functional model of information system of MES class of manufacture that is not specialized in the development of IS.

Because of the requirement for sufficient formalized reflect the processes that occur during the operation were formed quantitative and qualitative criteria against which the effectiveness was compared to models created by the process and functional approaches. In a detailed analysis of these two approaches were identified their main advantages and disadvantages. Modeling a model of the system using the process approach can increase the versatility of information systems of MES class at the design stage, through its concentration on the final result and optimal method for achieving it. At the same time the advantage of using a functional approach due to lower cost that are necessary to develop a functional model. Thus, recommendations are proved for further functional modeling of information systems of MES class use process approach.

Keywords: information system, process approach, functioning model, functional approach.

References

1. Gaydabrus, B. V. (2012). Otsenivanie IT-gotovnosti predpriyatiy energeticheskogo mashinostroeniya. *Upravlenie proektami i razvitie proizvodstva, 1,* 128–136.
2. *Katalog veduschih predpriyatiy Ukrainyi*. (2013). Available: http://www.rada.com.ua/rus/.
3. Kulvatunyou, B., Wysk, R. A. (2000). A functional approach to enterprise-based engineering activities. *Journal of Manufacturing Systems, 19(3),* 156–171. doi: 10.1016/s0278-6125(00)80009-6
4. Grekul, V. I., Denischenko, G. N., Korovkina, N. L. (2005). Proektirovanie informatsionnyih sistem. *Internet-universitet informatsionnyh tehnologii*. Available: http://www.intuit.ru/studies/courses/2195/55/info.
5. Gorbunov, I. A. (2010). Informatsionno-tehnologicheskaya sreda v usloviyah postroeniya i razvitiya sistemyi biznes-protsessov v kompanii. *Rossiiskii ekonomicheskii internet-zhurnal*. Available: http://www.e-rej.ru/Articles/2010/Gorbunov.pdf
6. O'Brien, W. J., Joachim, H., Siddiqui, M., Topsakal, O. (2008). Challenges, approaches and architecture for distributed process integration in heterogeneous environments. *Advanced Engineering Informatics, 22(1),* 28–44. doi:10.1016/j.aei.2007.08.008
7. Kishore, R., Zhang, H., Ramesh, R. (2006). Enterprise integration using the agent paradigm: foundations of multi-agent-based integrative business information systems. *Decision Support Systems, 42(1),* 48–78. doi:10.1016/j.dss.2004.09.011
8. Feng, S. C., Song, E. Y. (2003). A manufacturing process information model for design and process planning integration. *Journal of Manufacturing Systems, 22(1),* 1–15. doi:10.1016/s0278-6125(03)90001-x
9. Fayzrahmanov, R. A., Seleznev, K. A. (2005). *Strukturno funktsionalnyiy podhod k proektirovaniyu informatsionnyih tehnologiy i avtomatizirovannyih sistem s ispolzovaniem case-sredstv*. Perm: Perm. gos. tehn. un-t, 245.
10. Kettinger, W. J., Teng, J. T. C., Guha, S. (1997, Mar.). Business process change: a study of methodologies, techniques, and tools. *MIS Quarterly, 21(1),* 55–80. doi:10.2307/249742
11. Repin, V. V., Eliferov, V. (2013). *Protsessnyiy podhod k upravleniyu. Modelirovanie biznes-protsessov*. M., 544.
12. Ferrer, I., Rios, J., Ciurana, J. (2009). An approach to integrate manufacturing process information in part design phases. *Journal of Materials Processing Technology, 209(4),* 2085–2091. doi:10.1016/j.jmatprotec.2008.05.009

THE INTRODUCTION OF THE AUTOMATED CONTROL SYSTEM FOR FARE PAYMENT WITH MOBILE MODULE NFC IN PUBLIC TRANSPORT

page 24–29

Automated control system for fare payment is a modern hardware and software tools to increase profitability of passenger traffic and effective way to improve the organization of public transport services.

After analyzing the contactless payment system in public transport of the city of Kremenchug, you can say that with the introduction of the system will benefit all participants in the transport process, both passengers and transport companies. Transport companies will be able to monitor the operation of rolling stock, conducts counting the number of passengers to adjust the mode of the drivers on the line routes to improve and optimize the transport network.

This system is simple to use by passengers, because having only a mobile phone or smart card can easily pay for travel and control expenses at any time.

Keywords: ACSFP, mobile module NFC, validation, validator, smart cards.

References

1. Spirin, I. V. (2013). Sovremennye informatsionnye tehnologii. *Nauchnyi vestnik avtomobil'nogo transporta, 2,* 41–47.
2. Buvero, A. G., Flosh, A. V. (2012). *Passazhirskie perevozki*. M.: MADI, 38.
3. Bezrukov, A. Yu. (2013). *Sistema kontrolia oplaty proezda ASKOP*. M., 23.
4. Gromov, D. Yu. (2013). *Tehnologiia NFC i perspektivy ee ispol'zovaniia na transporte*. K., 67.
5. *Kompaniia «T-Prodzhekt»*. Available: http://t-project.ru/applied-systems/electronic-payments/ticket-validators. Last accessed 22.06.2015.
6. *Avtomatizirovannaia sistema oplaty i kontrolia proezda v kommunal'nom passazhirskom transporte g. Minska*. Available: http://www.belcard.by/cgi-bin/view.pl?topicid=ca12ef93
7. *TAdviser Portal*. Available: http://www.tadviser.ru/index. Last accessed 22.06.2015.
8. *Avtomatizirovannaia sistema kontrolia oplaty proezda*. Available: http://smilink-kursk.ru/articlematerial19
9. *Novaia sistema kontrolia oplaty proezda*. Available: http://www.lytkarino.info/news/785/
10. *Ofitsial'nyi sait administratsii Kurskoi oblasti*. Available: http://adm.rkursk.ru/index.php

A COMPOSITIONAL TECHNIQUE OF TASK SOLUTION OF TRADE STOCK THAT LOSES NATURAL PROPERTIES

page 29–34

The mathematical models of the problem of task of trade stock that lose their natural properties, taking into account complex factors, are given in the article. Parametric identification of the given models is complex, non-trivial process that requires the use of a method that does not depend on the choice of starting point and does not require verification of additional restrictions on the characteristics of the objective function.

It is proposed a composite method of direct optimization adapted to the task solution of trade stock that loses natural properties, taking into account complex factors. The algorithm of its implementation in search space of possible solutions is investigated. The aspects of program implementation of the method are considered. The experimental verification of models is done. The experiments show that the best results are obtained within a reasonable time are obtained in the case of developed punitive function compared with adaptive and fuzzy punitive functions, due to their focus on simulation of fuzzy variables.

Keywords: optimization, simulation, stocks, limitation, punitive function.

References

1. Chung, K. J., Liao, J. J. (2004). Lot-sizing decisions under trade credit depending on the ordering quantity. *Computers & Operation Research, Vol. 31, № 6,* 909–928. doi:10.1016/s0305-0548(03)00043-1

2. Sharma, A., Goel, R., Dua, N. K. (2012). Optimal policy for EOQ model with two level of trade credits in one replenishment cycle. *American Journal of Operations Research, Vol. 2, № 1,* 51–58. doi:10.4236/ajor.2012.21006
3. Shah, N. H., Raykundaliya, N. (2009). Optimal inventory policies for Weibull deterioration under trade credit in declining market. *Indus Journal of Managment & Social Sciences, Vol. 3, № 2,* 11–20.
4. Hou, K. L., Lin, L. C. (2009). A cash flow oriented EOQ model with deteriorating items under permissible delay in payments. *Journal of Applied Sciences, Vol. 9, № 9*, 1791–1794. doi:10.3923/jas.2009.1791.1794
5. Rajeswari, N., Vanjikkodi, T. (2012). An inventory model for items with two parameter Weibull distribution deterioration and backlogging. *American Journal of Operations Research, Vol. 2, № 2,* 247–252. doi:10.4236/ajor.2012.22029
6. Tripathy, C. K., Pradhan, L. M. (2012). An EOQ model for three parameter Weibull deterioration with permissible delay in payments and associated salvage value. *International Journal of Industrial Engineering Computations, Vol. 3, № 2,* 115–122. doi:10.5267/j.ijiec.2011.07.004
7. Hsu, J.-T., Hsu, L.-F. (2013). Two EPQ models with imperfect production processes, inspection errors, planned backorders, and sales returns. *Computers & Industrial Engineering, Vol. 64, № 1,* 389–402. doi:10.1016/j.cie.2012.10.005
8. Yegorova, O. (2014). Fuzzy expected value model with inspection errors and two level of trade credit in one replenishment cycle. *Information Models and Analyses, Vol. 3, № 1,* 37–52.
9. Yegorova, O., Snytyuk, V. (2015). Multidimensional compositional overcoming uncertainty technology. *In Proceedings of the International Conference Computational Intelligence (Results, Problems and Perspectives), May 12–15, 2015, Kyiv-Cherkasy.* Cherkasy: editor July Chabanenko, 68–69.
10. Yegorova, O., Pasishnyy, I. (2014). Fuzzy constraint handling technique used with genetic algorithms to optimize order quantity. *Eastern-European Journal of Enterprise Technologies, 5(4(71))*, 63–67. doi:10.15587/1729-4061.2014.27915

FORECASTING QUANTITATIVE CHARACTERISTICS OF OFFICIALLY REGISTERED HIV-INFECTED PERSONS IN THE REGION

page 34–39

The task of predicting quantitative characteristics of officially registered HIV-positive persons in the region occurs during the planning of public social and medical programs which by their nature programs of providing various services (medical, social, psychological, etc.) to target group of populations. Because these programs are developed and approved by both the national and regional level for a long period (five years), while planning measures provide key services is the availability of information on the expected number of users of these services for the period of the program.

The problem of forecasting the quantitative characteristics of officially registered HIV-positive persons in the region is considered as the problem of forecasting based on time series. The features of the problem solving by methods of autoregression, Winters, least squares with weights, linear and quadratic model Brown are analyzed. For each method it is noted feature of its application and guidelines. It is proposed to calculate the predicted values of quantitative characteristics of the target group of people using synthesized forecasting scheme based on basic models. To solve the problem it is made specific calculation, during which stipulates that the slightest error of prediction of quantitative characteristics of the target group of individuals achieved through the use of synthetic schemes. Predicted values of basic quantitative characteristics of officially registered HIV-infected persons in Zakarpattya region in the period from 2015 to 2019 are calculated. Quantitative characteristics that calculated in the study can be used in planning activities to provide services to people living with HIV in the implementation of state and national programs in Ukraine aimed at countering HIV/AIDS.

Keywords: forecasting model, time series, quantitative characteristics of officially registered HIV-infected persons.

References

1. Makarova, O. V. (2004). *Government social programs: theoretical aspects, method development and evaluation*. K.: Lear-K, 328.
2. On approval of the Concept of the National Programme on the Response to HIV/AIDS in the years 2014–2018. *Order of Cabinet of Ministers of Ukraine on 13 May 2013 № 356-p*. Available: http://zakon2.rada.gov.ua/laws/show/356-2013-p
3. On approving the National Target Programme on Combating HIV/AIDS in the years 2014–2018. *Law of Ukraine on October 20, 2014 № 1708-VII*. Available: http://zakon2.rada.gov.ua/laws/show/1708-18
4. *Evaluation of the size of risk groups vulnerable to HIV infection in Ukraine*. (2011). Kyiv, 39.
5. Mironyuk, I. S., Mulesa, O. Yu. (2013). Application of Information Technology to solve the problem of estimation of the number of high risk groups of HIV. *Bulletin of Social Hygiene and Public Health Organization Ukraine, 3(57)*, 55–63.
6. National Assessment of HIV/AIDS in Ukraine as of early 2012. (2012). *The State Service of Ukraine on combating HIV/AIDS and other socially dangerous diseases*. Kyiv, 12.
7. Chatfield, C. (2013). *The analysis of time series: an introduction*. CRC press, 352. doi:10.1007/978-1-4899-2921-1
8. Kuharev, V. N., Sally, V. N., Erpert, A. M. (1991). *Economic-mathematical methods and models in the planning and management*. Kiev: Vishcha School, 328.
9. Snytiuk, V. Ye. (2008). *Forecasting. Models. Methods. Algorithms*. K.: «Maklaut», 364.
10. Mendel, A. S. (2004). Method counterparts in predicting short time series: expert-statistical approach. *Automation and Remote Control, 4*, 143–152.
11. Zaichenko, Y. P., Mohammed, Moamed, Shapovalenko, N. V. (2002). Fuzzy neural networks and genetic algorithms in problems of macroeconomic forecasting. *Scientific news «KPI», 4*, 20–30.
12. Kasabov, N. K., Song, Q. (2002). DENFIS: dynamic evolving neural-fuzzy inference system and its application for time-series prediction. *IEEE Transactions on Fuzzy Systems, 10(2)*, 144–154. doi:10.1109/91.995117
13. Van Gestel, T., Suykens, J. A., Baestaens, D. E., Lambrechts, A., Lanckriet, G., Vandaele, B., Vandewalle, J. (2001). Financial time series prediction using least squares support vector machines within the evidence framework. *IEEE Transactions on Neural Networks, 12(4)*, 809–821. doi:10.1109/72.935093
14. Kozadaev, A. S., Arzamasians, A. A. (2006). Prediction of time series with the apparatus of artificial neural networks. The short-term forecast of air temperature. *Bulletin of the University of Tambov. Series: Natural and Technical Sciences, 11(3)*, 299–304.
15. Geche, F., Mulesa, O., Geche, S., Vashkeba, M. (2015). Development of synthesis method of predictive schemes based on basic predictive models. *Technology Audit And Production Reserves, 3(2(23))*, 36–41. doi:10.15587/2312-8372.2015.44932
16. HIV infection in Ukraine. (2015). *Newsletter, 43*, 109.

METHODOLOGICAL AND INSTRUMENTAL TOOLS OF GENERATION OF STRATEGIES OF KNOWLEDGE-INTENSIVE HIGH-TECH INDUSTRIES

page 40–44

An approach to the problem of decomposition of decision support for strategic management of the development of knowledge-intensive high-tech industries is proposed in the article. The subject of the research is methodological tools and generates strategies for the development of knowledge-intensive high-tech industries. Complexity and specificity of the strategy develop-

ment are analyzed. A scheme for generating strategies for the development of knowledge-intensive high-tech industries is considered, as well as the matrix model of the relative effectiveness level assessment of a hierarchical system of business processes in the organization is considered. It is used the original tool of normalized charts as graphic-analytical tools for analysis of the relative effectiveness of substrategies of organization. It is developed optimization mechanism for selecting strategies to improve the competitiveness of the organization, ensuring optimal allocation of resources between the volumes of measures to improve the efficiency of certain business processes in the organization. Algorithmic and software tools for modeling business processes in functionality are systematized.

Keywords: strategy of production development, modeling tools of business processes.

References

1. Gruzinov, V. P., Astaf'eva, I. A. (2012). Effektivnost' upravleniia promyshlennymi predpriiatiiami: teoreticheskii aspekt. *Zhurnal avtomobil'nyh inzhenerov, 1(72)*. Available: http://www.aae-press.ru/f/72/44.pdf
2. Velihanova, A. R. (2008). Osnovnye printsipy i zadachi effektivnogo upravleniia predpriiatiem v problemnoi srede. *Transportnoe delo Rossii, 3*, 30.
3. Kovalishina, G. V. (2002). Sistemnyi podhod v otsenke effektivnosti upravleniia firmoi. *Audit i finansovyi analiz, 2*. Available: http://www.auditfin.com/fin/2002/2/rkovalishina/rkovalishina.asp
4. Pastuhova, V. V. (2000). *Ispol'zovanie SWOT-analiza v protsesse vybora global'noi strategii predpriiatiia*. Donetsk: AOOT Donetskii Torgovyi Dom «Donbass», 74.
5. Gaponenko, A. L., Pankruhin, A. P. (2010). *Strategicheskoe upravlenie*. M.: Omega-L, 472.
6. Vartanian, V. M., Steliuk, B. B., Golovanova, M. A., Dronova, I. V. (2009). *Modeli, metody i instrumental'nye sredstva podderzhki priniatiia reshenii v naukoemkom vysokotehnologicheskom proizvodstve*. H.: ID «INZhEK», 224.
7. Romanenkov, Yu. A., Vartanian, V. M., Zeiniev, T. G. (2014). Optimizatsionnyi mehanizm vybora strategii po-vysheniia konkurentosposobnosti organizatsii. *Radioelektronnye i komp'iuternye sistemy, 4(68)*, 150–156.
8. Pokropivnij, S. F. (2002). *Ekonomika predpriiatiia*. K.: KNEU, 605.
9. Zueva, A. G., Noskov, B. V., Sidorenko, E. V., Vsiakih, E. I., Kiselev, S. P.; In: Tresko, I. A. (2008). *Praktika i problematika modelirovaniia biznes protsessov*. M.: DMK Press; Kompaniia AiTi, 246.
10. Alad'ev, V. Z., Boiko, V. K., Rovba, E. A. (2011). *Programmirovanie v paketah Maple i Mathematica: Sravnitel'nyi aspekt*. Belarus': Grodno, Grodnenskii gosudarstvennyi universitet, 517.
11. Plehanov, A. V. (2010). *Matematiko-statisticheskie metody obrabotki informatsii s primeneniem programmy SPSS*. SPb.: SPb-GUEF, 96.
12. Kul'tin, N. B. (2009). *Instrumenty upravleniia proektami: Project Expert i Microsoft Project*. SPb.: BHV-Peterburg, 160.
13. *Sravnitel'nyi analiz programm dlia biznes-modelirovaniia*. Available: http://bigc.ru/instruments/compare/
14. Cheremnyh, S. V., Semenov, I. O., Ruchkin, B. C. (2006). *Modelirovanie i analiz sistem. IDEF-tehnologii*. M.: Finansy i statistika, 192.

DEVELOPMENT AND USE OF INFORMATION TECHNOLOGY FOR EVALUATING AN OPERATOR'S VISUAL PROFILE FUNCTIONAL STATE

page 45–49

The article presents the information technology of functional assessment of visual profile of the operator, which allows to record the performance with the help of hardware and software, to carry out the selection of informative indicators based on the minimization of their connectedness and predict changes in this state in the process of visual work with different kinds of visual load. It is shown the possibility of using the correlation method and calculated with the help of the multicollinearity index to determine the optimal set of indicators of the functional state of the subjects and research degree of tension and mobilization of the body in the process of visual work

Information processing algorithm about the functional status of the operator of the visual profile, that proposed in the article, can be used not only to assess the current functional state and predict changes in the condition of the original in the performance of different types of visual problems, but also to forecast the state of the operator for a wide range of tasks.

Keywords: information technology, operator of the visual profile, assessment of functional state, fatigue, software and hardware package.

References

1. Philenko, I. A. (2003). Psihosamotychni aspects of operator activity. *Herald of Kharkiv State Pedagogical University n.a. G. S. Skovoroda, 10*, 196–202.
2. Dmitrieva, N. V., Hlazachev, A. S. (2000). Polyparametryck consumer information system for functional-diagnostically of research. *Scientific-theoretical magazine «Artificial Intelligence», 2*, 53–58.
3. Wilson, G. F. (2005). Operator functional state assessment for adaptive automation implementation. *Proceedings — spie the international society for optical engineering, Vol. 5797*, 100–104. doi:10.1117/12.601806
4. Zhang, J.-H., Wang, X.-Y., Mahfouf, M., Linkens, D. A. (2008). Fuzzy Logic based Identification of Operator Functional States Using Multiple Physiological and Performance Measures. *International Conference on BioMedical Engineering and Informatics, Vol. 1*, 570–574. doi:10.1109/bmei.2008.181
5. Fainzilberg, L. S. (2005). New information technology for electrocardiograms processing to detect coronary artery disease in the mass screening of the population. *Control systems and machines, 3*, 63–71.
6. Baevsky, P. M., Chernikova, A. G. (2002). The physiological norm problem: a mathematical model of functional states based on the analysis of heart rate variability. *Aerospace and Environmental Medicine, 5*, 30–31.
7. Hzhehotsky, M. R., Mysakovets, O. H., Petrishin, Y. S. (2006). Determining the level of fatigue of PC users. *Modern information and electronic technologies, scientific conference, Odessa, 22–26 April 2006*, 195.
8. *Electromyographic hardware complex «NEIROMIOGRAF»: Technical description and user manual*. (2003). Moscow, 7.
9. Shishkin, G. G., Ageev, I. M., Eskin, S. M. (2005). Instrument computerized system for diagnosing the functional state of the operators of radio stations. *Microwave equipment and telecommunication technologies: 15-th International Crimean Conference, Sevastopol*, 892–893.
10. Kravchenko, M. F., Stavitskiy, R. V., Lebedev, L. A. (2006). Using analytical complex AKC-ENOFIT to survey large population groups. *Medical equipment, 4*, 41–43.
11. Knorring, V. G., Knorring, L. N., Martynov, V. N., Salnikov, V. Y. (1997). Diagnostic and medical complex with reconfigurable structure. *Medical facilities: two-month scientific and technical journal, 1*, 17–20.
12. Chernyak, A. N., Dovgyallo, E. N., Vykhovanets, J. G., Mironov, G. I. (2005). Neyrokompyutering psychophysiological state. *Bulletin of Hygiene and Epidemiology, 5(1)*, 41–43.
13. Kochina, M. L., Lad, S. N., Saikivska, L. F. (2009). Approaches to modeling the functional state of the visual system. *Cybernetics and Computer Engineering, 159*, 19–27.
14. Kochina, M. L., Saikivska, L. F. (2006). Atomatiziing complex for diagnostics of functional state of PC users. *Radio engineering: Ukrainian interdepartmental scientific and technical collection, 146*, 49–54.
15. Vilenkin, S. Y. (1979). *Statistical analysis of random functions results research*. M.: Enerhyia, 320.

16. Ferster, E., Renz, B. (1983). *Methods of correlation and regression analysis*. M.: Fynansy i statystyka, 302.
17. Navakatikyan, S. A., Kryzhanovskaya, V. V., Kalnish, V. V. (1987). *Physiology and hygiene mental labor*. K.: Zdorov'ja, 152.
18. Navakatikyan, A. O., Kalnish, V. V., Martirosova, V. M. et al. (1986). VDT-users; efficancy: Methods of investigation and assessment criteria. *Proceedings of International Conference on Work with Display Units*. Stockholm, 10–13.
19. Kryvonosov, M. V., Podrihalo, L. V., Kochyna, M. L., Yavorskyi, O. V., Maslova, N. M. (17.12.2001). Sposib diahnostyky i informatsiinoho navantazhennia drukovanykh vydan dlia ditei ta pidlitkiv. *Patent of Ukraine 43719A, MPK A 61 V 10/00*. Appl. № 2001063812. Filed.06.06.2001. Bul. № 11, 1.

TASK FORMALIZATION OF CONSTRUCTING RATIONAL PRODUCT ASSEMBLY SEQUENCE

page 49–54

Analysis of technology of assembly processes has allowed developing mathematical models that reflect the structure of the product and the production system. Ways of reducing the production cycle are defined. On this basis, the rules are designed to rationalize assembly operations.

It is proposed a method of constructing a rational product assembly sequence. Its design takes into account the requirements of safety, assembly dimensional chain, simultaneous installation of several based elements on the base, precision of parts manufacturing, allocation of component assembly.

A method of solving this problem is characterized in that the assembly for this synthesis process is considered complex and environmental constraints. It provides the necessary quality of the product. Application of the method allows to obtain a sequence of assembly, which is suitable for practical implementation in a given production system and to minimize the duration of the production cycle.

Keywords: production cycle, environmental restrictions, assembly sequence, method, algorithm.

References

1. Arpent'ev, B. M., Kutsyn, A. N., Sozonov, Yu. I. (2001). Prognozirovanie kachestva funktsionirovaniia tehnicheskih sistem. *Vestnik NTU «KhPI», 10,* 41–49.
2. Zarubin, V. N., Kapustin, N. M. (1979). *Avomatizirovannaia sistema proektirovaniia tehnologicheskih protsessov mehanosborochnogo proizvodstva*. M.: Mashinostroenie, 274.
3. Zaharov, N. V., Timofeev, Yu V. (1992). *Razrabotka tehnologicheskih protsessov sborki*. K.: UMKVO, 152.
4. Lebedovskii, M. S. (1977). *Avtomatizatsiia protsessov v mashinostroenii*. L.: SZPI, 81.
5. Savuliak, V. V. (2013). *Skladal'ni protsesi v mashinobuduvanni*. Vinnitsia: VNTU, 99.
6. Shabaikovich, V. A. (2011). Problemi skladal'nogo virobnitstva. *Visnyk Natsionalnoho universytetu «Lvivska politekhnika», 713*, 212–216.
7. Vanin, O. V. (2011). Suchasni pidhodi do proektuvannia seriinih avtomatizovanih skladal'nih kompleksiv. *Materialy 8 Mizhnar. naukovo-praktychnoi internet-konferentsii «Suchasnist. Nauka. Chas. Vzaiemodiia ta vzaiemovplyv»*. Available: http://intkonf.org/vanin-ov-suchasni-pidhodi-do-proektuvannya-seriynih-avtomatizovanih-skladalnih-kompleksiv/
8. Bozhidarnik, V. V., Grigor'eva, N. S., Shabaikovich, V. A. (2005). *Avtomatichne skladannia virobiv*. Luts'k: Nadstir'ia, 386.
9. Grin'ova, V. M., Salun, M. M. (2009). *Organizatsiia virobnitstva*. K.: Znannia, 582.
10. Voronin, A. V., Grechuhin, A. I., Kalashnikov, A. S. et al. (1985). *Mehanizatsiia i avtomatizatsiia sborki v mashinostroenii*. M.: Mashinostroenie, 316.
11. Larichev, O. I. (2006). *Teoriia i metody priniatiia reshenii*. M.: Logos, 392.
12. Bozhko, A. N. (2010). Vybor ratsional'noi posledovatel'nosti sborki izdeliia. *Nauka i obrazovanie, 7*. Available: http://technomag.edu.ru/doc/147483.html/. Last accessed 08.07.2015.
13. Timofeev, Yu. V., Zaharov, N. V., Mel'nichenko, A. A. (1994). Matematicheskaia model' upravleniia tochnost'iu obshchei sborki agregatnih stankov. *Visnik SumDU, 1*, 49–54.
14. Tanaev, V. S., Povarich, M. P. (1974). *Sintez graf-shem algoritmov vybora reshenii*. Minsk: Nauka i tehnika, 112.
15. Haustova, A. V. (2000). *Formalizatsiia proektnyh reshenii formirovaniia struktur ob'ektov tehnologicheskogo proektirovaniia*. Lugansk, 197.
16. Bazrov, B. M., Shalin, A. P. (1987). *Ritmichnost' — put' povysheniia effektivnosti izgotovleniia detalei na stankah-avtomatah i avtomaticheskih liniah. Vol. 2*. M.: VNII TEMR, 48.
17. Konoplianchenko, E. V. (2001). *Pidvishchennia nadiinosti roboti skladal'nih sistem shliahom optimizatsii chasovih tehnologichnih lantsiugiv*. Kharkiv: NTU «KhPI», 20.

INFORMATION AND CONTROL SYSTEMS

THEORETICAL ANALYSIS OF INTERACTION BETWEEN RADIO PULSES AND COLORADO POTATO BEETLES IN THE POTATO PLANT ENVIRONMENT

page 55–59

To analyze the distribution of electric intensity of radio-pulse radiation in the plant environment with Colorado potato beetles it was developed the model in the form of the box filled with an isotropic dielectric medium with permittivity and conductivity. The nonstationary problem describing the distribution of electrical intensity of radio-pulse radiation by Maxwell's equations, using Laplace transform reduced to the Helmholtz equation. Solution of Helmholtz equations were obtained by separation of variables.

After a series of transformations were obtained by the equation of the electric field components for the plant layer of the Colorado potato beetles.

The study of the radio-pulse electromagnetic radiation distribution in the plant environment with Colorado potato beetles and their larvae will determine the necessary biotropic parameters (pulse-modulated frequency, pulse power, pulse period, pulse duration, time of exposure of the plant environment with Colorado potato beetles) radio-pulse energo-informational electromagnetic radiation to suppress reproduction ability of the beetles and destroying their larvae.

Keywords: radio-pulse radiation, Colorado potato beetle, energo-informational radiation, biotropic parameters of the electromagnetic field.

References

1. Hare, J. (1990). Ecology And Management Of The Colorado Potato Beetle. *Annual Review of Entomology, Vol. 35, № 1*, 81–100. doi:10.1146/annurev.ento.35.1.81
2. Tansky, V. I. (1975). *Harm of insects and methods of its study. Overview*. Moscow: VNIITESK MSK, 70.
3. Kozak, A. V. (2012). Application of EMF to kill pests in the soil of biological root systems of plants. *Bulletin of the National Technical Polytechnic University «Kharkiv Polytechnic Institute», № 14*, 13–15.
4. Grigoriev, I. V. (2004). Experience in the fight against dangerous pests. *Protection and Quarantine of plants, № 1*, 12–14.

5. Adamova, S. V. (2009). Analysis of the pulsed electromagnetic fields interaction with pests of fruit plants. *Bulletin of the National Technical Polytechnic University «Kharkiv Polytechnic Institute», № 44*, 3–8.
6. Dubik, V. N. (2011). Protection of fruit crops from pests. *Bulletin of the National Technical Polytechnic University «Kharkiv Polytechnic Institute», № 12*, 121–129.
7. Kozak, A. V., Kosulina, N. H., Frost, O. M. (2010). Analysis of methods for destruction of biological pest in root seedlings of fruit trees. *A national scientific production and information magazine. Energy conservation, energy efficiency and conservation, № 10(92)*, 68–72.
8. Carpenter, D. O., Ayraetyan, S. (2006). Bioloqical Effects of Electric and Maqnetic Fields. *Sources and Mechanisms, Vol. 1.* New York: Academic Press, 372.
9. Berg, H., Zhang, L. (2005). Electrostimulation in cell biology by low-frequency electromagnetic fields. *Bioelectoch. Bioener., Vol. 31*, 1–25.
10. Binhi, V. N. (2005). *Maqnetobioljqy: Underlyinq Physical Problems*. San Ditgo: Academic Press, 473.
11. Dumanskiy, A. V., Mikhailova, L. N. (2013). Analysis of informational electromagnetic radiation on the physical and chemical processes in biological objects. *Journal of Kharkov National Technical University of Agriculture of Petro Vasilenko. The problems of energy supply and energy efficiency in agriculture, Vol. 142,* 83–86.
12. Nikolskiy, V. V. (1978). *Electrodynamics and Propagation*. M.: Nauka, 544.
13. Lavrentiev, M. A., Shabat, B. V. (1958). *Methods of complex variable theory*. M.: GIFML, 692.

THEORETICAL ANALYSIS OF THE MICROWAVE RADIATION INTERACTION WITH ANIMALS SUFFERING BY MASTITIS

page 59–63

To analyze the distribution of electric intensity of radio-pulse radiation in the mammary gland of ewes it is developed the model in the form of a truncated circular cone shape, filled with an isotropic medium with a different dielectric permittivity.

In this article we solve the problem of homogeneous Maxwell equations describing distribution of the electric and magnetic fields in the module of the breast ewes by the method of integral equations.

As a result of reforms, the initial transient problem has been reduced to the following series of problems of the diffraction of monochromatic fields with frequency $\omega_m = \pm 1, \pm 2, \ldots$. for the area of the mammary gland of ewes.

Formulated diffraction problems are reduced to integral equations for the field of the mammary gland of ewes.

To this aim, using Green's formula, it was obtained integral equation for the distribution of the electric field inside mammary gland.

A theoretical analysis found that for the treatment of infectious mastitis of ewes should be carried out using radio-pulse radiation with frequency 30,8 GHz, pulse width $1 \cdot 10^{-6}$ sec, pulse repetition period $1 \cdot 10^{-4}$ sec, radio pulse amplitude within the sheep udder $|E_m|^2 / E_0^2 = 3{,}5 \cdot 10^{-3}$ (pulse, argon irradiation time of patients) for the treatment of mastitis of the ewes.

Keywords: radio-pulse radiation, mastitis, model of the internal organs of animals, information-wave therapy.

References

1. Ramazanov, S. D. (2000). Mastitis of sheep. *Sheep, № 4*, 40–41.
2. Golovko, A., Veyometov, V., Hutvinska, E. (2001). Etiopathogenesis of mastitis and their means of therapy. *Veterinary medicine of Ukraine*, 20–21.
3. Bessonov, A. E., Kolmykova, E. A. (2003). *Information Medicine*. M., 658.
4. Mikhailova, L. (2012). Determination of the parameters of electrodynamic system of multidiode gen-erator of very high range. *Eastern-European Journal Of Enterprise Technologies, 1(9(55))*, 36–38. Available: http://journals.uran.ua/eejet/article/view/3439
5. Karu, T. I., Pyatibrat, L. V., Afanasyeva, N. I. (2005). Cellular effect of low power laser therapy can be mediated by nitric oxide. *Lasers in Surgery and Medicine, Vol. 36, № 4*, 307–314. doi:10.1002/lsm.20148
6. Karu, T. I., Kolyakov, S. F. (2005). Exact action spectra for cellular responses relevant to phototherapy. *Photomedicine and Laser Surgery, Vol. 23, № 4,* 355–361. doi:10.1089/pho.2005.23.355
7. Sasimova, I. A., Kuchin. L. F. (2008). Explanation of informational biophysical influence of electromagnetic radiation on microbiological objects of livestock. *Eastern European Journal of advanced technologies, 4(2)*, 27–29.
8. Dumanskiy, A. V., Mikhailova, L. N. (2013). Analysis of informational electromagnetic radiation on the physical and chemical processes in biological objects. *Journal of Kharkov National Technical University of Agriculture of P. Vasilenko. The problems of energy supply and energy efficiency in agriculture Ukraine, Vol. 142*, 83–86.
9. Olenyuk, A. A., Mikhailova, L. N., Moroz, A. N. (2012). Biophysical analysis of the electromagnetic field influence on the information processes in biological objects. *Journal of Kharkov National Technical University of Agriculture of P. Vasilenko, Vol. 130*, 120–123.
10. Bessonov, A. E., Kolmukova, E. A. (2003). *Information medicine*. M., 658.
11. Nykolski, V. V. (1978). *Distribution and electrodynamics of radiowaves*. M.: Nauka, 544.
12. Colton, D., Kress, R. (1987). *Methods of integral equations in scattering theory*. M.: Mir, 312.

THE USE OF SDRAM FOR SYNCHRONIZED SWITCHING OF TELEVISION SIGNALS

page 63–68

The investigation of the possibility of using SDRAM-chip for synchronization of pre-unsynchronized television signals. Such type of memory can significantly reduce the cost of the synchronized switching television signals in the case of multi-user mode and a large number of sources (1000 and more) and build a switching system over a large area. Timing diagrams of the digital switching unit, which allows drawing conclusions about the possibility of using such devices for solving the problem of synchronization. This is important to optimize the cost of construction and redesign of the system when the location of the sources on a large territory may be situational and for a brief time to change. This approach also makes it possible to minimize the size of the switching system and fiber-optic camera channels, which do not depend on the number of service sources. According to the authors, such technical solution is proposed for the first time.

Keywords: switching television signals, SDRAM-buffering, routing, multi-user mode, TCP, TCP-simulator, path.

References

1. Dzhakoniya, V. E., Gogol', A. A., Druzin, Ja. V. (2007). *Television*. M.: Hot Line — Telecom, 616.
2. Olifer, V. G., Olifer, N. A. (2001). *Computer networks. Principles, technologies, protocols*. Saint Petersburg: Piter, 672.
3. Butenko, V. V. (2014). *Digital television broadcasting. Anywhere and anytime. To all and anyone*. M.: Scientific Research Institute of NIIR), 481.
4. Glasman, K. (2006). Conference IBC2006. *Journal «625», 10*, 66–71.
5. Bau, N. D. Experience delivery networking: the network ahead. *Global Telecoms Business*. Available: http://www.globaltelecomsbusiness.com/article/2907010/Experience-delivery-networking-the-network-ahead.html

6. Teterin, V. S. (1971). *Peculiarities of television directing at the multi-camera shooting method*. M.: VGIK, 105.
7. Mamchev, G. V. (2007). *Peculiarities of radio communication and television. University textbook*. M.: Hot Line — Telecom, 416.
8. Baron, S. N., Krivocheev, M. I. (1996). *Digital image and audio communication. Toward a global information infrastructure*. New York: Van Nostrand Reinhold, 288.
9. Panchenko, B. E., Pechenyuk, D. A. (2013). Framework analysis of the methods video signal switching. *Control systems and computers, 5*, 53–64.
10. Zubarev, Y. S., Krivosheev, M. I., Krasnoselsky, I. N. (2001). *Digital television broadcasting. Foundations, methods, systems*. Moscow: Scientific Research Institute of Radio (NIIR), 548.
11. Sokolov, A. G. (2001). *Montage: TV, movies, video*. M.: Publishing House «625», 207.
12. Rossmere, D. L., Glenn, R. S., Brown, W. B., Carluci, J. B., Duffy, R. W.; Sony Corporation, Sony Electronics, Inc. (2000, Jul. 18). Random access audio/video processor with compressed video resampling to allow higher bandwidth throughput. *Pat. US-6092119, 07-2000*. Available: http://www.google.com/patents/US6092119
13. Ota, K., Yamauchi, T. (2003, Oct. 30). Synchronous signal superimposing apparatus and synchronous signal superimposing method, which use constant current source. *Pat. US 2003/0202123 A1, 04-2003*. Available: http://www.google.com.ar/patents/US20030202123
14. Murakami, N.; Imagenics Co., Ltd. (2009, Apr. 30). Video switcher and video switching method. *Pat. US 2009/0109334 A1*. Available: http://www.google.com/patents/US20090109334
15. Panchenko, B. E., Pechenjuk, D. A. (2013, Nov. 7). Method of automated digital multi-program multi-signal commutation. *Pat. US 2013/0294457 A1, 11-2010*. Available: http://www.google.com/patents/US20130294457
16. Shimizu, H. Multiple channel image output device. *Pat. JP 2007235454 A, 02-2006*.
17. Liang, N. (2008, Jan. 9). Video signal synthesis controller. *Pat. CN 200620016569, 01-2008*. Available: http://www.google.ee/patents/CN201004686Y?cl=en&hl=et
18. Casper, D. A., Krim, M. J., Willis, J. D. (2010, Apr. 29). Dual use video mixer crosspoint matrix. *Pat US-2010/0103320, 04-2010*. Available: http://www.google.com.ar/patents/US20100103320
19. Cummings, C. E. (2002). Simulation and Synthesis Techniques for Asynchronous FIFO Design. *Synopsys Users Group Conference*. San Jose, CA, 22.
20. Arakelov, A. A., Sidorov, E. A., Bobkov, S. G. (2005). Architecture of a SRAM memory interface to provide the maximum switch device performance. *Problems of Advanced Microelectronic Systems*. M.: Institute for Design Problems in Microelectronics, RAS, 229–234.
21. Sharma, A., Ali, C. Z. (2013). Construct High-Speed SDRAM Memory Controller Using Multiple FIFO's for AHBMemory SlaveInterface. *International Journal of Emerging Technology and Advanced Engineering, Vol. 3, № 3*, 907–916.
22. Panchenko, B. E., Pechenyuk, D. A. (2015). Method of automated digital multi-program selective routing of digital signals in relation to their switching. *Appl. № a2015-02982*. 10.