MATHEMATICAL MODELING

MODELING OF THE OPTIMAL FLEET STRUCTURE AND PERSPECTIVE DIRECTIONS OF ITS WORK

page 4–8

In this research it is consider the structure optimization problem of the fleet structure and areas of its work within the annual period of time. It is analyzed the disadvantages in the existing approaches to solving this problem. Based on the requirements of practice and specificity of the annual planning period the main requirements to the fleet structure, on their basis are formulated and an economic-mathematical model on their base is developed.

The model takes into account the fact that the fleet structure within the annual period of time can vary by chartering/chartering out of ships. The result of the model implementation is the optimal combination of «set of ships» — «set of freight traffic», providing a maximum profit in the period under review. In this case the main limitation is demand. The criterion for optimizing the fleet structure and directions of its work is profit, which takes into account the potential downtime of ships and related loss of revenue and operating expenses.

The presented model can be used in the practice of maritime carriers to address issues on freight policy and marketing policy.

Keywords: modeling, fleet, ships, optimization, traffic flows, structure, chartering, rent, time-charter.

References

1. Lukashov, A. V. (2005). Mezhdunarodnyye finansy i upravleniye valyutnymi riskami v nefinansovykh korporatsiyakh. *Upravleniye korporativnymi finansami, № 1*, 36–52.
2. Voyevudskiy, Y. N., Konevtseva, N. A., Makhurenko, G. S., Tarasova, I. P.; In: Voyevudskiy, Y. N. (1986). *Ekonomiko-matematicheskiye metody i modeli v upravlenii morskim transportom*. M.: Transport, 287.
3. Gromovoy, E. P. (1979). *Matematicheskiye metody i modeli v planirovanii i upravlenii na morskom transporte*. M.: Transport, 360.
4. Stopford, M. (1997). *Maritime Economics*. Ed. 2. Routledge, 562. doi:10.4324/9780203442661
5. Onyshchenko, S. P. (2009). *Modelirovaniye protsessov organizatsii i funktsionirovaniya sistemy marketinga morskikh transportnykh predpriyatiy*. Odessa: Feniks, 328.
6. Shibayev, A. G., Rylov, S. Y., Koskyna, Yu. A., Sudnyk, N. V. (2011). Raspredeleniye stepeni vliyaniya kommercheskikh riskov pri taym — charternoy arende sudov. *Metodi ta zasobi upravlinnya rozvitkom transportnikh system, № 17*, 197–212.
7. Kirillova, Y. V.; ONMU (2004). *Organizatsiya i upravleniye rabotoy morskikh sudov v rolkernoy transportno-tekhnologicheskoy sisteme*. Odessa, 184.
8. Shibayev, A. G. (1998). Obobshcheniye i razvitiye modeley optimal'noy rasstanovki flota morskoy sudokhodnoy kompanii. *Visnyk Odeskoho derzhavnoho morskoho universytetu, № 2*, 66–72.
9. Zhikhareva, V. V. (2010). *Teoriya i praktika investitsionnoy deyatel'nosti sudokhodnykh kompaniy*. Odessa: IPREYED-NAN, 480.
10. Makhurenko, G. S., Zhikhareva, V. V. (2008). Modelirovaniye programmy popolneniya flota sudokhodnoy kompanii. *Metodi ta zasobi upravlinnya rozvitkom transportnikh system, № 14*, 5–23.
11. McConville, J. (1999). *The Economics of Maritime Transport. Theory and Practice*. Witherby&Co. Ltd., 424.
12. Onyshchenko, S. P., Shutenko, T. N. (2012). Spetsifika rynochnykh riskov i meropriyatiy po ikh snizheniyu v sovremennom sudokhodnom biznese. *Aktual'ni problemi ekonomiki, № 2*, 85–98.

MODELING OF MASS TRANSFER OF POLLUTANTS IN THE SOIL

page 8–11

In the article it is presented a study of influence of contaminants that enter the soil taking into account their specific physical and chemical properties on soil taking into account its internal properties and processes (the process of sorption, chemical interaction, etc.). The factors that affect the process of mass transfer of pollutants in the soil are determined. Accounting of these factors in the mathematical model of mass transfer of solutes in the soil will give an opportunity to assess the dynamics of migration of contaminants in the soil during the filtering process.

It is proposed a two-dimensional profile mathematical model of waste water filtration process into the depths of soil based on its properties. The implementation of this model will allow to calculate the concentration profile of contaminated substances in the liquid and solid phases at different times, that is obtained an objective understanding of the process of changing the concentration of impurities in the waste water in the process of mass transfer in the soil layer.

Keywords: waste water, filtration process, soil, mathematical modeling, mass transfer, kinetic equations.

References

1. Shestakov, V. M. (1995). *Hydrogeodynamics*. M.: Moscow State University, 368.
2. Abramov, I. B. (2007). *Assessment of the impact on groundwater industrial conurbations*. Kharkov, 285.
3. Lavryk, V. I. (1981). Solution of the problem of mass transfer of water-soluble substances in the case of convective diffusion coefficients depending on the speed of filtration. *Preprint 81.18*. Kyiv: Inst. Mathematics of the USSR, 3–24.
4. Lavrik, V. I., Nikiforovich, N. A. (1998). *Mathematical modeling of hydrostudies*. Kiev, 287.
5. Oleinik, A. J., Kiselev, S. K. (1999). Hydrodynamic model of filtration to clean groundwater from iron compounds. *Applied hydromechanics, № 1(73)*, 20–25.
6. Oleinik, A., Shtair, L., Klapoushak, A. (2013). Mathematical modelling of filtration processes in problems of evaluation of level and quality of groundwaters. *Eastern-European Journal Of Enterprise Technologies, 1(4(61))*, 15–18. Available: http://journals.uran.ua/eejet/article/view/9142
7. Tolpaev, V. A. (2003). Filtering equations in anisotropic media. *Proceedings of the universities: the North Caucasus region. Natural sciences. Application, № 7*, 7–18.
8. Molokova, N. V. (2010). Mathematical modeling of oil pollution of the porous medium. *Bulletin of the Siberian State Aerospace University named after Academician M. F. Reshetnev, № 5(31)*, 142–148.
9. Rubin, Y., Cushey, M. A., Bellin, A. (1994, March). Modeling of transport in groundwater for environmental risk assessment. *Stochastic Hydrology and Hydraulics, Vol. 8, № 1*, 57–77. doi:10.1007/bf01581390
10. Destouni, G., Sassner, M., Jensen, K. H. (1994, March). Chloride migration in heterogeneous soil: 2. Stochastic modeling. *Water Resources Research, Vol. 30, № 3*, 747–758. doi:10.1029/93wr02986
11. Bojko, T., Abramova, A., Zaporozhets, J. (2013). Mathematical modeling of polluting migration in soils. *Eastern-European Journal Of Enterprise Technologies, 6(4(66))*, 14–16. Available: http://journals.uran.ua/eejet/article/view/18711

DEVELOPMENT OF RESOURCE DISTRIBUTION MECHANISMS BETWEEN SHIPS AT OPERATIONAL WORK PLANNING OF STEVEDORING COMPANY

page 11–18

The primary goal of industrial — operational planning in the port is establishing the volume and character of reloading works for the planned period, distribution of technical and human resources and developing the actions for performance of this amount of works. In the article it is considered mechanism of industrial — operational planning of works of the stevedoring company.

In accordance with the considered resource distribution mechanisms in the ship handling in the port are opening up new possibilities in monthly handling plan of ships; ship handling in shift day time; compiling an optimal handling plan for each ship.

The functioning of the resource distribution mechanism consists of three stages.

I. The main manager of cargo area informs the chief stevedore about resource distribution mechanism (the number of distributed resources, processing requests of chief stevedore and priorities of ships).

II. The main stevedore is reporting requests on resources for ship handling.

III. In accordance with the established procedure the main manager of cargo area distributes resources between ships.

This mechanism is used in all kinds of operational planning in the port that allows to create a single system of continuous planning of ship handling.

Keywords: ships, sea port, stevedoring company, operational planning, technical resources, human resources, mechanisms for resource distribution.

References

1. Vetrenko, L. D., Ananyina, V. Z., Stepanets, A. V. (1989). *Organization and technology of transfer processes in seaports*. Moscow: Transport, 270.
2. Ananyina, V. Z., Makushev, P. A. (2004). Justification of the structure of labor port cargo handling units. *Methods that facilities of management development of transport system, Issue 8*, 150–166
3. Olefir, I. M. (2004). Formation principles of organization of stevedoring operations. *Development of methods of management and manage is on a transport, Issue 18*, 84–104.
4. Magamadov, A. R., Makarenko, A. E. (2004). Methodological principles of technological schedules development of ships in the ports. *Methods that facilities of management development of transport system, Issue 8*, 166–179
5. Magamadov, A. R., Makarenko, A. E. (2005). Analysis of system operational management of ships in ports. *Methods that facilities of management development of transport system, Issue 10*, 131–150.
6. Holodnyakova, A. S. (2010) Hierarchy management the process of technological line stevedoring company. *Development of methods of management and manage is on a transport, Issue 16*, 93–107.
7. Mahurenko, G. S., Holodnyakova, A. S. (2009). Simulation of the management hierarchy of cargo operations. *Development of methods of management and manage is on a transport, Issue 31*, 59–83.
8. Makushev, P. A., Cholodenko, A. M. (2008). Simulation of the boot process port. *Methods that facilities of management development of transport system, Issue 8*, 189–206.
9. Postan, M., Savelyeva, I. (2014). Method of equilibrium solution finding for port's operators in competitive environment of oligopoly type. *Technology Audit And Production Reserves, 4(2(18))*, 58–63. doi:10.15587/2312-8372.2014.26296
10. Henesey, L. (2004). *Enhancing Container Terminal Performance: A Multi Agent Systems Approach*. Kaserntryckeriet, Karlskrona, Sweden. Available: http://www.bth.se/faculty/lhe/Lic.pdf
11. Novikov, D. A. (1999). *Mechanisms of multi-level organizational systems*. Moscow: Fund «Management problems», 150.
12. In: Novikov, D. A. (2011). *Management mechanisms*. Moscow: URSS (Editorial URSS), 216.

SYSTEMS AND CONTROL PROCESSES

ABOUT THE INFLUENCE OF INTERCEPTING PARKING ON TRAFFIC FLOWS IN KHARKIV

page 19–22

At that time the actual direction to reduce traffic load transport networks in the largest cities is organization of «intercepting» parking. This article presents an analysis of the research on the organization of «intercepting» parking in cities. The main steps of the developed technique of investigation of «intercepting» parking influence on the parameters of traffic flow in the city of Kharkov are given. This methodology is based on the modeling of transport streams using a mathematical model of transport network load. According to the simulation results, based on a variation of the flow of «intercept» to «intercepting» parking lots, the mathematical models of changes in the characteristics of traffic flows are developed. The dependence of the total running and the average time of movement on the transport network on the intensity of the use of «intercepting» parking are determined. These models allow making the quantitative estimates of the effect of «intercepting» parking on the characteristics of the traffic flow. The obtained results can be used to justify the feasibility of the organization and the necessary capacity of «intercepting» parking.

Keywords: transportation network, parking, traffic flow, traffic modeling, traffic.

References

1. Rankin, V. U., Klafi, P., Halbert, S. (1981). *Avtomobilnye perevozki i organizaciya dorozhnogo dvizheniya*. Moskva: Transport, 592.
2. Vlasov, D. N., Danilina, N. V. (2010). Sovershenstvovanie transportnoy systemy krupneishego goroda putem razvitiya systemy «perekhvatyvauschikh» parkovok. *Proceedings of Moscow State University of Civil Engineering, № 4*, 49–54.
3. Vlasov, D. N., Danilina, N. V. (2011). «Perekhvatyvauschaya» stoyanka kak kluchevoy element transportno-peresadochnogo uzla. *Mezhdunarodny nauchno-tekhnicheskiy zhurnal «Nedvizhimost: ekonomika, upravlenie», № 2*, 55–58.
4. Potter, H. S. (2001, January 3). Parking strategies across the subregion. *Proceedings of the ICE — Municipal Engineer, Vol. 145, № 1*, 3–6. doi:10.1680/muen.2001.145.1.3
5. Dulfan, S. B., Lobashov, O. O. (2013). Ways to reduce road traffic load of city transport networks. *Technology Audit And Production Reserves, 6(1(14))*, 35–38. Available: http://journals.uran.ua/tarp/article/view/19545
6. Dulfan, S. B. (2014). Pro docilnist vlashtuvannya perekhvatyvauschikh parkovok u m. Kharkovi. *Komunalne gospodarstvo mist, V. 116*, 89–92.
7. Arnott, R., Rowse, J. (1999, January). Modeling Parking. *Journal of Urban Economics, Vol. 45, № 1*, 97–124. doi:10.1006/juec.1998.2084
8. Mukhija, V., Shoup, D. (2006, September 30). Quantity versus Quality in Off-Street Parking Requirements. *Journal of the American Planning Association, Vol. 72, № 3*, 296–308. doi:10.1080/01944360608976752
9. Danilina, N. V. (2012). Opredeleniye potrebnosti transportno-peresadochnykh uzlov v «perekhvatyvauschikh» stoyankakh. *Sovremenniye problemy nauki i obrazovaniya, № 6*, 6. Available: http://online.rae.ru/1021
10. Lobashov, O. O. (2010). Methodyka doslidzhennya vplivu transportnoyi merezhi na parametry transportnykh potokiv u mistah. *Informatsiyno-keruyuchi systemy na zaliznichnomu transporti, № 2*, 24–25.
11. Shvetsov, V., Helbing, D. (1999, June). Macroscopic dynamics of multilane traffic. *Physical Review E, Vol. 59, № 6*, 6328–6339. doi:10.1103/physreve.59.6328

DEVELOPMENT OF SOFTWARE AND HARDWARE DEVICE OF AUTOMATED SYSTEM OF THE PROCESS STABILIZATION OF ARC DIMENSIONAL PROCESSING

page 22–28

This article discusses the implementation of software and hardware device of automated system of the process stabilization of arc dimensional processing on EDM machines and some results of our research in this area are given. The main aim of research is to develop a functional structure of the program software and hardware devices and then checking its performance. Software and hardware device controller, based on a programmable logic controller, controls the automated electric supply tool electrode for EDM type of AMH-1.

It is given the dependences that describe the control law according to which the programmable logic controller stabilizes and supports the arc parameters.

The use of modern process control systems of EDM allows processing the materials with higher energy efficiency and less resource consumption.

This paper proposes a variant of the problem solution of automated system of the process stabilization of arc dimensional processing.

This system allows to automate the process of finding and maintaining the feed rate of the tool-electrode in an area close to the quasi-optimal performance of the process.

The investigation results can be used by designers in the field of process automation of tool electrode submission during EDM machining of metals.

Keywords: stabilization process, arc dimensional processing, programmable logic controller, the supply electrode.

References

1. Nosulenko, V. I. (2005). Razmernaya obrabotka metallov elektricheskoy dugoy. *Elektronnaya obrabotka materialov, 1*, 8–17
2. Nosulenko, V. I. (2006). O fizicheskoy prirode, ob obshchem i otlichiyakh, tekhnologicheskikh vozmozhnostyakh elektricheskikh razryadov i klassifikatsii sposobov elektrorazryadnoy obrabotki metallov. *Elektronnaya obrabotka materialov, 1*, 4–14
3. Savelenko, G. V. (2013). Obosnovaniye algoritma raboty ekstremalnogo regulyatora podachi elektroda-instrumenta na stankakh razmernoy obrabotki dugoy. *Materialy I mezhdunarodnoy zaochnoy nauchno-prakticheskoy konferentsii «Avtomatizirovannoye proyektirovaniye v mashinostroyenii»*. Novokuznetsk: Izdatelskiy tsentr SibGIU, 115–122
4. Yermolayev, Yu. O.; KNTU. (2011). Modernizatsiya elektromekhanichnoyi chastyny pryvoda podachi elektroeroziynoho verstata dlya rozmirnoyi obrobky duhoyu. *Zvit pro NDR, № derzhreyestratsiyi 0111U007656*. Kirovohrad, 34.
5. Yermolayev, Yu. O., Savelenko G. V. (2004). Rozrobka SAU elektromekhanichnoho pryvodu verstata typu «DUHA» na bazi «ESHYM-1». *Zbirnyk naukovykh prats KNTU, 15*, 270–273.
6. Gutkin, B. G. (1971). *Avtomatizatsiya elektroerozionnykh stankov*. L.: Mashinostroyeniye, 160.
7. Savelenko, G. V. (2015). The method of automatically determining of stability of the process dimensional of arc. *Eastern-European Journal of Enterprise Technologies, 1(5(73))*, 9–13. doi:10.15587/1729-4061.2015.36226
8. Yermolayev, Yu. O., Velykyy, P. M., Savelenko, G. V. (2007). Doslidzhennya SAU protsesu ROD na verstati z elektromekhanichnym pryvodom. I. Osnovni faktory, shcho vplyvayut na protses. *Zbirnyk naukovykh prats KNTU, 19*, 270–273.
9. Sobinov, O. H. (2006). Modelyuvannya shvydkosti znimannya materialu pry tekhnolohichnomu protsesi rozmirnoyi obrobky duhoyu. *Zbirnyk naukovykh prats KNTU, 17*, 247–252.
10. Smirnova, N. V., Smirnov, V. V. (2012). Opredeleniye parametrov volt-ampernoy kharakteristiki dugi pri izmenenii velichiny mezhelektrodnogo promezhutka. *Zbirnyk naukovikh prats KNTU: Tekhnika v silskogospodarskomu virobnitstvi, galuzeve mashinobuduvannya, avtomatizatsiya, 25(2)*, 272–277.
11. Smirnova, N. V. (2011). Korrelyatsionnyy metod opredeleniya parametrov rabochey tochki dugi v protsesse razmernoy obrabotki detaley elektricheskoy dugoy. *Nauchno-prakticheskiy zhurnal «Otraslevyye aspekty tekhnicheskikh nauk», 3*, 25–28.
12. Smirnova, N. V., Smirnov, V. V.; In: Husak, O. H., Yevtukhov, V. H. (2012). Upravleniya rezhimom goreniya dugi v protsesse razmernoy obrabotki detaley elektricheskoy dugoy. *Materialy II Vseukrayinskoyi mizhvuzivskoyi naukovo-tekhnichnoyi konferentsiyi «Suchasni tekhnolohiyi v promyslovomu vyrobnytstvi», Sumy, Part 1*, 153.
13. Savelenko, G. V., Yermolayev, Yu. O. (2014). Extreme regulator structure grounding of automated process productivity of electric discharge machining. *Technology Audit And Production Reserves, 6(4(20))*, 42–47. doi:10.15587/2312-8372.2014.32750
14. Nosulenko, V. I., Sisa, O. F. (2006). Stalist protsesu rozmirnoyi obrobky metaliv elektrychnoyu duhoyu ne profilovanym elektrodom. *Zbirnyk naukovykh prats KNTU, V. 15,* 148–153.
15. Zelenova, I. Ya., Dorozhko, L. I., Miroshkin, A. N. (2007). Sistema avtomatizirovannogo proyektirovaniya kompozitsionnykh mikroprogrammnykh ustroystv upravleniya. *Naukovi pratsi Donetskoho natsionalnoho tekhnichnoho universytetu. Seriya: Problemy modelyuvannya ta avtomatyzatsiyi proektuvannya, 6(127)*, 54–61.
16. Nikolayev, A. A., Kornilov, G. P., Tulupov, P. G., Yakimov, I. A., Povelitsa, Ye. V., Anufriyev, A. V. (2014). Razrabotka usovershenstvovannoy sistemy avtomaticheskogo upravleniya polozheniyem elektrodov dugovykh staleplavilnykh pechey i agregatov kovshpech. *Russian Internet Journal of Electrical Engineering. Vol. 1, No. 1*, 48–58. Available: http://www.electrical-engineering.ru/issues/2014/2014-1-8.pdf
17. Savelenko, H. V., Yermolayev, Yu. O. (2014). Doslidzhennya robochoho protsesu rozmirnoyi obrobky duhoyu na verstati z elektromekhanichnym pryvodom. *Kompyuterno-intehrovani tekhnolohiyi: osvita, nauka, vyrobnytstvo, 14*, 164–169. Available: http://nbuv.gov.ua/j-pdf/Kitonv_2014_14_27.pdf
18. *POR P. D. R. ARM Cortex-M4 32b MCU+ FPU, 225DMIPS, up to 2MB Flash/256+ 4KB RAM, USB OTG HS/FS, Ethernet, 17 TIMs, 3 ADCs, 20 comm. interfaces, camera & LCD-TFT*. (April 2014). Available: http://www.st.com/web/en/resource/technical/document/datasheet/DM00071990.pdf

AUTOMATIC CLEANING SYSTEM OF SAMPLE PREPARATION OF FLUE GAS TESTER

page 29–32

It is shown a detailed description of the operation of the automatic cleaning at different modes and levels of concentration of dust and gas stream pollution of flue gas.

The basis of an automatic cleaning system of dust filters before gas analyzers based on the principle of a closed system of automatic control. The system constantly compares the real current flow rate with a fixed current pre-entered in the control unit. The control unit sends a signal to the switching system of solenoid valves when reducing the flow of the sample, due to contamination (clogging) of filters below a fixed level and with the help of flow booster begins to reverse blowing of dust filter from dust in the chimney.

During investigation it is found that the best operation mode of system actuation is a 25–30 % decrease in the expense of the nominal value of the primary sample flow while «clean» filter. Another important feature of the system is the choice of performance and power of flow boosters for blowdown. The power of flow booster was 1,5–2,0 kW during investigations on the smokestacks of coal boilers, TPC with the dust concentration of 120–150 mg/m^3 with ensuring a flow rate of smoke samples in the range of 8–10 l/min.

The proposed system is simple in construction, does not require a significant investment for its implementation and provides automatic cleaning of dust filters without operator. Automatic cleaning of filter dust is recommended for stationary systems for monitoring the concentration of toxic components of flue gases for industry, energy, cement, brick and asphalt concrete plants, everywhere where the treatment and control of flue gas is carried out by gas analyzers.

Keywords: filter, gas analyzer, sample, gas, valve, flow meter, flow, dust, cleaning, control, schedule.

References

1. Blinov, V. A., Blinova, M. P.; applicant and patentee Novosibirsk Branch of Research and Practice Association «Health and Pathology». (28.02.1994). *Avtomaticheskii probootbornik dlia otbora prob vozduha*. Patent RF № 2008646: G01N 1/22. Appl. № 4841747/26; stated 21.06.1990. Available: http://ru-patent.info/20/05-09/2008646.html
2. Kudriashov, V. V., Ivanov, E. S., Kur'ianov, M. V.; patentee Institute of Comprehensive Exploitation of Mineral Resources of the Russian Academy of Sciences (RAS IPKON). (20.05.2014). *Aspirator-pyleprobootbornik*. Patent RF № 2516622: MPK: E21F G01N/. № 2012141693; stated 02.10.2012. Available: http://bankpatentov.ru/node/595189
3. Vartanov, A. Z., Ruban, A. D., Shkuratnik, V. L. (2009). *Metody i pribory kontrolia okruzhaiushchei sredy i ekologicheskii monitoring*. M.: Gornaia kniga, 640.
4. Yushketova, N. A., Poddubnyi, V. A. (2007). Metod passivnogo otbora prob dlia monitoringa himicheskogo zagriazneniia atmosfernogo vozduha. Chast' 1. Teoreticheskie osnovy (obzor). *Ekologicheskie sistemy i pribory, № 2*, 3–10.
5. Yushketova, N. A., Poddubnyi, V. A. (2007). Metod passivnogo otbora prob dlia monitoringa himicheskogo zagriazneniia atmosfernogo

vozduha. Chast' 2. Prakticheskie aspekty (obzor). *Ekologicheskie sistemy i pribory, № 3*, 15–23.
6. De Santis, F., Fino, A., Tiwari, S. et al.; In: Longhurst, J. W. S., Brebbia, C. A., Power, H. (2000). *A performance of the open end tube diffusion sampler (Palmes sampler) for monitoring nitrogen dioxide. Air Pollution VIII*. Boston: WIT Press, 419–429.
7. Gerboles, M., Buzica, D., Amantini, L., Lagler, F. (2006). Laboratory and field comparison of measurements obtained using the available diffusive samplers for ozone and nitrogen dioxide in ambient air. *Journal of Environmental Monitoring, Vol. 8, № 1*, 112–119. doi:10.1039/b511271k
8. Plaisance, H., Piechocki-Minguy, A., Garcia-Fouque, S., Galloo, J. C. (2004, February). Influence of meteorological factors on the NO_2 measurements by passive diffusion tube. *Atmospheric Environment, Vol. 38, № 4*, 573–580. doi:10.1016/j.atmosenv.2003.09.073
9. Poriev, V. A., Dashkovskyi, O. A., Myndiuk, Ya. L. et al.; In: Poriev, V. A. (2009). *Analitychni ekolohichni prylady ta systemy*. Vinnytsia: UNIVERSUM, 336.
10. Primisky, V., Ivasenko, V., Kornienko, D. (2014). Adaptation features and emission standards execution control in the industry. *Eastern-European Journal Of Enterprise Technologies, 3(1(69))*, 8–15. doi:10.15587/1729-4061.2014.24973
11. Korniienko, D. H. (09.10.2014). *Avtomatychna systema pylovoi ochystky probo pidhotovky hazoanalizatoriv*. Application for an invention № a201411028.

EXPERT-PROBABILISTIC PROGNOSTICATION OF PRODUCTION PROCESS QUALITATIVE INDEX OF RADIATION BIOENGINEERING RECORDERS

page 32–36

Extension of the fields of application and increasing the content of radioactive isotopes in the biosphere, as well as changes in their qualitative composition, increase the risk of radioactive contamination of the human environment and have an adverse impact on life processes. Extremely important the pollution control of environment by radioactive substances in the general system of nature protection and development of high-quality technical resources for its implementation. The main elements of dosimetry equipment and other means of measuring ionizing radiation in nuclear power engineering and biomedicine, with which this control is carried out, are detectors that generate certain signals, which detect and characterize parameters of ionizing radiation. The sensitivity of the measurements, as well as most of the accuracy characteristics of the detectors to a large extent depend on the excellence of their design, quality manufacturing and operating modes. Therefore, the use of Bayesian methods is an urgent task for classification, regression forecasting and recovery required for operating of probabilistic characteristics of quality assurance in the actual processes of production.

The article discusses aspects of the application of Bayes' theorem on the conditional probability of certain events for a given probability of another event to address improving quality indicators in the production of bioengineered destination and particularly recorders of ionizing radiation.

Keywords: Bayesian approach, quality improvement, radiation recorders, bioengineered products.

References

1. Fiunfer, E., Nepert, G. (1991). *Schetchiki izluchenii*. M.: Atomizdat, 325.
2. Kozlov, V. F. (1977). *Spravochnik po radiatsionnoi bezopasnosti*. M.: Atomizdat, 286.
3. Korn, A. S. (1998). *Radiometry. Pribory dlia izotopnoi diagnostiki v meditsine*. M.: Atomizdat, 364.
4. Kaniovska, I. Yu. (2004). *Teoriia ymovirnostei u prykladakh i zadachakh*. K.: IVTs «Vydavnytstvo «Politekhnika», 156.
5. Venttsel', E. S., Ovcharov, L. A. (1998). *Teoriia veroiatnostei i ee inzhenernye prilozheniia*. M.: Nauka, 480.
6. Zaitsev, E. P. (2008). *Teoriia veroiatnostei i matematicheskaia statistika*. Kremenchug, 484.
7. Turchyn, V. M. (2004). *Teoriia ymovirnostei: Osnovni poniattia, pryklady, zadachi*. K.: A. S. K., 208.
8. Zaporozhchenko, E. E., Sazonova, M. S., Lavrinenko, S. N. (2013). Operirovanie veroiatnostnymi harakteristikami povysheniia kachestvennyh pokazatelei protsessa proizvodstva bioinzhenernyh izdelii. *Vysoki tekhnolohii v mashynobuduvanni, № 1(23)*, 61–67.
9. Yaroshchuk, E., Krasnoshchekov, E., Kaliuzhnыi, A., Voilov, P. (2011). Hidden objects detection and identification using count rate of scintillation detectors. Eastern-*European Journal Of Enterprise Technologies, 5(9(53))*, 58–61. Available: http://journals.uran.ua/eejet/article/view/1308/1209
10. Beliaev, A. D., Ignatov, S. M., Nedorezov, V. G., Potapov, V. N., Rudnev, N. V., Turinge, A. A. (2008). Tsifrovoi stsintilliatsionnyi detektor dlia meditsinskoi rentgenovskoi diagnostiki s vysokim prostranstvennym razresheniem. *Al'manah klinicheskoi meditsiny, № 17–1*, 285–287.
11. Zapolovskii, N. I., Lavrinenko, O. S. (2014). Sozdanie effektivnyh ustroistv radiatsionnogo monitoringa na osnove registriruiushchih detektorov ioniziruiushchego izlucheniia. *Vseukrainska naukovo-praktychna konferentsiia «Impulsni protsesy u suchasnykh tekhnolohiiakh», Sektsiia 2*, 8–11.

DEVELOPMENT OF THE DIAGNOSTICS ALGORITHMS OF THE WATER CHEMISTRY CONDITIONS AT THE NUCLEAR POWER PLANT SECOND CIRCUIT

page 37–41

Based on the investigations, it was found that the maintenance quality of water-chemistry conditions (WCC) of secondary circuit of nuclear power plant WWER-1000 is evaluated using such indicators as the rate of corrosion of structural materials, the amount of deposits on the inner surfaces of equipment and the amount of liquid waste that can cause damage to the environment.

To minimize the performance by listed indicators now it is used a data support, such as pH, electrical conductivity, concentration of corrective additives within the established norms. But only support of values of WCC quality indicators makes it impossible to completely eliminate the occurrence of corrosion processes and the formation of deposits of impurities in the second circuit.

Therefore, it is set the task to develop a strategy management that will minimize corrosion rate of the secondary circuit equipment and the number of deposits on the surfaces of process equipment for WCC optimal control.

In this paper it is analyzed the causes of accidents at nuclear power plants and the principles of decision making by operational staff during these accidents. Special attention was paid to development of basic diagnostics of WCC algorithm that will reduce errors of decision making by operational staff.

As a result of researches it is developed a complex of logic models for the evaluation of violations of WCC maintenance. Based on the decisions obtained by logical model, the authors developed a strategy to control the formation of appropriate control actions that will reduce the degree of corrosion damage to construction materials of equipment and, as a result, avoid emergency modes of power plants.

Keywords: diagnostics of water-chemistry conditions, logical models, liquidation of emergencies.

References

1. *SRD 95.1.06.02.002-04. Water chemistry of the second circuit of nuclear power plants with PWR reactors. Technical requirements for the quality of the working environment. Corrective treatment with hydrazine hydrate, morpholine, lithium hydroxide.* (2004). GOSATOM Ukrainy, 22.
2. International Atomic Energy Agency. (2011). *Establishing the Safety Infrastructure for a Nuclear Power Programme*. IAEA Safety Standards Series No. SSG-16. Vienna: IAEA, 188.
3. International Atomic Energy Agency. (2012). *Communication with the Public in a Nuclear or Radiological Emergency.* Emergency Preparedness and Response Series. Vienna: IAEA, Eprpublic Communications, 116.
4. International Atomic Energy Agency. (2013). *Response and Assistance Network*. Emergency Preparedness and Response Series. Vienna: IAEA, EPR-RANET, 132.

5. *CO 153-34.37.510 Standard instruction on conducting water chemistry supercritical units.* (1986). Moskva: SPO Soiuztehenergo. Available: http://pwreng.ru/ntd/so/2632-co-153-3437510
6. Shutikov, A. V., Savchenko V. E., Vigranenko Y. M., Khrustalyov V. A. (2008). Ways of improving the water chemistry of the second circuit of NPP with PWR-1000. *Proceedings of TPU, № 2*, 39–43.
7. Medvedev, R. B., Merdukh, S. L. (2013). Features water chemistry conditions and mathematical modeling of the secondary circuit of nuclear reactor VVER-1000. *Scientific and technical journal «Science news», № 3*, 132–139.
8. Archipenko, A. V. (2003). State water chemistry of main and auxiliary circuits Ukrainian NPPs and the main directions of their improvement. *International scientific and technical conference «Water chemistry nuclear power plants»*. M., 247.
9. Egorova, T. M., Kritskii, V. G. (2003). Analysis of reference water chemistry of the main technological circuit and auxiliary systems RBMK and key issues for improving water chemistry. *International scientific and technical conference «Water-chemistry nuclear power plant»*. M., 247.
10. Medvedev, R. B., Merdukh, S. L. (2013). System of temperature mode control of block demineralizing plant at NPP. *Eastern-European Journal Of Enterprise Technologies, 4(2(64))*, 42–46. Available: http://journals.uran.ua/eejet/article/view/16657/
8. Chen, Y., Ma, Y., Yun, W. (2013, January 13). Application of Improved Genetic Algorithm in PID Controller Parameters Optimization. *TELKOMNIKA Indonesian Journal of Electrical Engineering, Vol. 11, № 3*, 1524–1530. doi:10.11591/telkomnika.v11i3.2301
9. Murray, N. (1990). Nonlinear PID controller. *Electrical Engineering, № 1*, 154–159.
10. *EBA FINAL draft Regulatory Technical Standards*. (2015). BCC Research. Available: http://www.eba.europa.eu/documents/10180/642449/EBA-RTS-2014-06+RTS+on+Prudent+Valuation.pdf
11. Zhmud', V. A., Polishchuk, A. V. (2012). Raschet mnozhestva koeffitsientov reguliatorov dlia obiekta s dvumia nestatsionarnymi parametrami. *Sbornik nauchnyh trudov NGTU, № 3(69)*, 59–70.
12. Bazhanov, V. L., Kuz'min, A. V., Kuz'min, N. V. (2009). Nastroika PID-reguliatorov s pomoshch'iu metoda masshtabirovaniia na obiektah upravleniia s zapazdyvaniem i na obiektah vysokogo poriadka. *Avtomatizatsiia v promyshlennosti, № 2*, 15–20.
13. Tiutiunnyk, A. H. (1998). *Optymalni i adaptyvni systemy avtomatychnoho keruvannia*. Zhytomyr: ZhITI, 512.
14. Bezvesilnaya, E. N., Tkachuk, A. H. (2014, July 3). Corrected gyrocompass synthesis as a system with changeable structure for aviation gravimetric system with piezoelectric gravimeter. *Aviation, Vol. 18, № 3*, 134–140. doi:10.3846/16487788.2014.969878

DEVELOPMENT OF METHOD FOR DETERMINING PARAMETERS OF REGULATOR FOR CONTROLLING THE ASTATIC OBJECT OF THIRD ORDER

page 41–45

The process of designing the automatic control systems is considered and its main stages are analyzed. The basic laws of regulation and regulators, developed on their basis, are characterized. Types of automatic tuning of regulators consist in three fundamentally important stages: identifying the control object, calculation regulator parameters, more accurate tuning of regulator. Existing methods of regulator choice are considered. It is proposed a new calculation method of regulator parameters to control by astatic object of the third order with astaticism equal to one. The analysis of the qualitative characteristics of the obtaining system is conducted. It is shown that the quality control process is provided using proportional differential control law. It is shown that the calculated parameters of proportional differential regulator provide almost smooth change of initial coordinates of control object, indicating the feasibility of using the proposed method.

Keywords: automatic control system, regulator, control object, astaticism, transfer function.

References

1. Samotokin, B. B. (2001). *Lektsii z teorii avtomatychnoho keruvannia*. Zhytomyr: ZhITI, 508.
2. Komissarchik, V. F. (2001). *Avtomaticheskoe regulirovanie tehnologicheskih protsessov*. Tver': TGTU, 248.
3. Kuzishchin, V. F., Petrov, S. V. (2012). Nastroika avtomaticheskih reguliatorov s opredeleniem modeli obiekta vtorogo poriadka s zapazdyvaniem po dvum tochkam kompleksnoi chastotnoi harakteristiki. *Teploenergetika, № 10*, 50–57.
4. Dikusar, Yu. G., Volkov, A. V., Farafonov, G. V. (2008). Analiticheskie formuly i algoritmy opredeleniia parametrov nastroiki avtomaticheskih reguliatorov energoustanovki. *Sbornik nauchnyh trudov SNUIaEiP, № 4(28)*, 15–21.
5. Pisarev, A. V. (2007). Sravnitel'nye issledovaniia raschetnyh metodov opredeleniia parametrov nastroek promyshlennyh PID-reguliatorov. *Energetika i teplotehnika. Sbornik nauchnyh trudov NGTU, № 11*, 191–200.
6. Singh, S. Kr., Boolchandani, D., Modani, S. G., Katal, N. (2014). Multi-Objective Optimization of PID Controller for Temperature Control in Centrifugal Machines Using Genetic Algorithm. *Research Journal of Applied Sciences, Engineering and Technology, Vol. 7, № 9*, 1794–1802.
7. Mohd, R. (2012). Multi-objective optimization of PID controller parameters using genetic algorithm. *A thesis submitted in fulfilment of the requirements for the award of the degree of Master of Engineering (Electrical)*. Universiti Teknologi Malaysia, Faculty of Electrical Engineering, 104–108.

DEFINING AND CLASSIFICATION OF THE SOFT PROJECTS AS A BASE FOR THEIR SCOPE PLANNING

page 46–52

In this paper we investigate a new class of soft projects, the main feature of which is a significant presence of personality in the design product and its defining role in the use of this product. Today, basic knowledge of soft projects is not enough to effectively manage, although the number of such projects is constantly increasing. The aim of research is to extend the existing knowledge about the nature of the soft projects and further their use as a basis for identifying features of planning their content. To achieve this aim we used methods of analysis, synthesis, graphical modeling.

According to the results, the conditions for a successful consumption of product of soft project formed at the time of its creation by changing (formation, development) the necessary worldview competencies of future consumer. On this basis it is formulated the definition of soft project. By means of the proposed model it is shown that a key feature of the classification of such projects depends on two parameters simultaneously — the degree of novelty of variable competence and presence of personality in the product of design. It is shown that the category «competence» for soft projects is considered as a management. Its application for planning the content of soft project involves determining the set of work packages, as well as their rational interconnectedness and duration. In this regard, further development is existed for the traditional model of presentation of hierarchy structure of the project works. The features of its use for educational projects with high degree of softness are considered. It is formulated a hypothesis about the dependence of the duration of work packages, rational correlation types of work, as well as rational forms of realization of the types of works from the heterogeneity of the importance of generated competencies for multiple users.

The proposed model, findings and the postulates allow use the traditional tools of content planning for particular class of soft projects. However, this requires additional experimental verification and refinement.

Keywords: soft project, competence, service, hierarchy structure of works, product-consumer.

References

1. Bushuev, S., Yaroshenko, Y., Yaroshenko, N. (2013). Enterprise energy in project management for development. *Project management and development of production, 2(46)*, 5–12.
2. Medvedieva, E. (2013). *Value-oriented management of interaction in projects: methodological bases*. Kyiv, 44.
3. *PMI research: tendencies in project management*. (03.04.2012). Available: http://www.pmexpert.ru/press-center/news-world/detail.php?ID=6076

4. LeRoy Ward, J. (18.02.2010). Ten tendencies of the project management in 2010. *Projects@Work*. Available: http://www.pmprofy.ru/content/rus/212/2124-article.asp
5. Valkman, Y. (2012). Integrity of characters: about the simulating of sense and understanding. *Information Technologies & Knowledge, Vol. 6, No 1*, 14–25.
6. Translated from Japanese: Yaroshenko, F. (2011). *Guidance on organization's innovative projects and programs management, Vol. 1, Version 1.2*. Kiev, 209.
7. Chin, G. (2014). *Agile Project Management: How to Succeed in the Face of Changing Project Requirements*. CC Pace Systems. Available: http://www.ccpace.com/asset_files/Agile_Project_Management.pdf
8. Levin, G. (2014, November 18). Managing Stakeholder Expectations for Project Success: A Knowledge Integration Framework and Value Focused Approach. *Project Management Journal, Vol. 45, № 6*, e3–e3. doi:10.1002/pmj.21464
9. Biryukov, O. (2012). *Context estimation of competence of command of project management*. Kiev: KNUBA, 23.
10. Tyssen, A. K., Wald, A., Spieth, P. (2013, December). Leadership in Temporary Organizations: A Review of Leadership Theories and a Research Agenda. *Project Management Journal, Vol. 44, № 6*, 52–67. doi:10.1002/pmj.21380
11. Verba, V. (2007). Classification of consulting projects. *Siveryanskyi litopys, 6 (26)*, 174–181.
12. Medvedieva, E. M. (2008). The corporative culture as an influenced point of the organization development processes favourabling project. *Project management and development of production, № 2(26)*, 57–65.
13. Rach, V. (2009). Soft projects: features, classification, application. *Project management in development of society. An acceleration of organization development on the base of project management: Proc. of VI international conference*. Kiev, 156–158.
14. Rach, V., Rach, D. (2000). Risk management in projects implemented in transitional economy: financial products for the real sector in Ukraine. *Proc. of international conference. Seminar «Project Management in lending to the real sector»*. Kyiv, 25–26.
15. *A Guide to the Project Management Body of Knowledge. Ed. 5*. (2013). Project Management Institute, Inc., 619.
16. *Practice Standard for Work Breakdown Structure. Ed. 2*. (2006). Project Management Institute, Inc., 111.
17. Alatoom Mohammad Faiz Ahmad. (2014). Conceptual model of the soft project scope planning basing on the service model. *Project management and development of production, № 1(49)*, 172–180.
18. Yaroshenko, Y. (2010). *Models «motive forces — resistances» in project and program management*. Kyiv, 160.
19. Skoibeda, P., Timohina, E., Zhavoronkova, I. (09.01.2014). Failures and successes-2013. Which projects have gone and wich were lucky to attract millions. *Business environment*. Available: http://journal.dasreda.ru/ideas/4626-provaly-i-uspehi-2013
20. *Competency-Based Education*. (2013). CAEL Forum & News Competency-Based Education. Available: http://www.cael.org/pdfs/cael_competency_based_education_2013
21. Caupin, G., Knoepfel, H., Koch, G., Pannenbäcker, K., Pérez-Polo, F., Seabury, Ch. (2006). *ICB — IPMA Competence Baseline, Version 3.0*. International Project Management Association. Available: http://www.ipma.ch/assets/ICB3.pdf
22. Rach, V., Rossoshanskaya, O., Medvedieva, E.; In: Rach, V. (2010). *Project management: practical aspects of regional development strategies realization*. Kiev, 276.
23. Beinhauer, R., Suh, I., Tahiri, L. (2014). *Competence based teaching and research in higher education*. Prishtina. Available: http://www.link-competences.org/kosovo/files/user/docs/CUP%20BOOK%20EN.pdf
24. Teplov, S. (2012). Effectiveness and efficiency of personnel educating. *Personnel management — Ukraine, 5(224)*, 50–53. Available: http://www.mim.kiev.ua/common/ua/press/publications/publ_2012/TEPLOV_S._Rezul_tativnost__i_effektivnost__obucheniya_personala.pdf
25. *Complex Project Manager Competency Standards, Version 4.1*. (August 2012). *Complex Project Management Leadership and Excellence*. Commonwealth of Australia (Department of Defence). Available: https://iccpm.com/sites/default/files/kcfinder/files/Resources/CPM%20Competency%20Standard%20V4.1.pdf
26. *The Standard for Program Management. Ed. 3*. (2013). Project Management Institute, Inc., 176.
27. *The Standard for Portfolio Management. Ed. 5*. (2013). Project Management Institute, Inc., 189.
28. National Office of Tempus. *Bases of educating during the hole life — pre-conditions of origin and history of development in EU-countries. Connection with Lissabon strategy*. Available: www.tempus-russia.ru/prep-zayavka/LLL-general.pdf
29. Grace, A. P. (2013). *Lifelong learning as critical action: international perspectives on people, politics, policy, and practice*. Toronto: Canadian Scholars' Press, 298.
30. *About higher education: Law of Ukraine, 01.07.2014 № 1556-VII*. Available: http://vnz.org.ua/zakonodavstvo/111-zakon-ukrayiny-pro-vyschu-osvitu

INVESTIGATION OF INTELLIGENT CLASSIFICATION OF CURRENT TECHNICAL CONDITION OF THE GAS TURBINE ENGINE

page 53–57

The structure of diagnosing the technical condition of the gas turbine engine (GTE) is given. It is proposed a method of training the intellectual automated system of diagnostics and control reconfiguration (IASDCR) by GTE modes based on integration of fuzzy logic and neural networks. The theoretical and experimental capabilities of IASDCR classification of current condition of GTE in specific operational situations are proposed. It is designed and synthesized the structure of IASDCR GTE, based on the proposed model. The method provides the ability to customize such systems for the diagnosis and management of different types of GTE reconfiguration during their operation, thereby increasing the reliability of classification and prediction of residual life, and prevents the transition of emergency situation in catastrophic situation. The expediency of using hybrid IASDCR based on radial basis networks and fuzzy logic theory, which allowed to classify the vibrational state GTE DR-59L with a probability of 0,96 and GTE DT-71P with a probability of 0,92.

Keywords: gas turbine engine, intelligent system, control reconfiguration, diagnostic system, technical condition.

References

1. Epifanov, S. V., Loboda, I. I. (2004). Identifikatsiia staticheskoi i dinamicheskoi modelei protochnoi chasti kak sredstvo diagnostirovaniia GTD. *Vestnik dvigatelestroeniia, № 2*, 206–212.
2. Gasidzhak, V. S., Kazak, V. N., Bel'skaia, A. A. (2008). Kombinirovannaia strategiia tehnicheskogo obsluzhivaniia GPA po narabotke s prognozirovaniem predotkaznogo sostoianiia. *Materialy mizhnarodnoi konferentsii «ISDMCI'2008», (Yevpatoriia, 19–23 travnia 2008), T. 2*, 100–103.
3. Dmitriev, S. A. (1996). *Diagnostirovanie protochnoi chasti GTD na ustanovivshihsia i neustanovivshihsia rezhimah raboty*. K.: KMUGA, 358.
4. Boguslaev, A. V., Dubrovin, V. I., Subbotin, S. A. (2004). Metody neiterativnogo sinteza mnogosloinyh neironnyh setei v zadachah diagnostiki aviadvigatelei. *Vestnik dvigatelestroeniia, № 1*, 86–93.
5. Boguslaev, A. V., Dubrovin, V. I., Subbotin, S. A., Yatsenko, V. K. (2002). Diagnostika lopatok aviadvigatelei na osnove mnogosloinoi logicheski prozrachnoi neironnoi seti. *Vestnik dvigatelestroeniia, № 1*, 85–90.
6. Yam, R. C. M., Tse, P. W., Li, L., Tu, P. (2001, February 1). Intelligent Predictive Decision Support System for Condition-Based Maintenance. *The International Journal of Advanced Manufacturing Technology, Vol. 17, № 5*, 383–391. doi:10.1007/s001700170173
7. Sirotin, N. N., Korovkin, Yu. M. (1979). *Tehnicheskaia diagnostika aviatsionnyh gazoturbinnyh dvigatelei*. M.: Mashinostroenie, 272.
8. Dubrovin, V. I., Subbotin, S. A., Boguslaev, A. V., Yatsenko, V. K. (2003). *Intellektual'nye sredstva diagnostirovaniia i prognozirovaniia nadezhnosti aviadvigatelei*. Zaporozhye: OAO «Motor-Sich», 279.
9. Hasydzhak, V. S., Kazak, V. M. (2007). Baiiesovskyi alhorytm rozpiznavannia peredvidmovnykh staniv hazoperekachuvalnykh ahrehativ. *Visnyk tsentralnoho naukovoho tsentru TAU, Vol. 10*, 77–78.
10. Bodianskii, E. V., Rudenko, O. G. (2004). *Iskusstvennye neironnye seti: arhitektura, obuchenie, primenenie*. Kharkov: TELETEH, 372.

INFORMATION AND CONTROL SYSTEMS

GOAL TREE MODEL DEVELOPMENT OF INFORMATION CONTROL SYSTEM OF MINI-HOTELS AND ITS CONTENT

page 58–64

Today the majority of domestic mini-hotels have difficulty in choosing and implementing of ICSH.

This article is devoted to the development of the ICSH goal tree model because it is the first and most important and key step to determine the ICSH effectiveness. The authors have considered the problem of the introduction of IT in the hospitality and tourism business. The requirements for automated ICSH are analyzed. The main steps in the process of development and implementation of ICSH are determined. It is proposed context diagrams describing the structure of the system functioning of mini-hotels. The model of evaluating the effectiveness of ICSH is proposed. Solution of this problem allows the supervisor to mini-hotels make the right decision when choosing and implementing of ICSH.

Through technical exchange of data for managers of mini-hotels now easier to create and sell packages of services to clients, solve problems of financial and operational management, marketing planning, improve competitiveness and expand its range of services. Applying ICSH, Internet, IT technologies, visionary hoteliers are able to maintain and develop the hotel business, improve service quality, increase competitiveness, reduce the cost of executing business processes. Automation services purchased a complex format and will affect all processes of functioning of mini-hotels and the relationship with the guests. Creation of integrated hotel information network, the center of which is a modern ICSH, minimizes the need to duplicate data and avoids errors that occur during manual data entry. Labor saving one or more employees several times the profit mini-hotels.

Therefore, it is important the ICSH efficiency and goal tree development of IS of mini-hotel.

Keywords: goal tree, information system effectiviness, information technology, hotel business.

References

1. Hvozdeva, T. V., Ballod, B. A. (2009). *Proektyrovanye ynformatsyonnukh system*. Rostov n/D.: Fenyks, 508.
2. Holenyshchev, E. P., Klymenko, Y. V. (2003). *Ynformatsyonnoe obespechenye system upravlenyya*. M.: Fenyks, 352.
3. In: Davis, W., Yen, D. (2008). *The Information System Consultant's Handbook: Systems Analysis and Design*. CRC Press, 800. doi:10.1201/9781420049107
4. Luftman, J. N., Lewis, P. R., Oldach, S. H. (1993). Transforming the enterprise: The alignment of business and information technology strategies. *IBM Systems Journal, Vol. 32, № 1*, 198–221. doi:10.1147/sj.321.0198
5. Rathnam, R. G., Johnsen, J., Wen, H. J. (2004/2005). Alignment of business strategy and IT strategy: A case study. *The Journal of Computer Information Systems, 45 (Winter)* (2), 1–9.
6. Anuja, R. (2005). Aligning IT and business goals. *Malaysian Business*, 1–10.
7. Lee, J., Bose, U. (2002, September). Operational linkage between diverse dimensions of information technology investments and multifaceted aspects of a firm's economic performance. *Journal of Information Technology, Vol. 17, № 3*, 119–131. doi:10.1080/02683960210161249
8. Faronov, V. V. (2002). *Prohrammyrovanye baz dannukh v Be1rU 5. Uchebnuy kurs*. SPb.: Pyter, 464.
9. Verevchenko, A. P. (2002). *Ynformatsyonnue resursu dlya prynyatyya reshenyy*. M.: Delovaya Knyha, Akademycheskyy Proekt, 560.
10. Kastel's, M. (2000). *Ynformatsyonnaya epokha: ekonomyka, obshchestvo y kul'tura*. M.: GU VShE, 608.
11. Belyaev, Y. P. (2009). *Proektyrovanye avtomatyzyrovannukh system*. M., 336.
12. Vendrov, A. M. (1998). *CASE-tekhnolohyy. Sovremennue metodu y sredstva proektyrovanyya ynformatsyonnukh system*. M.: Fynansu y statystyka, 196.
13. Maklakov, S. V. (2000). *BPwin y ERwin. CASE-sredstva razrabotky ynformatsyonnukh system*. M.: Dyaloh-MYFY, 256.
14. Fydel'man, H. N. (2005). *Al'ternatyvnuy menedzhment: Put' k hlobal'noy konkurentosposobnosty*. M.: Al'pyna Byznes Buks, 186.
15. Mazylkyna, E. Y. (2008). *Osnovu upravlenyya konkurentosposobnost'yu*. M.: Omeha-L, 336.
16. Yadykov, S. (2010). Vetriks. *Konsul'tant, № 5*. Available: http://vetriks.ru/info/49-info-3-1.html

METHOD OF GENERATING HIGH-POWER MICROWAVE NANOSECOND PULSES

page 64–68

The development of communication technology, radar, material processing, etc. stimulates the creation of powerful generators of microwave radiation with nanosecond pulse duration. A new method for generating microwave pulses of nanosecond duration is proposed. This method is based on the property of the redistribution of charges in the coaxial line with a multi-element core. The paper takes into account the time delay of fuse switching. Pulse power increases with delays of up to 5 ns. Pulse parameters depend on the profile of a multi-element core generator. On the criterion of maximum generator power the parameters of multi-element generator core construction are optimized. In view of the analysis pulse generator construction, which consists of four sections, has been created and tested. As a result, studies have shown that under the optimization of generator construction parameters the generator gain increases in power by 11 times.

Keywords: pulse generators of impact excitation, the microwave pulses of nanosecond duration.

References

1. Mesyats, G. A. (1974). *Generation of high-power nanosecond pulses*. M.: Sov. Radio, 256.
2. Shostko, O. S. (2000). Features of formation of fluctuations in travatrone. Scientific Papers. *Bulletin of Kharkiv National University. Series «Radio Physics and Electronics», 1(467)*, 136–139.
3. Shostko, I. S., Shostko, S. N., Avchinnikov, E. A., Gulak, V. P. (2002). Disc spark generator of microwave pulses of nanosecond duration. *Applied electronics, 1(1)*, 103–106.
4. Shostko, I. S., Shostko, S. N. (2004). Phase grid spark emitters. *Applied electronics, 2(3)*, 91–93.
5. Shlapakovski, A. S., Artemenko, S. N., Chumerin, P. Y., Yushkov, Y. G. (2015, January). Formation of Pulses with Adjustable Parameters in a Resonant Microwave Pulse Compressor. *Advanced Materials Research, Vol. 1084*, 256–261. doi:10.4028/www.scientific.net/amr.1084.256
6. Burtsev, V. A., Kalinin, N. V., Luchinskiy, A. V. (1963). *Electric explosion of conductors and its application in electro installations*. M.: Energoatomizdat, 288.
7. Mesyats, G. A., Vorobyov, G. A. (1963). *Technique for formation of high-voltage nanosecond pulses*. M.: Gosatomizdat, 167.
8. Mick, J., Kregs, J. (1960). *Electrical breakdown in gases*. M.: Publishing Foreign Literature, 605.
9. Skanavi, G. I. (1958). *Physics of Dielectrics*. M.: Phismatgiz, 907.
10. Vershinin, Y. N. (2000). *Electron heat and detonation processes in electrical breakdown of solid dielectrics*. Ekaterinburg, 258.
11. Kulikov, V. D. (2003). Investigation of the mechanism of electrical breakdown of ionic crystals in the nanosecond range. *Journal of technical physics, 73(12)*, 26–30.

PECULIARITIES OF HARDWARE IMPLEMENTATION OF GENERALIZED CELLULAR TETRA AUTOMATON

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Cellular automata are widely used in many fields of knowledge for the study of variety of complex real processes: computer engineering and computer science, cryptography, mathematics, physics, chemistry, ecology, biology, medicine, epidemiology, geology, architecture, sociology, theory of neural networks. Thus, cellular

automata (CA) and tetra automata are gaining relevance taking into account the hardware and software solutions.

Also it is marked a trend towards an increase in the number of possible states of CA that led to the emergence of new types of CA, which are united in this paper under a common name — postbinary cellular automata.

This article proposes a variant of generalized structure of CA cell using asynchronous data storage device, software configurable via the user interface. Several ways of hardware implementation of initial values record in register of the cell status and read the results from the current layer of states in the register of reading the results: serial, block, using a layer of initial states through direct serial or block addressing, or cascade addressing on the basis of tetracodes. It is considered the CTA structure when used as a coprocessor in the local computers. At the same time the detailed descriptions are given, problems are identified, corresponding schematic structure are given. It is considered in detail the generalized block diagram of a multi-layer cellular automaton and it is proposed a generalized block diagram of a multi-layer CA cell that improves performance and extended functionality compared with the known CA.

The main advantage of the proposed implementation of cellular automata is functional diversity of elements and flexibility, the ability to change the laws of transitions immediately in all cells (matrix elements). Therefore, CA mass production (as well as CTA) on this technology can get a testing ground for numerous experiments in various fields of science.

Keywords: postbinary cellular automaton, tetra automaton, advanced code-logical basis, data storage device, cell, tetracode.

References

1. Konopleva, A. P., Anoprienko, A. Ja. (2007). Igra «Zhizn'» Dzh. Konveja na baze giperkodov. *Materialy III mezhdunarodnoj nauchno-tehnicheskoj konferencii «Informatika i komp'juternye tehnologii-2007», 11–13 December 2007*. Donetsk: DonNTU, 254–257.
2. Anoprienko, A. Ja., Konopleva, A. P. (2008). Razvitie idei primenenija giperkodov v modelirovanii kletochnyh avtomatov. *Naukovi praci Donec'kogo nacional'nogo tehnichnogo universitetu, serija «Informatika, kibernetika ta obchisljuval'na tehnika», 9(132),* 115–118.
3. Anoprienko, A. Ja., Konopleva, A. P. (2011). Upravljaemyj postbinarnyj kletochnyj avtomat. *Materialy II vseukrainskoj nauchno-tehnicheskoj konferencii «Informacionnye upravljajushhie sistemy i komp'juternyj monitoring (IUS i KM 2011)», 12–13 aprelja 2011 g., T. 2*. Donetsk: DonNTU, 215–219.
4. Anoprienko, A. Ja., Ivanica, S. V. (2011). *Postbinarnyj komp'juting i interval'nye vychislenija v kontekste kodo-logicheskoj jevoljucii*. Donetsk: DonNTU, UNITEH, 248 s.
5. Anoprienko, A. Ja., Ivanica, S. V. (2011). Osobennosti realizacii postbinarnyh logiches-kih operacij. *Nauchno-teoreticheskij zhurnal «Iskusstvennyj intellekt», № 2*, 110–121.
6. Anoprienko, A. Ja., Ivanica, S. V. (2012). *Tetralogika, tetravychislenija i nookomp'juting*. Donetsk: DonNTU, UNITEH, 308.
7. Piwonska, A., Seredynski, F., Szaban, M. (2012). Searching Cellular Automata Rules for Solving Two-Dimensional Binary Classification Problem. *Lecture Notes in Computer Science, Vol. 7495*, 121–130. doi:10.1007/978-3-642-33350-7_13
8. Martínez, G. J., Adamatzky, A., McIntosh, H. V. (2010). Localization Dynamics in a Binary Two-Dimensional Cellular Automaton: The Diffusion Rule. *Game of Life Cellular Automata,* 291–315. doi:10.1007/978-1-84996-217-9_16
9. Schiff, J. L. (2008). *Cellular automata: a discrete view of the world*. A John Wiley&Sons inc, Publication. University of Auckland, 279.
10. Cenek, M., Mitchell, M. (2009). Evolving Cellular Automata. *Encyclopedia of Complexity and Systems Science*, 3233–3242. doi:10.1007/978-0-387-30440-3_191
11. Sutner, K. (1999). Linear Cellular Automata and de Bruijn Automata. *Cellular Automata,* Vol. 460, 303–319. doi:10.1007/978-94-015-9153-9_12
12. Pivato, M. (2009). Ergodic Theory of Cellular Automata. *Encyclopedia of Complexity and Systems Science,* 2980–3015. doi:10.1007/978-0-387-30440-3_178
13. Breukelaar, R., Bäck, T. (2005). Using a genetic algorithm to evolve behavior in multi dimensional cellular automata. *Proceedings of the 2005 conference on Genetic and evolutionary computation-GECCO'05*. ACM Press, 107–114. doi:10.1145/1068009.1068024
14. Schiff, J. L. (2007). *Cellular Automata*. John Wiley & Sons, Inc., 254. doi:10.1002/9781118032381
15. Boccara, N. (2009). Phase Transitions in Cellular Automata. *Encyclopedia of Complexity and Systems Science,* 6771–6782. doi:10.1007/978-0-387-30440-3_405
16. Tempesti, G., Mange, D., Stauffer, A. (2009). Self-Replication and Cellular Automata. *Encyclopedia of Complexity and Systems Science,* 1–24. doi:10.1007/978-3-642-27737-5_477-7
17. Weisstein, E. W. Elementary Cellular Automaton. *MathWorld — A Wolfram Web Resource*. Available: http://mathworld.wolfram.com/ElementaryCellularAutomaton.html
18. Cook, M. (2004). Universality in Elementary Cellular Automata. *Complex Systems, 15*, 1–40. Available: http://www.complex-systems.com/pdf/15-1-1.pdf
19. Stepancov, M. E. (2002). Kletochnye avtomaty kak modeli nelinejnyh javlenij. *Trudy devjatyh matematicheskih chtenij «Matematicheskie metody i prilozhenija»*. Moskva: MGSU, 141–142.