



## WEB RESOURCES MANAGEMENT IN CONDITIONS OF UNCERTAINTY

page 4–7

The main task of electronic content commerce systems (ECCS) is to facilitate the work of moderators, authors, analysts and administrators of information resources. The main goal of the ECCS functioning is to improve the functionality of information resources for users of the content. The ECCS selected topical issues range in the content set from various external sources for moderators and authors according to their ranking through the commercial content formation subsystem. An author creates a commercial content according to automatically matched information analysis from various sources of actual content. When necessary, a moderator creates new rules to filter content from different sources. He also updates other sources addresses in the subsystem of the commercial content formation. An analyst analyzes activity of target audience and the ECCS functioning. As a result, he develops new rules of statistics and dynamic analysis of the commercial content lifecycle through the commercial content support subsystem. These rules can increase the target audience range; the visits number; the unique visitors number; revisits; the visits number from search engines; the direct visits number; the regional visits number; the thematic visits number, etc. for the information resources in the ECCS. The article aims at modeling information resources processing in the ECCS. This allows us to build the general approach to design, construction and implementation of similar systems. Such solution will alternatively promote generalization and standardization of information resources processing in the ECCS methodology through the stages of commercial content formation, management and support. This helps to reduce construction time for a typical e-business systems building. Implementation of such systems allows to reduce time of production of its own commercial content, to analyze the external commercial content derived from external sources, to analyze the dynamics of the content lifecycle, to analyze the statistics of the ECCS function, to analyze the statistics of user activity of information resources in the ECCS, to increase target audience of information resources and to expand the feature set in the ECCS. The set of functional requirements and standardized specifications for creation of similar systems are the result of modeling and development of information resources processing in the ECCS. The purpose of these requirements is to provide a generalized approach to development of such ECCS as an online newspaper, an online magazine, an online publishing, distance learning system, an online shop for selling content (e-books, photos, videos, audio etc). The standardization of requirements for the ECCS construction provides creation of generalized approach for developers of such systems. This reduces time of designing and implementation of such systems and respectively helps to omit the phase of project development.

**Keywords:** information resources, commercial content, content analysis, content monitoring, content search, electronic content commerce systems.

### References

- Berko, A., Vysotska, V., Pasichnyk, V. (2009). *Systemy elektronoyi kontent-komertsiyi*. Lviv, Ukraine: NULP Publ., 612.
- Clifton, B. (2009). *Google Analytics: Professional'nyj analiz posešaemosti veb-sajtov*. Advanced Web Metrics with Google Analytics. M., Russia: Vil'jame Publ., 400.
- Lande, D., Furashov, V., Braychevskyy, S., Hryhorev, O. (2006). *Osnovy modelirovaniya i otsenki elektronnykh informatsionnykh potokov*. Kyiv, Ukraine: Engineering Publ., 348.
- Lande, D. (2006). *Osnovy intehratsii informatsionnykh potokov*. Kyiv, Ukraine: Engineering Publ., 240.
- EMC, IBM, & Microsoft. (2008). *Content Management Interoperability Services*. All Rights Reserved. Version 0.5., 17.
- Hackos, J. (2002). *Content Management for Dynamic Web Delivery*. Hoboken, N.-J.: Wiley, 432.
- Halvorson, K. (2009). *Content Strategy for the Web*. Reading, Mass: New Riders Press, 192.
- McGovern, G., Norton, R. (2001). *Content Critical*. Upper Saddle River, N.-J.: FT Press, 256.
- McKeever, S. (2003). Understanding Web content management systems: evolution, lifecycle and market. *Industrial Management & Data Systems*, Vol. 103, № 9, 686–692. doi:10.1108/02635570310506106
- Nakano, R. (2002). *Web content management: a collaborative approach*. Boston: Addison Wesley Professional, 222.

## EVALUATION METHOD OF THE ACTUAL TECHNICAL STATE OF BIOMEDICAL EQUIPMENT IN THE PROCESS OF EXPLOITATION

page 7–10

The materials of the article puts the task of improving the quality of repair work by building an effective method for estimating the actual technical condition of biomedical equipment, the practical implementation of which can be accomplished through the introduction of automation in the repair process. Specifically, the efficiency of the assessment process of technical state of biomedical equipment depends on the degree of volume optimization of control parameters that may be obtained by modelling the processes of its functioning. The basic steps of implementation of assessment method of the actual technical state of biomedical equipment are shown. It was found that the quantity and quality structure of parameters to assess the technical condition defines: operability control, diagnostics and forecasting of technical condition and application efficiency of means of evaluation of technical condition. It is proved that the information content, as well as the accuracy of the selected set of parameters is a prerequisite for the transition of repairs and maintenance for the actual technical condition.

**Keywords:** biomedical equipment, actual technical condition, manufacturing technology, information technology, evaluation parameters, automated complex.

### References

- Kucherenko, V. (2015). A structure of forming and transformation of informative resource in information technology of medical equipment repair technological process. *Technology Audit And Production Reserves*, 1(2(21)), 22–26. doi:10.15587/2312-8372.2015.37188
- Kucherenko, V. (2014). Quality assurance of biomedical equipment repair process on technical condition. *Technology Audit And Production Reserves*, 1(3(15)), 22–24. doi:10.15587/2312-8372.2014.21582
- Kucherenko, V. (2012). Metodyka pobudovy novitnoho tekhnolohichnoho protsesu remontu medychnoho diahnostychnoho obladnannia. *Systemy obrobky informatsii*, 5(103), 38–41.
- Mozgalevskii, A. V., Gaskarov, D. V. (1985). *Tekhnicheskaia diagnostika*. M.: Vyssh. shk, 207.
- Kuzovik, V. D. (1984). Nekotorye voprosy avtomatizatsii tekhnologicheskogo protsessa remonta aviatsionnoi tekhniki. *Materialy vsesoiuznoi nauchno-tekhnicheskoi konferentsii «Sovershenstvovanie tekhnologicheskikh protsessov remonta aviatsionnoi tekhniki na zavodakh grazhdanskoi aviatsii»*. M.: VGPO «Aviaremонт», 19.
- Malinovskii, A. V. (2007). *Rukovodstvo po remontu i tekhnicheskomu obsluzhivaniuu meditsinskoi tekhniki RMT 59498076-03-2007. Vol. 3, Part 1*. SPb.: Medtehnika, 278.
- Hihienichni vymohy do vlashtuvannia ta ekspluatatsii renthenivskyykh kabinetiv i provedennia renthenolohichnykh doslidzhen. *Derzhavni sanitarni normy i pravyla. DsanPiN 6.6.3-150-2007*. (2007). Kyiv, 72.
- In: Blinov, N. N. (1985). *Ekspluatatsiia i remont rentgenodiagnosticheskikh apparatov*. M.: Meditsina, 256.
- Blinov, N. N., Leonov, B. I. (2001). *Rentgenovskie diagnosticheskie apparaty. Vol. 1*. M.: VNIIMT, 218.

10. Kovalenko, Yu. N., Balashov, S. V. (2013). Prakticheskie aspekty obespecheniia kachestva i bezopasnosti rentgenologicheskikh issledovaniy. *Promeneva diahnostyka, promeneva terapiia*, 3–4, 97–101.

**DEVELOPMENT OF OPTIMIZATION METHOD OF THE REPAIR WORK TAKING INTO ACCOUNT THE RISK INDICATORS**

page 11–17

The methods of data collection and processing residual resource determination, planning repair work by optimizing the decision based on the criteria of acceptable risk level of reliability and performance of the equipment are developed.

Optimization of planning the repair work is achieved as a result of Risk Based Inspection using information technology of risk assessment. The proposed technology allows to combine the study of cause-and-effect relationships of processes based on fault tree analysis (FTA) and modeling the possible consequences of failure. As a result, using the methods of sorting the coefficients of the value and the maximum allowable risk parameters provide the sequence and chronology of the necessary recovery procedures. The aim of article is to achieve repair regime depend on condition. This can significantly reduce the cost of repairs.

**Keywords:** reliability, performance, failure, resource, repair, risk.

**References**

- Gromakov, E. I., Aleksandrova, T. V., Rudachenko, A. V. (2010). Tehnicheskoye obsluzhivaniye i remont po sostoiyaniyu oborudovaniya s ispolzovaniyem kart Shuharta. *Izvestiya Tomskogo politehnicheskogo universiteta*, Vol. 317, № 5, 112–117.
- Card, A. J., Ward, J. R., Clarkson, P. J. (2014, September). Re-balancing risk management-Part 1: The Process for Active Risk Control (PARC). *Journal of Healthcare Risk Management*, Vol. 34, № 2, 21–30. doi:10.1002/jhrm.21155
- In: Subbotin, A. I. et al. (2003). *Obshchie pravila vzryvobezopasnosti dlya vzryvopozharoопасnykh himicheskikh, neftehimicheskikh i neftepererabatyvayushchikh proizvodstv: PB 09-540-03*. M.: Gos. unitar. predpriyatiye «Nauch.-tehn. tsentr po bezopasnosti v prom-sti Gosgortekhnadzora Rossii», 108.
- Collective of authors. (2002). *Metodiki otsenki posledstviy avarii na opasnykh proizvodstvennykh objektah. Series 27. Issue 2*. Ed. 2. M.: Gosudarstvennoe unitarnoe predpriyatie «Nauchno-tehnicheskii tsentr po bezopasnosti v promyshlennosti Gosgortekhnadzora Rossii», 208.
- Beiker, U. et al.; In: Zel'dovich, Ya. B., Gel'fand, B. E. (1986). *Vzryvnye iavleniia. Otsenka i posledstviia*. Translated from English. In two books. M.: Mir, 319.
- Dem'ianenko, G. P. et al. (1989). *Zashchita objektov narodnogo hoziaistva ot oruzhiia massovogo porazheniia*. K.: Vysshiaia shkola. Glavnoe izd-vo, 286.
- Ob utverzhenii metodiki opredeleniia raschetnykh velichin pozharnogo riska na proizvodstvennykh objektah*. Prikaz MChS RF ot 10 iulia 2009 goda № 404. Available: [http://www.consultant.ru/document/cons\\_doc\\_LAW\\_109874/](http://www.consultant.ru/document/cons_doc_LAW_109874/)
- Belov, P. G. (2003). *Sistemnyi analiz i modelirovanie opasnykh protsessov v tehnosfere*. M.: Akademiia, 512.
- Venttsel', E. S. (1969). *Teoriia veroiatnostei*. M.: Nauka, 576.
- Sakov, G. P., Tsivilev, M. P., Poliakov, I. S. et al.; In: Shoi-gu, S. K. (1998). *Obespechenie meropriiatii i deistviy sil likvidatsii chrezvychainykh situatsii. Book 2. Operativnoe prognozirovanie inzhenernoi obstanovki v chrezvychainykh situatsiiakh*. M.: ZAO «PAPIRUS», 166.
- Henley, J., Kumamoto, H. (1981). *Reliability Engineering and Risk Assessment*. New York: Prentice-Hall, 542.
- In: Van den Bosch, C. J. H., Weterings, R. A. P. M. (1997). *Methods for the calculation of Physical Effects*. Ed. 3. Publicatiereeks Gevaarlijke Stoffen. Available: <http://www.bib.ub.edu/fileadmin/fdocs/PGS2-1997.pdf>

**METHOD OF PRESENTATION OF EXPERT INFORMATION BY MEANS OF FUZZY LOGIC AND OBTAINING THE GROUP ASSESSMENT OF EXPERT OPINIONS**

page 17–21

In the article it is discussed an application of the theory of fuzzy sets to provide expert information, which is not the real linguistic nature. This is particularly relevant for intelligent automated decision support systems, because such systems operate on the basis of expert data. The quality of these systems depends on the chosen method of treatment. To date, there are many methods that allow processing the quantitative expert information as opposed to methods that allow processing the non-numeric data. Since most expert data are expressed in linguistic terms, it should be used the theory of fuzzy sets for their presentation. Therefore, we investigated the possibility of using fuzzy logic and classical methods of expert assessments in this article for presentation and further processing of the results of the expert survey. Adequacy of this approach is shown. Further development of the proposed methods is in their software implementation.

**Keywords:** expert information, qualification of experts, group expert evaluation, fuzzy logic.

**References**

- Gong, J., Liu, L. (2010). Representing and measuring experts knowledge based on knowledge network. *Studies in Science of Science*, 28(10), 1521–1530.
- Korneev, V., Gareyev, A., Vasjutin, S., Reich, V. (2000). *Databases. Intelligent processing of information*. M.: Knowledge, 352.
- Maxwell, S. E., Delaney, H. D. (2004). *Designing experiments and analyzing data: A model comparison perspective*. Ed. 2. Mahwah, NJ: Lawrence Erlbaum Associates, 1104.
- In: Ryabushkin, T., Baklanov, G., Volkov, A. (1997). Statistical methods of analysis of expert estimations. *Proc. Sciences. Art. Scientific notes on statistics*, Vol. 29. M.: Nauka, 385.
- Litvak, B. (1982). *Expert information: Methods for the preparation and analysis*. M.: Radio and Communications, 184.
- Orlov, A. (2004). *Applied Statistics*. M.: Exam, 656.
- J., J. E., Linstone, H. A., Turoff, M. (1976, August). The Delphi Method: Techniques and Applications. *Technometrics*, Vol. 18, № 3, 363–364. doi:10.2307/1268751
- Dalkey, N. C. (1969). *The Delphi method: An experimental study of group opinion*. Santa-Monica, Calif: RAND corporation, 80. Available: [http://www.rand.org/content/dam/rand/pubs/research\\_memoranda/2005/RM5888.pdf](http://www.rand.org/content/dam/rand/pubs/research_memoranda/2005/RM5888.pdf)
- Scheibe, M., Skutsh, M., Schofer, J. (1975). Experiments in Delphi methodology. In: *The Delphi method. Techniques and applications*. London: Addison – Wesley Publ., 257–281.
- Snityuk, V., Rifat Mohammed Ali. (2000). Model methods for determining the competence of experts on the basis of the axioms of unbiasedness. *Bulletin of Cherkasy Engineering and Technological Institute*, № 4, 121–126.
- Gharajedaghi, J., Ackoff, R. L. (1985, March). Toward systemic education of systems scientists. *Systems Research*, Vol. 2, № 1, 21–27. doi:10.1002/sres.3850020105
- Melihov, A., Bernstein, L., Korovin, S. (1990). *Situational advising system with fuzzy logic*. M.: Nauka. Ch. Ed. Sci. Lit., 272.
- Shtovba, S. (2007). *Design of fuzzy systems by means of MATLAB*. M.: Hotline – Telecom, 288.
- Pavlov, A., Sokolov, B.; GUA. (2005). *Methods of processing expert information*. St. Petersburg., 42.

**SOFTWARE IMPLEMENTATION OF THE BSP ALGORITHM FOR CLUSTERIZATION OF SOCIAL NETWORKS**

page 21–26

Recently, analysis of social networks has received increasing attention in the scientific community of data mining. Traditional clustering algorithms divide objects into clusters based on their

similarity. Cluster analysis of social networks is different from traditional clustering because the objects group not only depending on the value of their attributes, but depending on the relationships between these objects. BSP (business system planning) clustering algorithm is considered in the article. A block diagram of the considered clustering algorithm is given and its detail work is shown on the example. The proposed algorithm, unlike traditional clustering algorithms, allows you to combine objects to a social network in different clusters based on their relationships and to determine the relationship between clusters dynamically, does not require a large amount of memory.

**Keywords:** clustering, social network, BSP algorithm, cluster analysis.

### References

1. Berezko, O. L., Peleshchyshyn, A. M. (2007). WWW as a social network. *Proc. of the Second Intern. Conf. on Computer Science and Engineering (CSE'2007)*. Lviv, 29–30.
2. Fischer, C. (1982). *To dwell among friends*. Chicago: University of Chicago Press, 459.
3. Wellman, B. (1979, March). The Community Question: The Intimate Networks of East Yorkers. *American Journal of Sociology*, Vol. 84, № 5, 1201–1231. doi:10.1086/226906
4. Freeman, L. C. (1978, January). Centrality in social networks conceptual clarification. *Social Networks*, Vol. 1, № 3, 215–239. doi:10.1016/0378-8733(78)90021-7
5. *International Network for Social Network Analysis*. (13.03.2015). Available: <http://www.insna.org/>
6. Watts, D. J. (1999, September). Networks, Dynamics, and the Small-World Phenomenon. *American Journal of Sociology*, Vol. 105, № 2, 493–527. doi:10.1086/210318
7. Nair, P. S., Sarasamma, S. T. (2007, June). Data Mining Through Fuzzy Social Network Analysis. *NAFIPS 2007 – 2007 Annual Meeting of the North American Fuzzy Information Processing Society*. Institute of Electrical & Electronics Engineers (IEEE). Available: <http://doi.org/10.1109/nafigs.2007.383846>
8. Mandel, J. D. (1988). *Cluster analysis*. M.: Finance and Statistics, 176.
9. Syvoholovko, E. V. (2011). The method is generalized clustering in the analysis of social networks. *Software and systems*, № 4, 98–101.
10. Boyko, E. A. (2012). Social network clustering using BSP clustering algorithm. *Eastern-European Journal Of Enterprise Technologies*, 3(11(57)), 34–36. Available: <http://journals.urau.ua/ejet/article/view/4199>

### RESEARCH METHODS OF STATISTICAL CHARACTERISTICS OF CCD-MEASUREMENT OF POSITION AND BRIGHTNESS OF THE SOLAR SYSTEM OBJECTS

page 26–37

It is proposed a set of methods to assess the statistical properties of CCD-measurement of the Solar system. As data sources are used the Series of CCD-frames of asteroid surveys, as well as Internet services: archive MPC, Minor Planet Checker, service NASA HORIZONS. They are processed by CoLiTec software.

The proposed methods investigate the average deviation and standard deviation of the estimates between the equatorial coordinates of catalog and the measured values, the coefficients of skewness and kurtosis of estimates of equatorial coordinates of objects. The developed methods allow us to investigate the accuracy of performance of the software used by astronomers for astrometry of small bodies of the Solar system, and also to investigate the statistical characteristics of estimates of position and brightness of asteroids that are stored in the archive MPC or contained in CCD-dimensions, the relevant personnel investigated; as well as quality indicators to detect the objects in the Solar system.

As part of the research, the proposed methods are implemented by the authors in a research software tool SSOAnSe, which is the first tool with similar functions. SSOAnSe allows the analysis, including operational, an expanded set of indicators measuring accuracy and quality of the discovery of asteroids in the extension set of analyzed subsamples of measurements and frames.

**Keywords:** CCD-measurement, MPC, Minor Planet Checker, NASA HORIZONS, evaluation of indicators accuracy.

### References

1. Chamberlin, A. *NEO Discovery Statistics*. NASA. Available: <http://neo.jpl.nasa.gov/stats/>
2. L'vov, V. N., Tsekmeister, S. D. *Paket programm EPOS*. Pulkovskaja stranitsa OSZ. Available: <http://www.gao.spb.ru/personal/neo/rus/esupp/main.htm>
3. Bykov, O. P., L'vov, V. N., Izmailov, I. S., Kastel, G. R. (2008, November). An accuracy estimation of the World CCD asteroid observations in the years 1999–2005. *Planetary and Space Science*, Vol. 56, № 14, 1847–1850. doi:10.1016/j.pss.2008.02.0324.
4. L'vov, V. N., Smekhacheva, R. I., Tsekmeister, S. D. (2001). EPOS – the program package for the Solar system objects research. *Proceedings of the Conference Near Earth Astronomy in XXI Century*, 235–240.
5. Izmailov, I. S., Bykov, O. P., Kastel, G. R. *Pulkovo Method for an Accuracy Estimation*. Accuracy of World positional CCD observations of the minor planets. Available: <http://accuracy.puldb.ru/METHOD.HTM>
6. *AstDyS*. (15.10.2015). Available: <http://hamilton.dm.unipi.it/astdys/index.php?pc=0>
7. Carpino, M., Milani, A., Chesley, S. R. (2003, December). Error statistics of asteroid optical astrometric observations. *Icarus*, Vol. 166, № 2, 248–270. doi:10.1016/s0019-1035(03)00051-4
8. Chesley, S. R., Baer, J., Monet, D. G. (2010, November). Treatment of star catalog biases in asteroid astrometric observations. *Icarus*, Vol. 210, № 1, 158–181. doi:10.1016/j.icarus.2010.06.003
9. *Calculation of residuals of asteroid positions*. Available: <http://www.fitsblink.net/residuals/index.html>
10. *Statistics on residuals from observations of minor planets, by observatory code*. MPC Submission Information. Available: <http://www.minorplanetcenter.net/iau/special/residuals.txt>
11. *Statistics on residuals from observations of numbered minor planets, by observatory code*. MPC Submission Information. Available: <http://www.minorplanetcenter.net/iau/special/residuals2.txt>
12. Kononovich, E. V., Moroz, V. I.; In: Ivanov, V. V. (2004). *Obshchii kurs astronomii*. Ed. 2. M.: Editorial URSS, 544.
13. Vallado, D. A. (2001). *Fundamentals of Astrodynamics and Applications*. El Segundo, CA: Microcosm Press, 958.
14. *Pulkovo Observatory of Russian Academy of Sciences is situated near Saint-Petersburg*. Available: <http://www.gao.spb.ru/>
15. *The MPC Orbit (MPCORB) Database*. Available: <http://www.minorplanetcenter.net/iau/MPCORB.html>
16. *University of Pisa*. Available: <http://www.unipi.it/>
17. *MPC Submission Information*. Available: <http://www.minorplanetcenter.net/iau/info/TechInfo.html>
18. *The OrbFit Software Package* (2012, February 18). Available: <http://adams.dm.unipi.it/~orbmain/orbfit/>
19. *MPC/MPO/MPS Archive*. Available: [http://www.minorplanetcenter.net/iau/ECS/MPCArchive/MPCArchive\\_TBL.html](http://www.minorplanetcenter.net/iau/ECS/MPCArchive/MPCArchive_TBL.html)
20. *The Institut de Mecanique Celeste et de Calcul des Ephemerides (IMCCE)*. Available: <http://www.imcce.fr/>
21. *MPChecker: Minor Planet Checker*. Available: <http://www.minorplanetcenter.net/cgi-bin/checkmp.cgi>
22. Venttsel', E. S., Ovcharov, L. A. (2000). *Teoriia veroiatnosti i ee inzhenernye prilozheniia*. Ed. 2. M.: Vyssh. shk., 480.
23. In: Prohorov, Yu. V. (2003). *Veroiatnost' i matematicheskaia statistika*. M.: Bol'shaia rossiiskaia entsiklopediia, 912.
24. Kobzar', A. I. (2006). *Prikladnaia matematicheskaia statistika. Dlia inzhenerov i nauchnykh rabotnikov*. M.: Fizmatlit, 816.
25. Kallenberg, O. (1997). *Foundations of Modern Probability*. Springer, 535. doi:10.1007/b98838

26. JPL/Horizons Execution Control VARLIST Checker. Available: [http://ssd.jpl.nasa.gov/pub/ssd/horizons\\_batch\\_example.lon0067](http://ssd.jpl.nasa.gov/pub/ssd/horizons_batch_example.lon0067)
27. CoLiTec – Collection Light Technology. Available: <http://www.neoastrosoft.com/>
28. Savanevych, V. E., Kozhukhov, A. M., Bryukhovetskiy, A. B., Vlasenko, V. P., Dikov, E. N., Ivashchenko, Yu. N., Elenin, L. (2011). Program of Automatic Asteroid Search and Detection on Series of CCD-Images. *42nd Lunar and Planetary Science Conference*. Available: <http://www.lpi.usra.edu/meetings/lpsc2011/pdf/1140.pdf>
29. MPCAT-OBS: Observation Archive: Minor Planet Checker. Available: <http://www.minorplanetcenter.net/iau/ECS/MPCAT-OBS/MPCAT-OBS.html>
8. Aleshin, L. I. (2001). *Avtomatizatsiia v biblioteke. Part 1*. M.: Profizdat, 172.
9. Aleshin, L. I. (2001). *Avtomatizatsiia v biblioteke. Part 2*. M.: Profizdat, 144.
10. Zobel, J., Moffat, A., Wilkinson, R., Sacks-Davis, R. (1995, May). Efficient retrieval of partial documents. *Information Processing & Management, Vol. 31, № 3*, 361–377. doi:10.1016/0306-4573(94)00052-5
11. Kozima, H. (1993). Text segmentation based on similarity between words. *Proceedings of the 31st annual meeting on Association for Computational Linguistics*. Association for Computational Linguistics (ACL), 286–288 doi:10.3115/981574.981616
12. *Spysok rekomendovanoi literatury do dystsyplin, shcho vykladaiutsia u Natsionalnomu universyteti «Lvivska politehnika»*. Available: <http://library.lp.edu.ua/ttp/>

**THE IMPLEMENTATION OF ALGORITHM OF RANKING SEARCH RESULT IN INFORMATION SYSTEM OF UNIVERSITY LIBRARY**

page 37–43

This paper describes the implementation of the algorithm of ranking search results of the user in informational and search system of library. Today, in Ukraine almost no university libraries, that aren't computerized, at least partially. Libraries offer a range of remote services for their users – e-catalog and specialized e-services. If these services are provided by web means then access to them in most cases is anonymous. Today, libraries have large databases that describe millions of books, magazines and newspapers. If the user does not clearly imagine that he searches, then deal in such large arrays is very difficult. Therefore, in addition to specific features of information system that are used to refine the search query, an important element is the function of governing the presentation of search results – ranking. Implementation of ranking algorithms in the work of library information systems allow users to minimize the time required to find and organize information search based on qualitative criteria. In scientific and technical library of the National University «Lviv Polytechnic» was developed specialized information system that allows you to create a list of books for students. The proposed ranking algorithm was incorporated in the work of the system. In the opinion of users it is greatly improved process for selecting literature for the study of academic disciplines, if literature, recommended by the teacher, doesn't fit for some reasons

**Keywords:** academic courses, information system, library, learning process, ranking.

**References**

1. Yakovlieva, Yu. V. (2004). Metodyka ranzhuvannia rezultativ poshuku v informatsiino-poshukovykh systemakh bibliotek. *Reiestratsiia, zberihannia i obrobky danykh, Vol. 6, № 3*, 66–73.
2. Yakovlieva, Yu. V. (2004). Otsinka informatyvnosti dokumentiv u poshukovykh systemakh naukovykh bibliotek. *Naukovo-tekhnichna informatsiia, № 4*, 52–54.
3. Baharev, A. T., Zuev, A. K., Kamilov, M. M., Medvedev, G. A. et al. (1969). *Teoriia i primenenie sluchainogo poiska*. Riga: «Zinatne», 309.
4. Hryhoruk, P. M., Hryhoruk, S. S. (2012). Informatsiina model protsesu pryiniattia rishennia. *Aktualni problemy ekonomichnoi kibernetiky*. K.: Stylos, 154–171.
5. Gelbukh, A., Sidorov, G. (2001). Zipf and Heaps Laws' Coefficients Depend on Language. *Computational Linguistics and Intelligent Text Processing*. Springer Science + Business Media, 332–335. doi:10.1007/3-540-44686-9\_33
6. Bahle, D., Williams, H. E., Zobel, J. (2002). Efficient phrase querying with an auxiliary index. *Proceedings of the 25th annual international ACM SIGIR conference on Research and development in information retrieval – SIGIR'02*. Association for Computing Machinery (ACM), 215–221. doi:10.1145/564376.564415
7. Solton, J. (1979). *Dinamicheskie bibliotchno-informatsionnye sistemy*. Translation from English. M.: Mir, 557.

**USING MODERN COMPUTER TECHNOLOGY FOR AUTOMATIZATION OF PRODUCTION PROCESSES**

page 43–49

Using of modern computer technology to automate production processes will increase productivity and significantly reduce production time product at work.

For optimal organization of production processes using computer technology needed them the right choice. It is caused by the specific activities of enterprises of different types of economic activity, ownership and diversity of the tasks of economic analysis, the solution of which is effectively the effective management of the enterprise in the market, which, in turn, are characterized by rapid change of environmental factors, uncertainty and risk. Because modern production – a complex, multi-faceted, multi-functional system, which is in the process of improvement and adaptation to external factors. To succeed output required to implement a strategic plan for industrial automation.

Nowadays there are many systems to automate production processes. In this regard, we choose a system for the enterprise: the class system, for example, ERP-systems can be installed in industrial enterprises and organizations in the service sector, for medium-sized businesses do not need a powerful functionality of these systems, so usually choose MRP II system; system manufacturer (western or domestic); someone who will carry out the introduction of (developer or consultant).

Between the preferred systems of automation of production processes identified: Sarah system (Computer Aided Process Planning), system of CAD (Computer Aided Design – design using computer programs), class CAE applications (numerical simulation of heat and mass transfer processes, physical and chemical reactions and metallurgical processes, analysis of electric fields), the system ERP (Enterprise Resource Planning – Enterprise Resource).

There are examples of application of T-FLEX CAD 3D.

These studies provide an opportunity to improve computer technology to automate production processes.

**Keywords:** modern computer technology, information technology, automation of production processes, computer systems automation.

**References**

1. *Systemy avtomatichnoho proektuvannia SAPR*. (2009). Available: <http://joiner.org.ua/2rozrjad/2009-07-08-13-19-32/2009-07-24-08-10-10/2009-07-24-08-42-32.html>
2. Hladchuk, O. (2013). Innovatsiina ekonomika. *Naukovo-vyrobnychi zhurnal, 10(48)*, 167–174.
3. Taliupa, N. (2009). Suchasni pidkhody do udoskonalennia tekhnologii upravlinnia. *Investytsii: praktyka ta dosvid, 8*, 49–50.
4. Shapurov, O. (2008). Sutnist, rol i obiektyvna neobkhdnist udoskonalennia upravlinnia pidpriemstvamy. *Aktualni problemy ekonomiky, 8*, 138–146.

5. Yanenkova, I. H. (2014). Formuvannya promyslovykh ta innovatsiinykh klasteriv v Ukraini. *Zbirnyk naukovykh prats Natsionalnoho universytetu korablebuduvannia*, 1, 115–119. Available: [http://nbuv.gov.ua/j-pdf/znnpuk\\_2014\\_1\\_21.pdf](http://nbuv.gov.ua/j-pdf/znnpuk_2014_1_21.pdf)
6. Davydov, I. Ye. (2008). *Upravlinnia vytratamy*. K.: Tsentr uchbovoi literatury, 320.
7. Ivanilov, O. (2009). *Ekonomika pidpryemstva*. K.: Tsentr uchbovoi literatury, 728.
8. Boltak, O. L. *Shliakhy vdoskonalennia systemy upravlinnia pidpryemstvom*. Vidkrytyi mizhnarodnyi universytet rozvytku liudy ny «Ukraina». Available: <http://nauka.zinet.info/9/boltak.php>
9. Avilov, A., Kaminskaia, Yu. O., Trusova, D. S. (2013). *Primenenie komp'uternykh sistem dlia avtomatizatsii i razrabotki novykh tehnologii v mashinostroitel'nom proizvodstve*. Available: <http://www.science-education.ru/pdf/2013/3/77.pdf>
10. Ladaniuk, A., Trehub, V., Kyshenko, V. (2000). Upravlenie tehnologicheskimi kompleksami v komp'uterno-integrirovannykh sistemah. *Problema upravleniia y informatyky*, 2, 72–79.
11. Biblioteka ekonomista. (2005). Neoavstriiska shkola ekonomichnoho neoliberalizmu: pohliady L. fon Mizesa ta F. fon Khaiieka. *Istoriia ekonomichnykh uchen*. Available: <http://library.if.ua/book/39/2903.html>
12. *Vyrobnycha stratehiia*. Available: [http://pidruchniki.com/12090613/marketing/virobnicha\\_strategiya](http://pidruchniki.com/12090613/marketing/virobnicha_strategiya)
13. Kudriavtsev, Yu. (2008). *Obzor algoritmov MOLAP*. Available: [http://citforum.ck.ua/consulting/BI/molap\\_overview/](http://citforum.ck.ua/consulting/BI/molap_overview/)
14. Rossolovskii, A. (2000). *AutoCAD: Nastol'naia kniga pol'zovatel'ia*. M.: Nolidzh, 928.
15. *Nezavisimyi ERP-portal «ERP-online»*. Available: <http://www.erp-online.ru/>
16. *T-FLEX CAD. Kratkii vvodnyi kurs*. (2011). M.: AO «Top Systemy», 283.
4. Bobryshev, A. D. (2011). Vyiavlenie i issledovanie problemnykh polei v organizatsii deiatel'nosti kompanii, na kotorye okazyvaet vliianie krizis. *Problemy prognozirovaniia*, 2, 127–136.
5. Popov, V. L. (2009). *Upravlenie innovatsionnymi proektami*. M.: INFRA-M, 336.
6. Bushuev, S. D., Bushueva, N. S., Yaroshenko, R. F. (2012). Model' garmonizatsii tsennosti programm razvitiia organizatsii v usloviiah turbulentnosti okruzheniia. *Upravlinnia rozvoikom skladnih sistem*, 10, 9–13.
7. Ohara, S. (2005). *A Guidebook of Project & Program Management for Enterprise Innovation: Volume 2*. Project Management Association of Japan, 238.
8. Münch, J., Fagerholm, F., Johnson, P., Pirttilahti, J., Torkkel, J., Jäärvinen, J. (2013). Creating Minimum Viable Products in Industry-Academia Collaborations. *Lecture Notes in Business Information Processing*, Vol. 167, 137–151. doi:10.1007/978-3-642-44930-7\_9
9. Tolstova, Yu. N. (2003). *Izmerenie v sotsiologii*. M.: INFRA-M, 312.
10. *Otbor i otsenka innovatsionnykh proektov*. Tehnologicheskii park Mogilev. Available: <http://www.technopark.by/business/206.html>

#### DEVELOPMENT AND IMPLEMENTATION OF INFORMATION PROJECT MANAGEMENT SYSTEM IN BUILDING COMPANIES

page 54–58

The article is devoted to research of a problematic field of management of complicated investment-building projects in project-oriented building companies. In the article are studied key issues that happen to Main Contractor organizations on the stages of preparation and realization of projects, and also possible technical realization of main goals, using applied specific program solutions on the base of modern information technologies. Were studied the possibilities to apply modern information project management systems to different types of the projects, that make a significant part of corporate project management system. On the example of the turn-key hotel building project were shown the results of development and implementation of additional and specific program modules on the base of project management information systems in investment-building projects. Suggested decisions made it possible to automatize the process of transition from commercial proposal development stage to detailed project planning. In its turn, the adoption of functional of existing program products to requirements of building industry peculiarities and unique demands of certain building company made it possible to extend the application of project management information systems and to improve their effectiveness.

**Keywords:** information technology, project, project management, project management information system.

#### References

1. Oberemok, I. (2014). Flexible approach to the implementation of corporate project management system. *Management of complex systems*, № 17, 42–45.
2. Stutko, N. *The efficiency of project management information system (PMIS)*. Available: [http://www.iteam.ru/publications/project/section\\_41/article\\_2709/](http://www.iteam.ru/publications/project/section_41/article_2709/)
3. Chainsky, V. The effectiveness of the company and the construction of the corporate system. *Journal «Corporate systems»*. Available: [http://www.iteam.ru/publications/it/section\\_53/article\\_3686/](http://www.iteam.ru/publications/it/section_53/article_3686/)
4. Mazur, I., Shapiro, V., Ginsburg, A. et al. (2007). *Investment and Construction Engineering*. M.: Elim, 1216.
5. Morozov, V., Osetrin, K. (2005). Development of the models which define, develop and configure management portfolios of investment projects construction corporations. *Project management and production development*, № 4(16), 38–45.
6. Morozov, V., Kalnichenko, O. (2011). Functional-role approach to the description of the project life cycle of project-oriented corporations. *Management of complex systems*, № 5, 23–29.

#### VALUE BASED SCOPE MANAGEMENT OF INNOVATION PROJECTS IN CRISIS CONDITIONS

page 49–53

During the research process of value-based scope management of Innovation projects in crisis conditions it was created a system of criteria, which can be used for evaluation of the projects operations in aspect of their importance for delivering Value in the final product of the Innovation project. Thurstone method was used for the analysis of the experts' evaluation results. It enabled to identify the most important project operations for the further redesigning of the WBS.

During the crisis economic situation a manager has to keep project successful while decreasing finances. The Value-based approach was chosen for the decision making efficiency increasing. This approach allows to concentrate on choosing the most important project operations, and save the Value of the final product.

A system of criteria of Innovation project success was proposed as result of the research. Also it was proposed a procedure of experts' evaluation analyzing, which allows to range project operations for WBS redesigning.

The results of the research are considered to be useful as there is an opportunity to range Innovation project operations effectively in crisis conditions.

**Keywords:** project management, scope management, value-based management, innovation project, crisis management.

#### References

1. Bykovskii, V. V., Mishchenko, E. S., Bykovskaia, E. V. (2011). *Upravlenie innovatsionnymi proektami i programmami*. Tambov: GOU VPO TGTU, 104.
2. Sergeev, V. A., Kipcharskaia, E. V., Podymalo, D. K.; In: Sergeeva, V. A. (2010). *Osnovy innovatsionnogo proektirovaniia*. Ul'ianovsk: UIGTU, 246.
3. *Rukovodstvo k Svodu znanii po upravleniiu proektami (Rukovodstvo PMBOK)*. (2013). Ed. 5. Project Management Institute. Available: <http://rutracker.org/forum/viewtopic.php?t=4687650>

7. Jurgen, A. (2010). *Management 3.0 — Leading Agile Developers, Developing Agile Leaders*. Boston: Addison-Wisley, 451.
8. Cohn, M. (2009). *Succeeding with Agile: Software Development Using Scrum*. Addison-Wesley Professional, 438.
9. Stack, J. (1994). *The Great Game of Business*. Oxford Oxfordshire. Oxford University Press, 373.
10. David, M. (2009). *Sides ESI Consulting Services «Agile or PM-BOK & You can have both!», 28.*
11. Ozhegov, S. I., Shvedova, N. Yu. (2004). *Tolkovyi slovar' russkogo iazyka*. M.: ONIKS 21 vek: Mir i Obrazovanie, 1198.
12. *Programmnyi paket sintaksicheskogo razbora i mashinnogo perevoda*. (2008). Available: <http://cs.isa.ru:10000/dwarf/>
13. Knut, D. E. (2007). *Iskusstvo programmirovaniia. Tom 3. Sortirovka i poisk*. M.: Izdatel'skii dom Vil'iams, 800.
14. Horstmann, K., Kornell, G. (2014). *Java. Tom 2. Biblioteka professionala*. M.: Izdatel'skii dom Vil'iams, 864.

## METHOD OF AUTOMATED CONSTRUCTION OF EXPLANATORY DICTIONARY OF SUBJECT AREA

page 58–63

The article deals with the method of the automated construction of explanatory dictionary based on the processing of many texts from a specific subject area.

The technology of selection and grouping of source texts, based on inter-document and intra-document clustering, which allows save significant terms in the dictionary.

It is developed the procedure of selection of terms (individual words and phrases) from documents, based on the calculation of the frequency of their occurrence in the text.

The technique of finding of synonyms, definitions, and using other dictionaries is proposed.

The formula that allows you to estimate the time spent on the various stages of compiling the dictionary is given.

The results of experiments that confirm the effectiveness of the proposed method of construction of dictionary of subject area are given.

The proposed method of automatic compilation of the dictionary of subject area can be used to determine the stage of requirements for software products in information systems and artificial intelligence systems.

**Keywords:** dictionary, term, subject area, synonym, group name.

### References

1. Chertkova, E. A. (2005). Modelirovanie predmetnoi oblasti dlia proektirovaniia komp'iuternyh obuchaiushchih sistem. *Kongress konferentsii «Informatsionnye tehnologii v obrazovanii». Sektsiia VII*. Available: <http://ito.edu.ru/2005/Moscow/VII/VII-0-5032.html>
2. *JaLingo*. Available: <http://jalingo.sourceforge.net/>
3. Kungurtsev, A. B., Barykina, I. V. (2006). Formirovanie slovaria predmetnoi oblasti. *Iskusstvennyi intellekt, № 1*, 144–151.
4. Kunhurtsev, A. B., Borodavkin, S. M. (2009). Zastosuvannia merezh freimiv dlia pobudovy modeli vyluchennia faktiv z tekstiv na pryrodniimovi. *Iskusstvennyi intellekt, № 4*, 202–207.
5. Kungurtsev, A., Borodavkin, S., Golub, A. (2012). Method of creation of domains dictionaries for extraction of the facts from texts in the natural language. *Eastern-European Journal Of Enterprise Technologies, 1(4(43))*, 32–36. Available: <http://journals.uran.ua/eejet/article/view/2550>
6. Bourigault, D. (1992). Surface grammatical analysis for the extraction of terminological noun phrases. *Proceedings of the 14th conference on Computational linguistics*. Association for Computational Linguistics (ACL), 977–981. doi:10.3115/993079.993111
7. Baroni, M., Bernardini, S. (2004). Bootstrapping Corpora and Terms from the Web. *Proceedings of LREC*. Lisbon: ELDA, 1313–1316.
8. *Programmnyi paket sintaksicheskii analiz. Proekt AOT*. Available: <http://www.aot.ru/docs/synan.html>
9. Shelov, S. D. (2001). Terminovedenie: sem' voprosov i sem' otvetov po semantike termina. *NTI. Ser. 2. Informatsonnye protsessy i sistemy, № 2*, 1–11.
10. Liashevskaiia, O. N., Sharov, S. A. (2009). *Chastotnyi slovar' sovremennogo russkogo iazyka (na materialah Natsional'nogo korpusa russkogo iazyka)*. M.: Azbukovnik. Available: <http://dict.ruslang.ru/freq.php>

## PROJECT DEVELOPMENT OF RECOMMENDATION SYSTEM FOR IMPROVING THE ENERGY EFFICIENCY OF RESIDENTIAL BUILDINGS

page 63–68

This work is devoted to the project of creating the decision support system for improving the energy efficiency of buildings. The main objective is to determinate the structure of this information system and set the plan for further work.

The main parts of the system are: 1) an expert system with knowledge base of improving energy efficiency methods, 2) subsystem for modeling heat balance, 3) decision support subsystem for alternatives comparison, 4) database of current market prices. There are several required external data sources: users — information about the building, economic criteria and limitations; experts — knowledge for expert subsystems; distributors — market prices; and automatically entered data about environment state.

For heat balance modeling, we will use the open source software solution like OpenBEM. The expert system will be based on the set of production rules. External visual editor is required for describing the plan of building in 2D-layout. The data processing will be based on the web 2.0 approach, so users can add and evaluate information.

Software implementation of business logic and database layers will be designed for deployment in the cloud. The user interface is the web-client with html5 technology.

The next step for this project development is designing the expert system. After that, we plan to determine the «minimum valuable product» (by the «Lean Startup» approach) and start the iterative development process in the agile framework, like Scrum.

**Keywords:** energy efficiency, energy saving, heat balance, expert systems, simulation, startup.

### References

1. Zerkalov, D. V. (2012). *Enerhozberezhennia v Ukraini*. K.: Osnova, 582. Available: <http://www.zerkalov.org/files/evu-zm.pdf>
2. Bondarenko, G. V. (2008). Rol energoeffektivnosti ekonomiki v obespechenii energeticheskoi bezopasnosti gosudarstva. *Tezisy dokladov Mezhdunarodnoi nauchno-prakticheskoi konferentsii «Socialnye faktory ustojchivogo innovatsionnogo razvitiia ekonomiki»*. Minsk: GIUST BGU, 88–90.
3. Babaev, V. N., Govorov, F. P., Rapina, T. V., Rapina, K. A. (2012). Vozmozhnosti termomodernizatsii zdaniia gorodov. *Problemy, perspektivy ta normatyvno-pravove zabezpechennia enerho-, resursoberezhennia v zhytlovo-komunalnomu hospodarstvi*. Available: <http://eprints.kname.edu.ua/32013/>
4. Karpushev, S. A., Haritonov, A. Yu. (2010). Avtomatizirovannaia sistema monitoringa energoeffektivnosti munitsipal'nykh obiektoiv g. Donetska. *Tekhnohemo-ekolohichna bezpeka ta tsyvilnyi zakhyst*. Kyiv-Kremenchuk, 55–67. Available: <http://tes.igns.gov.ua/materials/1n/Karpushev.pdf>
5. Karp, I. N., Nikitin, E. E. (2011). Puti resheniia problem komunal'noi energetiki. *Zhytlovo-komunalne hospodarstvo Ukrainy, 6(39)*, 16–22. Available: [http://esco.co.ua/journal/2011\\_12/art104.pdf](http://esco.co.ua/journal/2011_12/art104.pdf)
6. *Energoberezhennia v zhilishchnom fonde: problemy, praktika i perspektivy*. (2004). M.: dena, Fond «Institut ekonomiki goroda», 108.

7. Miokova, N. V. (2014). Razvitie sotrudnichestva s Fondom vostochnoevropeiskogo partnerstva po energoefektivnosti i okruzhaiushchei srede: opyt Ukrainy. *Evrazijskaia Ekonomicheskaia Integratsiia*, 1(22), 102–114.
8. Fenomenov, K. N. (2011). Kompleks osnovnykh meropriiatiu po vnedreniiu energosberegaiushchih tekhnologii v zhilishchno-kommunal'nom hoziaistve. *Problemy sovremennoi ekonomiki*, 3, 248–250.
9. Tabunshchikov, Yu. A., Brodach, M. M. (2002). *Matematicheskoe modelirovanie i optimizatsiia teplovoi effektivnosti zdaniu*. M.: AVOK-PRESS, 194.
10. Volkov, A. A., Chelyshkov, P. D., Sedov, A. V.; MON RF, Moskovskii gosudarstvennyi stroititel'nyi un-t. (2014). *Modelirovanie energoefektivnykh inzhenernykh sistem*. Moskva: MGSU, 64. Available: <http://lib-04.gic.mgsu.ru/lib/2014/26.pdf>
11. Maliarenko, V. A., Goloshchapov, V. N., Orlova, N. A. (2007). Usloviia odnoznachnosti v zadachakh upravleniia teplovym rezhimom zdaniu. *Kommunal'noe hoziaistvo gorodov*, 74, 341–349.
12. Parfenov, S. G., Reviznikov, D. L.; In: Komarova, Yu. Yu., Mhitariana, V. A., Lisina, R. D. (2004). Kompleks programm dlia matematicheskogo modelirovaniia temperaturnogo rezhima v pomeshcheniiah ofisnykh i zhilykh zdaniu. *Problemy sozdaniia perspektivnoi aviatsionnoi tekhniki*. M.: MAI, 320–324. Available: <http://nirs.lisin.ru/sb/2004.pdf#page=320>
13. Kutsenko, A., Kovalenko, S., Tovagnyansky, V. (2014). System approach to mathematical modeling of thermal processes in buildings. *Eastern-European Journal Of Enterprise Technologies*, 4(4(70)), 9–12. doi:10.15587/1729-4061.2014.26200
14. Panferov, V. I., Anisimova, E. Yu., Nagornaya, A. N. (2006). K teorii matematicheskogo modelirovaniia teplovogo rezhima zdaniu. *Vestnik Yuzhno-Uralskogo gosudarstvennogo universiteta. Seriya: Komp'yuternye tekhnologii, upravlenie, radioelektronika*, 14(69), 128–132.
15. Hand, J. W. (2011, July 27). *The ESP-r Cookbook-Strategies for Deploying Virtual Representations of the Build Environment*. Glasgow, UK: University of Strathclyde. Available: [http://www.esru.strath.ac.uk/Documents/ESP-r\\_cookbook\\_july\\_2011.pdf](http://www.esru.strath.ac.uk/Documents/ESP-r_cookbook_july_2011.pdf)
16. Guglielmetti, R., Macumber, D., Long, N. (2011, November). OpenStudio: an open source integrated analysis platform. *Proceedings of the 12th Conference of International Building Performance Simulation Association*. Available: <http://www.nrel.gov/docs/fy12osti/51836.pdf>
17. *OpenBEM – Open Source Building Energy Model*. (2014, Oct. 21). Available: <https://github.com/emoncms/openbem>
18. *SAP 2012. The Government's Standard Assessment Procedure for Energy Rating of Dwellings*. (2013, October). Version 9.92. Watford: Building Research Establishment. Available: [http://www.bre.co.uk/filelibrary/SAP/2012/SAP-2012\\_9-92.pdf](http://www.bre.co.uk/filelibrary/SAP/2012/SAP-2012_9-92.pdf)
19. Becker, R. (2012). *Windows Azure Programming Patterns for Start-ups*. Packt Publishing Ltd, 292.
20. Semenov, S. S., Poltavskii, A. V. (2014). Analiz metodov priniatiia reshenii pri razrabotke slozhnykh tekhnicheskikh sistem. *XII Vserossiiskoe soveshchanie po problemam upravleniia VSPU-2014, Moskva 16–19 iunია 2014 g.*, Vol. 16, 8101–8123. Available: <http://vspu2014.ipu.ru/proceedings/predngs/8101.pdf>
21. Bliumin, C. L., Shuikova, I. A. (2001). *Modeli i metody priniatiia reshenii v usloviiah neopredelennosti*. Lipetsk: LEGI, 138.
22. Bhattacharya, A. (2011, December). Why Online Advertising is failing down in the Internet era. *IRACST – Engineering Science and Technology: An International Journal (ESTIJ)*, Vol. 1, No. 1, 11–17. Available: <http://estij.org/papers/vol1no12011/3vol1no1.pdf>

## CONSTRUCTION OF MATHEMATICAL MODELS OF THE HUMAN OPERATOR

page 68–72

In this article the human operator is considered as a unit, has a certain «transfer function» in a similar way to unit that used in communication theory. Such assumption is a certain degree of approximation, but this formalization allows us to justify the fact

that the systems described in the study are subject to the volume and speed of receiving the information, the speed of processing and decision-making, and, finally, the capacity of the «exit» – the speed of the motor corresponding reactions.

Presented principles and methods of analysis of operator activity are based on the theory of automatic control and are a continuation of research on the construction of a mathematical model of human operator. Development of analysis principles of the operators of automated systems, the identification of its specific features, structural features and psychological content needed to address a number of practical issues that arise in the design of control systems. These include: the optimal organization of operator activities, development of adequate and effective methods of teaching of operator personnel, the principles of its selection for those activities in which even a small operator error could result in serious accidents that result in the destruction of expensive equipment and loss of life (for example, in military systems).

**Keywords:** mathematical modeling, linear dynamic system, Laplace transform, transfer function.

## References

1. Mathematical modeling of social and economic dynamics. (2007). *Materials of the II International conference, Moscow, June 20–22, 2007*. Moscow: Russian University of friendship of peoples. Available: <http://pandia.ru/text/78/061/19502.php>
2. Shmeleva, T. F. (2012). Modeling the behavioral activity of the human operator in the aviation sociotechnical system. *Information Processing Systems, Vol. 2*, 145–154. Available: [http://nbuv.gov.ua/j-pdf/soi\\_2012\\_2\\_30.pdf](http://nbuv.gov.ua/j-pdf/soi_2012_2_30.pdf)
3. Plohotnikov, K. E. (2003). *Mathematical modeling and computational experiment. Methodology and practice*. M.: URSS. Available: [http://intsys.msu.ru/magazine/archive/v13\(1-4\)/plokhotnikov-005-032.pdf](http://intsys.msu.ru/magazine/archive/v13(1-4)/plokhotnikov-005-032.pdf)
4. Krasnoshchekov, P. S., Petrov, A. A. (1983). *Principles of model construction. Mathematical modeling*. M.: Publishing house of Moscow State University, 264.
5. Buslenko, N. P. (1977). *Modeling of complex systems*. M.: Nauka, 400.
6. In: Malinetski, G. G. (2007). *Abstracts of 2nd International conference «Mathematical modeling of historical processes»*. M.: Preprint, Inst. Appl. Math., the Russian Academy of Science. Available: [http://www.keldysh.ru/papers/2007/prep56/prep2007\\_56.html](http://www.keldysh.ru/papers/2007/prep56/prep2007_56.html)
7. Bodrov, V. A. (1998). *Psychology and reliability: the Person in control systems technology*. M.: Institute of psychology RAS, 176.
8. Andersen, P., Andersson, S. A. (1968). *Physiological Basis of the Alpha Rhythm*. N.-Y.: Appleton-Century-Crofts, 384.
9. In: Martmez, J. L., Kesner, R. P. (1986). *Learning and memory. A biological view*. N.Y., 452.
10. Mogenson, G., Jones, D., Yim, C. (1980). From motivation to action: Functional interface between the limbic system and the motor system. *Progress in Neurobiology, Vol. 14, № 2–3*, 69–97. doi:10.1016/0301-0082(80)90018-0
11. Holambe, R. S., Deshpande, M. S. (2012). Linear and Dynamic System Model. *SpringerBriefs in Electrical and Computer Engineering*. Springer Science + Business Media, 27–44. doi:10.1007/978-1-4614-1505-3\_3
12. Thompson, R. F. (1975). *Introduction to physiological psychology*. N.Y., 669.
13. Segel, L. A. (1988, October). Mathematics for dynamic modeling. *Mathematical Biosciences, Vol. 91, № 2*, 225–226. doi:10.1016/0025-5564(88)90017-x
14. Polyanskii, P. V. (1992). Moire mechanism of conjugate-image reconstruction in a generalized holographic filter scheme. *Optics and Spectroscopy, 72(3)*, 391–394.
15. Paek, E. G., Psaltis, D. (May 01, 1987). Optical Associative Memory Using Fourier Transform Holograms. *Optical Engineering, Vol. 26, № 5*, 265428. doi:10.1117/12.7974093

16. Rabiner, L. R., Shafer, R. W. (1989). *Digital signal processing of speech signals*. Prentice-Hall, Englewood Cliffs, 962.

**ADAPTATION OF FUZZY C-MEANS METHOD FOR DETERMINATION THE STRUCTURE OF SOCIAL GROUPS**

page 73–76

The problem of determining the structure of social groups occurs in various scientific researches related to the necessity classification of persons on certain grounds or building a socio-demographic portrait of people of some social group. Such problems are usually solved by conducting sociological research and further statistical analysis of the results. This approach is effective, but often results in the need to attract substantial financial and human resources. So, it is important to develop the models and methods for solving this class of problems based on readily available data.

Verbal and mathematical formulation of the problem of determining the structure of a social problem of fuzzy clustering are made in the article. However, the article noted that the feature of input data is their numerical nature, making it difficult to use the classical methods of clustering objects. Also, performing clustering, in this case it is necessary to take into account the aim of problem – the nature of clusters. To solve the problem it is proposed an adapted fuzzy-c-means method, in which on the basis of expert interviews are taken into account not only the value attributes, which are characterized by objects, but also the importance of these attributes when making reference of the object to a particular cluster. Objects, in turn, are represented by means of linguistic variables on the set of which are defined the relevant metrics.

The proposed method can be effectively used for tasks related to the determination of society structure.

**Keywords:** social group structure, fuzzy clustering, linguistic variable, fuzzy c-means method.

**References**

1. Oharenko, V. M., Malakhova, Zh. D.; Humanitarian University, Zaporozhye Institute of State and Municipal Management. (2005). *Sociology of small groups*. Kyiv: Tsentr navchalnoi lit., 291.
2. Zhol, K. K. (2005). *Sociology*. K.: Lybid, 440.
3. Myroniuk, I. S., Shatylo, V. Y., Hutsol, I. Ya., Brych, V. V. (2011). The results determine the estimated number of vulnerable to HIV infection groups (WSB) in the Transcarpathian region. *Ukraina. Zdorovia natsii*, 2(18), 133–137.
4. Myroniuk, I. S., Mulesa, O. Yu. (2013). The use of information technology to solve the problem of estimation of the number of high risk groups for HIV infection. *Visnyk sotsialnoi hihieny ta orhanizatsii okhorony zdorovia Ukrainy. Naukovo-praktychnyi zhurnal*, 3(57), 55–63.
5. Myroniuk, I. S. (2012). Definition of behavioral risks for HIV-infected residents of Transcarpathia related to labor migration. *Tuberkuloz. Lehenevi khvoroby. VIL-infektsiia*, 2(9), 97–102.
6. Mulesa, O. Yu. (2013). Information technologies of quantitative evaluation of risk groups of human immunodeficiency virus infection. *Eastern-European Journal Of Enterprise Technologies*, 5(4(65)), 10–15. Available: <http://journals.uran.ua/eejet/article/view/18327>
7. Tu, J., Honsales, R. (1978). *The principles of pattern recognition*. M.: Myr, 412.
8. Mandel, Y. D. (1988). *Cluster analysis*. Moskva: Fynansy y statystyka, 320.
9. Snytiuk, V. Ye. (2008). *Forecasting. Models. Methods. Algorithms*. K.: Maklout, 364.
10. Gorban, A. N, Zinovyev, A. Yu. (2002). Method of Elastic Maps and its Applications in Data Visualization and Data Modelling. *Int. Journal of Computing Anticipatory Systems, CHAOS, Vol. 12*, 353–369.
11. Snytiuk, V. (2005). Evolutionary clustering of complex objects and processes. *XI-th International Conference «Knowledge-Dialogue-Solution», Varna, T. 1*, 232–237.
12. Baturkin, S. A., Baturkina, E. Yu., Zimenko, V. A., Sihinov, Y. V. (2010). Statistical data clustering algorithms in adaptive learning systems. *Vestnyk RHRTU*, 1(31), 82–85.
13. Fukunaha, K. (1979). *Introduction to statistical pattern recognition theory*. M.: Nauka. Hlavnaia redaktsiia fizyko-matematicheskoi lyteratury, 368.
14. Pliuta, V. (1989). *Comparative multivariate analysis in econometric modeling*. Moskva: Finansy i statystyka, 175.
15. Kotov, A., Krasyl'nykov, N. (2006, October 2). *Data clustering*. Available: <http://yury.name/internet/02ia-seminar-note.pdf>
16. Kohonen, T. (1989). *Self-Organization and Associative Memory. Springer Series in Information Sciences*. Springer Berlin Heidelberg, 312. doi:10.1007/978-3-642-88163-3
17. Horbachenko, V. Y. (2013). *Networks and Kohonen maps*. Available: <http://gorbachenko.self-organization.ru/index.html>
18. Smeshko, Yu. V. (2012). On a criterion to select the exponential weight classification algorithm of fuzzy C-means. *Molodezh y nauk*. Krasnoyarsk, 19–25.
19. Orlovskiy, S. A. (1981). *Decision making with fuzzy initial information*. M.: Nauka. Hlavnaia redaktsiia fizyko-matematicheskoi lyteratury, 208.
20. Voloshyn, O. F., Mashchenko, S. O. (2010). *Decision theory*. Kiev: Publishing and Printing Center «Kyivskiy universytet», 366.
21. Maliar, M., Shvalahin, O. (2011). Parallel-successive screening scheme of variants for the choice problem. *Eastern-European Journal Of Enterprise Technologies*, 1(4(49)), 39–42. Available: <http://journals.uran.ua/eejet/article/view/1911>