TRAINS BREAKING-UP SAFETY CONTROL AT HUMP YARDS (p. 4-9)

Svitlana Bantyukova

Mathematical models of trains breaking-up safety control at hump yards and determination of recommended control parameters of car retarders are considered. A general mathematical model of the classification process is absent, evaluation and accounting of numerous impacts on the classification process safety are insufficient, consideration and regulation of individual process components of classification yards cause the need for additional research in this area.

Based on the developed models, there is a possibility of rational trains breaking-up safety control by minimizing the risks that may occur at the hump yard. Herewith, the human factor effect on the classification process is largely taken into account. Recommended control parameters of car retarders are determined by the criterion of the minimum number of onsets of each cut on the hump yard slope, the number of overspeeds of entry of each cut to the of retarders of brake positions and the number of overspeeds of impact of each cut with other cuts at classification yard.

The models provide efficient safety control of breaking up trains and allow to increase the safety and efficiency of the hump yard process.

Keywords: trains breaking up safety, risk, recommended control parameters, hump yard.

References

1. Myamlin, S. V., Kozachenko, D. N. (2009). Dinamika vagonov v otcepe pri skatyvanii s sortirovochnoj gorki. Zbirnik naukovix prac Doneckogo institutu zaliznichnogo transportu Ukrainskoi derzhavnoi akademii zaliznichnogo transportu, 17, 150–155.
2. Kozachenko, D. M. (2011). Rozvitok teoretichnix osnov ocinki texniko-ekspluatacijnoi efektivnosti ta bezpeki funkcionuvannya sortuvalnix girok. Dnipropetrovsk, 297.
3. Bessonenko, S. A. (2010). Teoriya rascheta sortirovochnyx gorok dlya razlichnyx klimaticheskix zon. Moscow, 37.
4. Zářecký, S., Grúň, J., Žilka, J. (2008). The newest trends in marshalling yards automation. Transport problems, 3 (4), 1. Available at: http://transportproblems.polsl.pl/pl/Archiwum/2008/ zeszyt4/2008t3z4_13.pdf
5. Dick, C. T., Dirnberger, J. R. (2014). Advancing the science of yard design and operations with the CSX hump yard simulation system. Proceedings of the 2014 Joint Rail Conference, 1–10. Available at: http://railtec.illinois.edu/articles/ Files/Conference%20Proceedings/2014/ JRC2014-3841.pdf
6. Bagheri, M., Saccomanno, F., Chenouri, S., Fu, L. (2011). Reducing the threat of in-transit derailments involving dangerous goods through effective placement along the train consist. Accident Analysis & Prevention, 43 (3), 613–620. doi: 10.1016/j.aap.2010.09.008
7. Zhao, X. H. (2015). Research on safety evaluation of railway marshslling station. Globe Thesis. Available at: http://www.globethesis.com/ ?t=2232330371995530
8. Bagheri, M., Saccomanno, F., Fu, L. (2012). Modeling hazardous materials risks for different train make-up plans. Transportation Research Part E: Logistics and Transportation Review, 48 (5), 907–918. doi: 10.1016/j.tre.2012.02.004
9. Annual report on railway safety in the Slovak republic. Railway regulatory authority (2013). Available at: http://www.google.com.ua/url?sa=t&rct=j&q=&esrc =s&source=web &cd=1&ved=0CBwQFjAA&url=http%3A%2F%2Fwww.era.europa.eu%2FDocument-Register %2FDocuments%2F NSA%2520Annual%2520Report% 25202012%2520Slovakia.pdf&ei=_tlEVf3KEcG6UJahgsAF&usg=AFQjCNEp3 28J0vp1JbtTUKKWK0vUj3uJ3Q&bvm=bv.92291466,d. bGg&cad=rjt
10. Zhukovickij, I. V., Zagarij, G. I., Luxanin, N. I. (2000). Upravlenie zamedlitelyami tormoznoj pozicii sortirovochnoj gorki. Chast 1. Model sistemy. Informacionno-upravlyayushhie sistemy na zheleznodorozhnom transporte, 5, 10–15.
11. Litvinenko, A. E. (2007). Metod napravlennogo perebora v sistemax upravleniya i diagnostirovaniya. Kiev, 328.

DEVELOPMENT OF DISTRIBUTION MODEL OF PASSENGER TRANSPORTATION VOLUMES AMONG SUBURBAN TRANSPORT MODES (p. 10-14)

Tatyana Grigorova, Yuri Davidich, Victor Dolya

The analysis of the factors influencing the passenger traffic formation was performed. It was found that the passenger traffic formation is a complex process which is based on the route selection by passengers. The passengers' choice is significantly affected by the availability of alternative transport modes. The technique of carrying out a full-scale survey of the passenger transportation parameters in various traffic directions of suburban passenger transport was given. A statistical analysis of changes in the share of passengers who prefer road transport of the total transportation volume on suburban routes was conducted. The influence of the ratio of traffic speeds, tariffs per kilometer of travel, capacity utilization rates, waiting time on road and rail transport modes was determined. Regression model of changes in the share of passengers who prefer road transport of the total transportation volume on suburban routes was designed. The evaluation of the statistical significance of the model was performed and conclusion on the admissibility of its use in solving the problems of optimizing the passenger transportation parameters on suburban routes was made.

Keywords: transport service, suburban routes, transport mode, transportation volume, transportation parameters.

References

1. Efremov, I. S., Kobozev, V. M., Yudin, V. A. (1980). Teorija gorodskih passazhirskih perevozok. Moscow: Vysshaja school, 535.
2. Hickman, M. D., Bernstein, D. H. (1997). Transit Service and Path Choice Models in Stochastic and Time-Dependent Networks. Transportation Science, 31 (2), 129–146. doi: 10.1287/trsc.31.2.129
3. Schmöcker, J.-D., Bell, M. G. H., Kurauchi, F. (2008). A quasi-dynamic capacity constrained frequency-based transit assignment model. Transportation Research Part B: Methodological, 42 (10), 925–945. doi: 10.1016/j. trb.2008.02.001
4. Nuzzolo, A. (2001). Schedule-based path choice models for public transport networks. Proceedings of Advanced Course on Transit Networks, Rome, 15.
5. Nuzzolo, A., Russo, F., & Crisalli, U. (2001). A Doubly Dynamic Schedule-based Assignment Model for Transit Networks. Transportation Science, 35 (3), 268–285. doi: 10.1287/trsc.35.3.268.10149
6. Tong, C. O., Wong, S. C. (1999). A schedule-based time-dependent trip assignment model for transit networks. ATR, 33 (3), 371–388. doi: 10.1002/atr.5670330307
7. Lam, W. H. K., Gao, Z. Y., Chan, K. S., Yang, H. (1999). A stochastic user equilibrium assignment model for

congested transit networks. Transportation Research Part B: Methodological, 33 (5), 351–368. doi: 10.1016/s0191-2615(98)00040-x

8. Transportna systema Ukrayiny. Available at: http://www.geograf.com.ua/human/school-course/409-transportna-sistemaukrajini

9. Mironenko, V. K., Gaba, V. V., Matsyuk, V. I., Grushevska, T. M., Kosciusko, V. P. (2014). Naturni doslidzhennya that matematichni modeli primiskih pasazhirskih transported. Naukoemni tehnologii, 24, 496–502.

10. Butko, T. V. (2009). Udoskonalennya tehnologii organizatsii primiskih transported. Collection Naukova Pratzen ukrainskoi derzhavnoi academy zaliznicnovo transport, 102, 15–23.

11. Kristopchuk, M. J. (2009). Efektyvnist' pasazhyrs'koyi transportnoyi systemy prymis'koho spoluchennya. Kharkiv, KhNAUE, 214.

12. Osnovy organizacii prigorodnogo passazhirskogo dvizhenija. Available at: http://scbist.com/wiki/9011-osnovy-organizacii-prigorodnogo-passazhirskogodvizheniya.html.

13. Yanovsky, P. O. (2008). Pasazhyrs'ki perevezennya. Kiev, NAU, 469.

14. Rodaschuk, G. Y. (2013) Optimizatsiya marshrutnoi merezhi transported to pasazhiriv silskoi mistsevosti. Collection Naukova Pratzen VNAU, 4 (81), 186–195.

15. Spirin, I. V. (2003). Organizacija i upravlenie passazhirskimi avtomobil'nymi perevozkami. Moscow: Academy, 400.

16. Gudkov, V. A., Mirotin, L. B., Velmozhin, A. V., Shiryaev, S. A. (2004). Passazhirskie avtomobil'nye perevozki. Moscow: Hotline – Telecom, 448.

17. Halushko, V. G. (1976). Verojatnostno-statisticheskie metody na avtotransporte. Kiev: Vysshaja school, 232.

SUBSTATIATION OF TRUCK SELECTION IN TERMS OF MINIMIZING PSYCHOPHYSIOLOGICAL STRESS ON A DRIVER (p. 15-22)

Oleg Deryugin, Sergiy Cheberyachko

The method of selecting efficient truck for solving the pressing problems of cargo transportation and the required number of goods in corresponding road conditions and when updating the rolling stock was proposed. It is based on selecting the most important indicators of trucks, with their hierarchical classification and determining the integral quality criterion of trucks using the profile method and the analytic hierarchy process («AHP»). This allows more efficient use of the truck for transporting cargo in the required amount in the specified location without losses and with minimal material and labor costs in compliance with current legislation. Technical-operational, ergonomic, dynamic, environmental and power characteristics of vehicles have been analyzed, based on which it was revealed that the truck MERCEDES-BENZACTROS with ecological EURO 4 level (integral quality index considering weight coefficients – 0.95) engine occupies the leading position. The theoretical research allowed to substantiate the method of selecting vehicles taking into account ergonomic characteristics. An adequate method for solving such multicriteria problems, which lies in combining the set of indicators into the integral quality factor, which characterizes the vehicle quality was determined. The method for making management decisions on updating the rolling stock of the car enterprise allows to reduce the impact of transport-technological process indicators on the psychophysiological state of drivers.

Keywords: truck, technical-operational characteristics, physiological stress, ergonomic characteristics, profile method.

References

1. Han, S., Hong, S. (2003). A systematic approach for coupling user satisfaction with product design. Ergonomics, 46 (13–14), 1441–1461. doi: 10.1080/0014013031000 1610928

2. Fatkhutdinov, R. A. (2000). Konkurentnosposobnost: ekonomika, strategiya, upravleniye. Moscow: INFRA-M, 312.

3. Bayley, M., Curtis, B., Lupton, K., Wright, C. (2004). Vehicle aesthetics and their impact on the pedestrian environment. Transportation Research Part D: Transport and Environment, 9 (6), 437–450. doi: 10.1016/j.trd.2004.08.002

4. Grujicic, M., Pandurangan, B., Xie, X., Gramopadhye, A. K., Wagner, D., Ozen, M. (2010). Musculoskeletal computational analysis of the influence of car-seat design/adjustments on long-distance driving fatigue. International Journal of Industrial Ergonomics, 40 (3), 345–355. doi: 10.1016/j.ergon.2010.01.002

5. Funakoshi, M., Taoda, K., Tsujimura, H., Nishiyama, K. (2004). Measurement of wholebody vibration in taxi divers. Applied Ergonomics, 46 (2), 119–124.

6. Kolich, M., Taboun, S. (2004). Ergonomics modelling and evaluation of automobile seat comfort. Ergonomics, 47 (8), 841–863. doi: 10.1080/0014013042000193273

7. Arens, E., Xu, T., Miura, K., Hui, Z., Fountain, M., Bauman, F. (1998). A study of occupant cooling by personally controlled air movement. Energy and Buildings, 27 (1), 45–59. doi: 10.1016/s0378-7788(97)00025-x

8. Goryev, A. E. (2008). Gruzovye avtomobilnye perevozki. 5th edition. Moscow: Izdatelskiy tsentr «Akademiya», 288.

9. Faskhiev, Kh. A., Krakhmalyova, A. V. (2004). Otsenka urovnya konkurentosposobnosti gruzovykh avtomobiley I ikh dvigateley. Marketing v Rossii I za rubezhom, 5, 3–16.

10. Faskhiev, Kh. A., Kostin, I. M. (2002). Tekhniko-ekonomicheskaya otsenka gruzovykh avtomobiley pri razrabotke. Naberezhnyye Chelny: Izd-vo KamPI, 480.

11. Faskhiev, Kh. A. (2001). Analiz metodov otsenki kachestva i konkurentosposobnosti gruzovykh avtomobiley. Metody menedzhmenta kachestva, 3, 24–28; 4, 21–26.

12. Saati, T., Kerns, K. (1991). Analiticheskoe planirovanie. Organizatsiya sistem. Moscow: Radio i svyuaz, 224.

STUDY OF EFFICIENCY OF USING NEURAL NETWORKS WHEN FORECASTING THE TRAIN ARRIVAL AT THE TECHNICAL STATIONS (p. 23-27)

Roman Vernigora, Lidiia Yelnikova

For efficient management of the railway direction, it was proposed to create a predictive model of the train operation. One of the components of this model is the train arrival module, designed to determine the arrival time of different trains to technical stations of the railway direction. The train arrival module is proposed to build based on a neural network, which using statistical information for prior periods and the train data obtained in real time, determines the train arrival time at the technical station.

Since the train departure parameters (time and date of departure from the next technical station, train weight and engine type) have different measurement units and there are significant differences between the minimum and the maximum value of the same parameter, it was decided to encode data about train in binary form. The values of each factor were grouped by intervals of a certain value.

As a result of experiments with different types of neural networks, it was found that using the perceptron, the structure and construction method of which is given in the paper provides the smallest error of the results obtained. The operation principle of such neural network is as follows. Train information is encoded and fed to the neural network input in binary form; the result of the neural network operation is also a binary output vector, the value of which is interpreted in a certain value of the train movement duration. Based on the movement duration values, the predicted arrival time of freight trains at the technical station is calculated.

Experiments with the interval value at binary coding of individual factors have shown a significant effect of this

parameter on the neural network operation quality and train arrival forecasting accuracy.

Keywords: operational planning, forecasting, neural network, perceptron, train movement duration.

References

1. Vernigora, R., Yelnikova, L. (2012). Prospects of locomotives and locomotive crews work adaptive control system creation. Transport systems and transport technologies, 4, 25–29.

2. Vernigora, R., Yelnikova, L. (2014). The possibility of using artificial neural networks when predicting train work of rail directions. Transport systems and transport technologies, 7, 15–19.

3. Nikolaeva, I. (2012). Application of artificial neural networks for prediction the dynamics of economic performance Sphere of services: innovation and quality, 8. Available at: http://journal.kfrgteu.ru/files/1/2012_8_22.pdf

4. Kremen, T., Yakovina, V., Sinitska, O. (2011). Using Elman neural network to predict software reliability. Computer Science and Engineering: materials of the V International conference of young scientists, 88–89. Available at: http://ena.lp.edu.ua:8080/bitstream/ntb/22553/1/26-Kremen-88-89.pdf

5. Kudritska, N. (2014). Prediction of development of the transport system of Ukraine using neural networks. Economic and mathematical modeling of socio-economic systems, 19, 198–207. Available at: http://nbuv.gov.ua/j-pdf/emmses_2014_19_13.pdf

6. Sun, Y., Lang, M., Wang, D., Liu, L. (2014). A PSO-GRNN model for railway freight volume. Journal of Industrial Engineering and Managemen, 7 (2), 413–433. doi: 10.3926/jiem.1007

7. Anitha, B., Duraiswamy, K. (2012). A heuristic moving vehicle location prediction technique via optimal paths selection with aid of genetic algorithm and feed forward back propagation neural network. International Journal of Computer Science, 8 (12), 2008–2016. Available at: http://thescipub.com/PDF/jcssp.2012.2008.2016.pdf doi: 10.3844/jcssp.2012.2008.2016

8. Anitha, B., Duraiswamy, K. (2014). An efficient optimization based vehicle movement prediction with aid of feed forward back propagation neural network. International Journal of Computer Science, 91 (12), 24–31. Available at: http://research.ijcaonline.org/volume91/number12/pxc3895196.pdf doi: 10.5120/15933-5196

9. Lavrukhin, O. V. (2014). Intellectual model formation of railway station work during the train operation execution. Nauka ta progres transportu, 55 (1), 43–53.

10. Filippenko, O. I., Filippenko, I. G. (2005). Biological, artificial and neuro- automaton networks – a comparative analysis. Part 2. Artificial neural networks. Eastern-European Journal of Enterprise Tecnologies, 3/2 (15), 87–93.

11. Haykin, S. (2006). Neural networks: a complete course. Moscow: Izdatel'skij dom «Vil'jams», 1104.

12. Yelnikova L. (2014). The research of duration of freight trains movement between the technical stations of railway direction. Transport systems and transport technologies, 8, 35–39.

13. Rudenko, O. G., Bodyanskiy, E. V. (2006). Artificial neural networks. Kharkiv: TOV «Kompanija SMIT»,, 404.

14. Rutkovskaya, D., Pilinskiy, M., Rutkovskiy, L. (2006). Neural networks, genetic algorithms and fuzzy systems. Moscow: Gorjachaja linija – Telekom, 452.

15. Bodyanskiy, E. V., Rudenko, O. G. Artificial neural networks: architecture, training, application. Kharkiv: Teleteh 369.

16. Bishop, C. M. (1995). Neural networks for pattern recognition. Clarendon Press, Oxford, 498. Available at: http://www.engineering.upm.ro/masterie/sacpi/mat_did/info068/docum/neural%20networks%20for%20pattern%20recognition.pdf

17. Sussner, P. (1999). Perceptrons. Wiley Encyclopedia of Electrical and Electronics Engineering. doi: 10.1002/047134608x.w5112

18. Novotarskiy, M. A., Nesterenko, B. B. (2004). Artificial neural networks: the calculation. Works of the Institute of mathematics of NAS of Ukraine, 50, 408. Available at: http://novotarskiy.narod.ru/mono2.htm

19. Lotfi, E., Akbarzadeh-T, M.-R. (2014). A novel single neuron perceptron with universal approximation and XOR computation properties. Computational Intelligence and Neuroscience, 2014, 1–6. doi: 10.1155/2014/746376

APPLICATION OF INFORMATION CHARACTERISTICS IN MODELS OF DRIVER'S PERCEPTION OF ROAD CONDITIONS (p. 27-32)

Nadezhda Kulbashnaya, Irina Linnik

Further development of the information theory in the model of driver's perception of road conditions was proposed. It is assumed that there is a definite dynamic relationship between the relative organization of the driver's perception field and the relative organization of the driver's interaction with the environment, which in turn is determined by the variability of motion speeds. Therefore, the first step in the analysis is developing a dynamic model of the influence of the relative organization of the driver's perception field on motion speeds.

Therefore, the process of directional formation of the motion medium by regulating the motion speeds is considered in the proposed model as a dynamic process of changing the relative organization of the driver's perception field. For this purpose, the transfer function of the driver, in which the function of the relative organization of the driver's perception field is an input characteristic and the speed change – an output parameter is used. Conversion of the transfer function is carried out on the assumption that the driver's reaction to a periodic change in the relative organization of the driver's perception field can be represented as a sequence of rectangular pulses. The transfer function is solved using the Laplace transform.

Keywords: information theory, road conditions, transfer function, perception, driver, impulse function.

References

1. Gray, R. M. (2011). Entropy and Information Theory. Springer, 409. doi: 10.1007/978-1-4419-7970-4

2. Marek, J., Sten, T. (1977).Traffic environment and the driver. Driver behavior and training in international perspective. Springfield: Thomas, 248.

3. Csiszar, I., Katona G., Tardos, G. (Eds.) (2007). Entropy, Search, Complexity. Springer, 264.

4. Cover, T. M., Thomas, J. A. (2006). Elements of Information Theory. Wiley-interscience, 748.

5. Gavrilov, E. V., Gridchin, A. M., Rauhen, V. N. (1998). Systematic design of roads: the manual. Belgorod: Publishing house of the DIA, Part 1, 138.

6. Kovalenko, L. A. (2003). Throughput Estimation two-lane highways with regard to the behaviour of drivers. Kiev: NTU, 20.

7. Krespo, H. (1991). The Planning of measures to improve the level of convenience of traffic on two-lane highways. Kharkov: HADI, 278.

8. Sarksyan, M. V. (2003). Doskonalenia methods psychologiczna I primatologia regulowany of Shvidkoy movement on avtomobilnyj roads. Kharkov: HADI, 20.

9. Golovanenko, N. C. (1986). Assessment of the ergonomic quality of roads and traffic conditions. Kharkov: HADI, 25.

10. Förster, G. Self-regulating system (1964). Moscow: Mir, 5–23.

11. Shannon, K. (1963). Work on information theory in Cybernetics. Moscow: Publishing house of foreign literature, 830.

12. Ashb y , W. R. (1957). An Introduction to Cybernetics London: Chapman & Hall, 295.

13. Eliasmith, C., Anderson, C. H. (2002). Neural Engineering: Computation, Representation, and Dynamics in Neurobiological Systems. The MIT Press, 326.

14. Polyak, B. T. (2009). Research on automatic control theory. Probl. Upr., 3.1, 13–18.

ALGORITHMIC MODEL OF INFORMATION TECHNOLOGY FOR ANALYSIS AND FORECASTING OF COMMODITY MARKET CONDITIONS (p. 32-37)

Vasiliy Lysytskyi, Tan Manh Nguyen

The paper presents the results of research in the field of mathematical modeling of the formation dynamics of the commodity market conditions, taking into account market pricing mechanisms, as well as the effect of the dynamic processes occurring in the economic and social environments.

Using the methods of system dynamics, an algorithmic model for forecasting the dynamics of commodity market conditions was developed. The modeling algorithm of the simulation model of the commodity market functioning, which determines the functional and behavioral characteristics of the developed information technology for analysis and forecasting of the commodity market conditions was designed. The method of adjusting the simulation model to the real commodity market was proposed. Using statistical and current information on the commodity market functioning, the user interface of the information technology allows determining appropriate parameters, building time series for forecast trajectories of changes in the commodity market characteristics, visually analyzing trends in the commodity market conditions, single out trend components of the time series, predicting the trend direction change moment. In addition, the developed information technology allows to carry out the scenario method for analysis and forecasting of the commodity market conditions.

Keywords: model, information technology, analysis, forecasting, market conditions, commodity, market, demand, supply, price.

References

1. Grigoriev, V. P., Kozlovsky, A. V., Mariasov, D. A. (2006). Software packet for analysis and forecast market information. Izvestija Tomskogo politehnicheskogo universiteta, 309 (7), 200–204.
2. Ivashchenko, A. B. (2012). The software market for time series analysis. Systemnyy analiz ta informaciy̆ni tehnologiï u naukah pro pryrodu ta suspil'stvo, 1(2)-2(3), 165–169.
3. Zareipour, H. (2006). Price Forecasting and Optimal Operation of Wholesale Customers in a Competitive Electricity Market. Canada, Ontario, 201.
4. Espinola, R. et al. (2002) Day-ahead electricity prices forecasting based on time series models: a comparison. 14th Power Systems Computation Conference, Spain, Sevilla, Session 15, Paper 6, 8. Available at: http://www.pscc-central. org/uploads/tx_ethpublications/s15p06.pdf
5. Harris, L. (2003). Trading and Exchanges: Market Microstructure for Practitioners. England: Oxford University Press, 656.
6. Cont, R. (2006) Volatility Clustering in Financial Markets. Empirical Facts and Agent–Based Models. Springer, 289–310.
7. O'Connor, B. Comparison of data analysis packages: R, Matlab, SciPy, Excel, SAS, SPSS, Stata. Available at: http://brenocon.com/ blog/2009/02/comparison-of-data-analysis- packages-r-matlab-scipy-excel-sas-spss-stata/ (Last accessed: 28.11.2014).
8. Steinhaus, S. (2008). Comparison of mathematical programs for data analysis. Available at: http://www.scientificweb.de/ncrunch/ (Last accessed: 28.11.2014).
9. Basaran, F. U., Kurban, M. (2007). A New Approach for the Short-Term Load Forecasting with Autoregressive and Artificial Neural Network Models. International Journal of Computational Intelligence Research, 3 (1), 66–71. doi: 10.5019/j.ijcir.2007.88
10. Forrester, J. W. (1976). World Dynamics (Second Edition). Massachusetts, USA: Wright-Allen Press, 144.
11. Naylor, T. (1975) Computer Simulation Experiments with Models of Economic Systems. Moscow: Mir, 500.
12. Theil, H. (1964) Optimal Decision Rules for Government and Industry. Chicago, USA: Rand McNally.
13. Theil, H. (1966). Applied economic forecasting. Chicago, USA: Rand McNally.

DEVELOPMENT OF SYSTEMOLOGICAL MODEL OF THE PROBLEM OF STRUCTURAL AND TOPOLOGICAL REENGINEERING OF LARGE SCALE MONITORING SYSTEMS (p. 37-42)

Volodymyr Beskorovainyi, Kseniia Podolyaka

The paper deals with developing the systemological model of the problem of structural and topological reengineering of large-scale monitoring systems. Based on the analysis of the life cycle stages of geographically distributed systems, the place of reengineering in the structure of the life cycle of large-scale monitoring systems was defined, the analysis of the factors that determine their efficiency was performed. Formalization of the description of large-scale monitoring systems has allowed to identify subsets of elements, relationships, topologies and properties that will be included and (or) excluded in the system re-engineering process. This allows to form a set of feasible system reengineering solutions.

To reduce the reengineering problem complexity, a three-level scheme of its decomposition was proposed, the composition and the relation schematic of problem-related tasks by the input and output data were determined. This allows to create effective technologies for structural and topological reengineering.

Practical application of the results obtained allows to reduce the time for solving reengineering problems, improve the quality of solutions through joint problem solving and on this basis improve the cost and functional characteristics of the restructured systems.

Keywords: large-scale monitoring system, reengineering, systemological model, optimization, decomposition, methodology.

References

1. Hammer, M., Champy, S. (1997). Reengineering the Corporation: Manifesto for Business Revolution, SPB: Publisher St. Petersburg University, 332.
2. Davenport, T. H. (2013). Process innovation: reengineering work through information technology. Chicago: Harvard Business Press, 352.
3. Morris, D. C., Brandon, J. (1993). Re-engineering your business. London: McGraw Hill, 247.
4. Manganelli, R. L., Klein, M. K. (1994). The reengineering handbook: a step-by-step guide to business transformation. New York : Amacom, 318.
5. Hess, T., Brecht, L. (2013). State of the art of business process redesign: Presentation and comparison of existing methods. Wiesbaden : Springer-Verlag, 117.
6. Bergey, J., Hefley, W., Lamia, W., Smith, D. (1996). A Reengineering Process Framework. Pittsburgh: Carnegie Mellon University, 13.
7. Kazman, R., Woods, S. G., Carriere, S. (1998). Requirements for integrating software architecture and reengineering models: CORUM II: Reverse Engineering, 1998. Proceedings. Fifth Working Conference, 154–163. doi: 10.1109/wcre.1998.723185
8. Comella-Dorda, S., Wallnau, K., Seacord, R. C., Robert, J. (2000). A survey of legacy system modernization approaches (No. CMU/SEI-2000-TN-003). Carnegie-Mellon univ pittsburgh pa Software engineering inst, 1–17.

9. Ahtyrchenko, K. V. (2003). Metody i tegnologii reinginiringa IS. Trudy Instituta sistemnogo programmirovaniya RAN, 4, 116–128.
10. Eric, S. K. (2011). Social modeling for requirements engineering. London : The MIT Press, 717.
11. Beskorovainyi, V. V. (2002). Systemological analysis of the problem of structural synthesis of distributed systems. ACS and automation devices, 120, 29–37.
12. Tarasyuk, V. P. (2004). Mathematical modeling of technical systems. Minsk: Design PRO, 320.
13. Borschev, A. V. (2004). Prakticheskoe agentnoe modelirovanie i ego mesto v arsenale analitica. Exponenta Pro, 3-4, 38–47.
14. Lickin, N. (2009). Retrospectiva i perspective sistemnoy dinamiki. Analiz dinamiki razvitiya. Biznes-Informatica, 3, 55–67.
15. Beskorovainyi, V. V., Soboleva, E. V. (2012). Komposicionnaya model' dinamicheskoy raspredelennoy zadachi structurnogo sinteza territorial'no-raspredelennyh objectov. Vistnyk NTU «KhPI», 2 (976), 60–76.

RESEARCH ON THE SOUCES OF EFFICIENCY AND IMPLEMENTATION OF TRANSPORT LOGISTICS CLUSTERS (p. 43-51)

Mykhayilo Postan, Gennadii Stolyarov

The paper analyzes the notions, principles of forming, the classification, and effective functioning of transport logistics clusters (TLCs). The study reveals peculiarities of the European classification and organizational structures of the leading European TLCs. We have pointed out advantages and identified the sources of cluster formations efficiency. We have introduced the notion of potential efficiency sources for TLCs whose composition is rationalized for port clusters and suggested the methods for the efficiency estimation on expanding the cluster resource base. The article presents the results of a synergetic effect from a joint use of port transshipment complexes by sea port operators. The devised and presented TLC organizational structure includes a Center for cluster development, a Board, a Secretariat, and Committees that implement specific projects to improve the cluster efficiency and development. The Committee on the operational control of resources is provided with a technology of managing vessels processing at interchangeable berths as well as principles for the allocation of additional income from the reduction of the vessels parking time. Transport logistics companies participate in joint cluster projects based on the companies' complete independence as well as on voluntary and mutually beneficial conditions.

The research is relevant due to the lack of publications on organizational forms and managerial decisions in the implementation of potential TLCs efficiency sources. The commonly considered organizational structures represent unions that are not aimed at solving specific problems of TLCs development and efficiency. The research has determined that implementation of the suggested organizational and managerial decisions considerably increases the economic efficiency and competitiveness of TLCs.

The developed proposals for coordination and cooperation of TLC companies and enterprises can be practically useful in developing appropriate regional organizational structures.

Keywords: cluster, transport, logistics, port, efficiency, management, technology, organization, structure, synergy.

References

1. Porter, M. (2006). Conkurentsiya. Moscow: Izdatel'skiyi dom "Vil'yams", 608.
2. Sheffi, Y. (2012). Logistics Clusters: delivering valul and drining growth. Cambridge, Massachusetts: MIT Press.
3. Krikavskiyi, E. V. (2005). Logistychni klastery. L'viv: NU"L'vivs'ka politehnika".
4. Menshinina, I. G., Kapustina, L. M. (2008). Klasteroobrazovanie v regionalnoyi ekonomike. Feder. Agenstvo po obrazovaniu, Ural. gos. ekon. Un-t – Ekaterenburg: Izd-vo Ural. Gos. ekon. Un-ta, 154.
5. Evtodieva, T. V. (2011). Logisticheskie klasrey: sutshnost' i vidy. Ekonomicheskie nauki, 4 (77), 78–81.
6. Vladimirov, U. L., Tret'yak, V. P. (2008). O klassifikatsii klasterov predpriyatiyi/Al'monah "Nauka, Innovatsii, Obrazovanie", 7, 72–86.
7. Notteboom, T. (2008). The Relationship between Seaports and the Inter-Modal Hinterland in Light of Global Supply Chains. OECD/ITF Joint Transport Research Centre Discussion Papers, 44. doi: 10.1787/235371341338
8. Zakharchenko, V. I., Osipov, V. N. (2010). Klasternaya forma territorial'no - proizvodstvennoi organizatsii. Odessa: "Favorit"–"Pechatniyi dom", 122.
9. Khasanov, R. Hk. Sinergeticheskiyi effect klastera. Available at: http://www.pmjobs.net/art/3.doc
10. Kulaevskyyi, A. A. (1989). Effektivnost' regional'nogo transportnogo kompleksa (metodologicheskie voprosy). Novosibirsk: Nauka. Sib. otd-nie, 128.
11. Rebitzer, D. W. (2007). The European Logistics Market, Europe Estate Yearbook.
12. The Future of London's Maritime Services Cluster: A Call for Action (2004). Report prepared by Fisher Association, 113. Available at: http://fisherassoc.co.uk/project.asp?c=66
13. Development in the Norwegian maritime cluster: report/1st European maritime Cluster Organization Roundtable (2004). Wassenaar, Netherlands, 28. Available at: http://nortrade.com/index?cmd=show_article&id=168
14. Kapitsa, S. P., Kudyumov, S. P., Malinetskiyi, G. G. (2001). Sinergetika i prognozy budutshego. Moscow: Editorial URSS, 283.
15. Postan, M. Ya. (2006). Ekonomiko-matematicheskie modeli smeshannykh perevozok. Odessa: astroprint, 376.

SOFTWARE DEVELOPMENT AND MANAGEMENT PROBLEM ANALYSIS OF INVESTMENT PORTFOLIO STRUCTURE (p. 51-56)

Anna Vorobiova, Aleksandr Goloskokov

The problem of investors in the modern Ukrainian stock market is considered. Each investor faces a dilemma, wishing to have more yield and less risk. Since this task is controvertsial, the investor must make a compromise choice between yield and risk. The problem is that to be successful an investor needs help to assess the overall situation in the market. So far, there are so many online agencies, specialized in training to work with the securities market, but there is no the software that would allow to conduct investment portfolio management based on various mathematical models. Many people are involved in this area of the market, therefore; there is the need to automate securities transactions.

It was proposed to consider methods for finding the risky structure of the portfolio and the allocation of available capital between the risky and nonrisky part of the portfolio using Markowitz models and Pontryagin's max i mum principle, with the aim to develop an optimal reallocation strategy of investor funds.

In carrying out this work, risky portfolio structure, found by maximizing the Sharpe relationship and based on the Markowitz portfolio theory, namely, the search for the minimum risk portfolio was determined. During the capital allocation between risky and nonrisky part of the portfolio, management in the form of feedback was used. All the calculations were made using the developed software and have allowed to evaluate the usefulness of the work.

Research results and developed software can be used in investment departments of commercial banks and by small investors.

Keywords: security, investment portfolio, investment, Markowitz model, maximum principle.

References

1. Galanova, B. A., Basov, A. I. (Eds.) (2006). Securities market. Moscow: Finansy i statistika, 448.
2. Brigham, Y. U., Gapenski, L. A., Kovalev, B. B. (1997). Financial Management. Full course, 669.
3. Sharpe, W., Alexander, V. (2001). Investment. Moscow: INFRA-M, 1028.
4. Degtyareva, O. I., Korshunov, N. M., Zhukov, E. F. (2004). The securities market and exchange business. The Textbook for high schools, 501.
5. Mokrienko, O. M. (2012). The process of managing a portfolio of brands. The journal "Proceedings of the St. Petersburg University of Economics and Finance", 437.
6. O'Brien, J. (1995). The financial analysis and securities. Moscow: «Delo Ltd», 208.
7. Tsiganyuk, D. L., Stepanenko, O. S. (2010). Improving management model portfolio of collective investment institutions. Economics Regulation Mechanism, 144.
8. Meshcheryakov, A., Partickm M. V. (2012). Management portfolio of commercial banks. Research publication. Journal of Dnipropetrovsk University. Available at: http://vestnikdnu.com.ua/archive/201264/mescheryakov.html
9. Morozkin, Y. N., Svistunova, E. S. (2011). Portfolio management in a commercial bank. Herald of the Chelyabinsk State University, 31 (6(221)), 138–141.
10. Milutin, A. A., Dmitruk, A. V., Osmolovskiy, N. P. (2004). The maximum principle in optimal control. Moscow, 72.
11. Paraev, Y. I., Tsvetnitskaya, S. A. (2009). Study of investment strategy portfolio management. Journal Bulletin of the Tomsk State University. Management, Computer Science and Informatics, 4 (9), 17–25.
12. Malyugin, B. I. (2003). Securities Market: Quantitative methods of analysis. Moscow: Delo, 320.
13. Paramonov, V. I. (2015). The main way out of private investors in the stock market from a broker to a family office. Moscow State Institute of International Relations (University) MFA of Russia, 133.
14. Gitman, L. J. (1997). Investing Basics. Moscow: Delo, 1008.
15. Pontryagin, L. S., Boltyanskii, V. G., Gamkrelidze, R. V., Mishchenko E. F. (1969). The mathematical theory of optimal processes. Moscow "Nauka", 169.