

APPLICATION OF MIVAR TECHNOLOGIES FOR STUDENTS INDIVIDUAL TRAJECTORIES IMPLEMENTATION IN ENGINEERING AND ECONOMIC EDUCATION

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In order to match better the employers requirements and increase the universities competitiveness providing economic and engineering education, it is proposed to use new tools for training students, such as individual trajectories and other forms of training individualization. It is important to take into account the requirements of Federal state educational standards (FSES). However, the FSES retains enough alternatives for individualizing training in specialization choosing in a certain professional field. For example, for students studying information technologies such specialization may be in the choice between different economic sectors: banks, telecommunications, industrial production, logistics, automotive industry, Internet companies, social networks, etc. Individualization of training may consist in a more detailed study of one of the areas in it: databases; expert systems; distributed registries; artificial intelligence; image recognition; natural language understanding; automated systems and technological processes management; robotics, etc. Opportunities for individualizing student learning be even within the FSES. Examples of training individualization of BMSTU students are presented.

Practical work has shown that individualization complicates the work and increases the time spent by University staff on managing trajectories in student training. Achievements of mivar technologies of logical artificial intelligence allow automating routine operations for managing individual students trajectories. In general, artificial intelligence can help in almost all tasks of economic and engineering education in the transition to continuous training of people "through all life".

Keywords: individualization of training, motivation, life strategy, elective disciplines, artificial intelligence, economic systems, mivar, mivar nets, expert systems, decision-making systems, robots.

REFERENCES

1. Shaposhnikova N.Yu. *Individual'naja obrazovatel'naja traektorija studenta: analiz traktovok ponjatija* [The individual educational trajectory of a student: analysis of interpretations of the concept] // *Pedagogicheskoe obrazovanie v Rossii* [Pedagogical education in Russia]. 2015. No. 5. Pp. 39-44.
2. Goncharova E.V., Chumicheva R.M. *Organizacija individual'noj obrazovatel'noj traektorii obuchenija bakalavrov* [Organization of an individual educational trajectory of bachelor's studies] // *Bulletin of NGU*. 2012. No. 2. Pp. 3-11.
3. Bochkareva S.M. *Metody, sredstva i tehnologii v t'jutorskom soprovozhdenii individual'noj traektorii razvitija studenta* [Methods, tools and technologies in tutorial support of an individual student development path] // *Pedagogika i psihologija kak resurs razvitija sovremennogo obshhestva: sb. st. 2-ï Mezhdun. nauch.-prakt. konf. (Rjazan', 7-9 okt. 2010 g.)* [Pedagogy and Psychology as a resource for the development of modern society: Sat. Art. 2nd Int. scientific practical con. (Ryazan, October 7-9, 2010)]. Ryazan, 2010. Pp. 320-325.
4. Labunskaya N.A. *Individual'nyj obrazovatel'nyj marshrut studenta: podhody k raskrytiju ponjatija* [The individual educational route of the student: approaches to the

- disclosure of the concept] // *Izvestija RGPU im. A.I. Gercena* [Bulletin of the Russian State Pedagogical University named after A.I. Herzen]. 2002. No. 3. Pp. 79-90.
5. Grinko M.A. *Proektirovanie individual'nyh traektorij obuchenija inostrannomu jazyku studentov pedagogicheskikh vuzov* [Designing individual trajectories of teaching a foreign language to students of pedagogical universities] // *Vestnik Adygeisk. gos. un-ta. Ser. 3: Pedagogika i psihologija* [Bulletin of Adygeisk. state university. Ser. 3: Pedagogy and psychology]. 2011. No 3. Pp. 18-22.
6. Shaposhnikova N.Yu. *Opyt vvedenija portfolio dlja ocenki dostizhenij i razvitija studentov v universitetah Velikobritanii* [The experience of introducing a portfolio for assessing the achievements and development of students at universities in the UK] // *Otechestvennaja i zarubezhnaja pedagogika* [Domestic and foreign pedagogy]. 2018. Vol. 1. No. 1 (46). Pp. 94-107.
7. Shaposhnikova N.Yu. *Sostojanie problemy realizacii individual'nyh obrazovatel'nyh traektorij studentov v vysshej shkole* [The state of the problem of implementing individual educational trajectories of students in higher education] // *Nauka o cheloveke: gumanitarnye issledovanija* [Human Science: Humanitarian Studies]. 2016. No. 2 (24). Pp. 105-111.
8. Varlamov O.O. *Evoljucionnye bazy dannyh i znanij dlja adaptivnogo sinteza intellektual'nyh sistem. Mivarnoe informacionnoe prostranstvo* [Evolutionary databases and knowledge for adaptive synthesis of intellectual systems. Mivar information space]. M.: Radio and communications, 2002. 288 p.
9. Varlamov O.O. *Wi!Mi Expert System Shell as the Novel Tool for Building KnowledgeBased Systems with Linear Computational Complexity* // *International Review of Automatic Control*. 2018. 11(6). P. 314-325.
10. Adamova L.E., Varlamov O.O., Osipov V.G., Chuvikov D.A. *O prakticheskoj realizacii mivarnogo virtual'nogo ruskोजazychnogo tekstovogo konsul'tanta v bankovskoj sfere* [On the practical implementation of the mivar virtual Russian-language text consultant in the banking sector] // *Izvestija Kabardino-Balkarskogo nauchnogo centra RAN* [News of the KabardinBalkar Scientific Center of the Russian Academy of Sciences]. 2018. No. 6-2 (86). P. 10-17.
11. Shadrin S.S., Varlamov O.O., Ivanov A.M. *Experimental autonomous road vehicle with logical artificial intelligence* // *Journal of Advanced Transportation*. 2017. Vol. 2017. 10 p.
12. Varlamov O.O. *Perebornoye yedinichno-inkrementnoye summirovaniye chisel s lineynoy vychislitel'noy slozhnost'yu* [Enumerated unit-incremental summation of numbers with linear computational complexity] // *Avtomatizatsiya i sovremennye tekhnologii* [Automation and modern technology]. 2003. No. 1. P. 34-40.
13. Ostroukh A., Surkova N., Varlamov O., Chernenky V. and Baldin A. *Automated process control system of mobile crushing and screening plant* *Journal of Applied Engineering Science*. 2018. 16(3). 343-348.
14. Chernenkiy V., Gapanyuk Y., Terekhov V., Revunkov G. and Kaganov Y. *The hybrid intelligent information system approach as the basis for cognitive architecture* // *Procedia Computer Science*. 2018. 145. 143-152.
15. Chernenkiy V.M., Gapanyuk Y.E., Revunkov G.I., Kaganov Y.T., Fedorenko Y.S. and Minakova S.V. *Using metagraph approach for complex domains description* *CEUR Workshop Proceedings*. 2017. 2022. 342-349.
16. Chernenkiy V., Gapanyuk Y., Revunkov G., Kaganov Y. and Fedorenko Y. *Metagraph Approach as a Data Model for Cognitive Architecture* *Advances in Intelligent Systems and Computing*. 2019. 848. 50-55.

17. Terekhov V.I., Chernenky I.M., Buklin S.V. and Yakubov A.R. Cognitive Visualization in Management Decision Support Problems Optical Memory and Neural Networks (Information Optics). 2019. 28(1). 27-35.

18. Burdakov A.V., Ukharov A.O., Myalkin M.P. and Terekhov V.I. Forecasting of influenzalike illness incidence in amur region with neural networks Studies in Computational Intelligence. 2019. 799. 307-314.

19. Gapanyuk Y., Latkin I., Chernobrovkin S., Leontiev A., Ozhegov G., Opryshko A. and Myalkin M. Architecture and implementation of an intelligent news analysis system CEUR Workshop Proceedings. 2017. 1975. 41-55.

20. Taran M., Revunkov G. and Gapanyuk Y. The hybrid intelligent information system for poems generation Studies in Computational Intelligence. 2020. 856. 78-86.

21. Gapanyuk Y.E. The Semantic Complex Event Processing Based on Metagraph Approach Advances in Intelligent Systems and Computing 2020. 948. 99-104.

22. Burdakov A.V., Ukharov A.O., Myalkin M.P. and Terekhov V.I. Forecasting of influenzalike illness incidence in amur region with neural networks Studies in Computational Intelligence.

2019. 799. 307-314.

23. Sergushin G.S., Varlamov O.O., Chibirova M.O., Eliseev D.V., Muravyova E.A. *Issledovanie vozmozhnostej informacionnogo modelirovaniya slozhnyh sistem upravleniya tehnologicheskimi processami na osnove mivarnyh tehnologij* [The study of the possibilities of information modeling of complex process control systems based on mivar technologies] // *Avtomatizacija i upravlenie v tehniceskikh sistemah* [Automation and control in technical systems]. 2013. No. 2 (4). Pp. 51-66.

24. Varlamov O.O. *O vozmozhnosti sozdaniya intellektual'nyh sistem na osnove grid, sistem adaptivnogo sinteza ivk, servisno-orientirovannoj arhitektury i mivarnogo informacionnogo prostranstva* [About the possibility of creating intelligent systems based on grid, systems of adaptive synthesis of information technologies, service-oriented architecture and mivar information space] // *Izvestija TRTU* [News of TRTU]. 2005. No. 10 (54). Pp. 130-140.

25. Mayboroda Yu.I., Sintsov M.Yu., Ozerin A.Yu., Kuzin A.A., Varlamov O.O. *Sistema avtomaticheskogo tegirovaniya izobrazhenij na osnove mivarnyh tehnologij* [The system of automatic tagging of images based on mivar technologies] // *Programmnye sistemy: teorija i prilozhenija* [Program systems: theory and applications]. 2014. Vol. 5. No. 4 (22). Pp. 159-170.

26. Maksimova A.Yu., Varlamov O.O. *Mivarnaja jekspertnaja sistema dlja raspoznavaniya obrazov na osnove nechetkoj klassifikacii i modelirovaniya razlichnyh predmetnyh oblastej s avtomatizirovannym rasshireniem konteksta* [Mivar expert system for pattern recognition based on fuzzy classification and modeling of various subject areas with automated expansion of the context] // *Izvestija JuFU. Tehniceskie nauki* [News of SFU. Technical science]. 2011. No 12 (125). Pp. 77-87.

27. Varlamov O.O. *Perspektivy sozdaniya mivarnyh sistem upravlenija dlja avtonomnyh intellektual'nyh robotov* [Prospects for the creation of mivar control systems for autonomous intelligent robots] // *Radiopromyshlennost'* [Radio industry]. 2015. No. 3. P. 210-225.

28. Varlamov O.O. *Formalizacija termina "ponimanie smysla teksta" na osnove mivarnyh tehnologij i koncepcii "veshh'-svoystvo-otnoshenie"* [Formalization of the term "understanding of the meaning of the text" on the basis of mivar technologies and the concept of "thing-propertyrelation"] // *Radiopromyshlennost'* [Radio industry]. 2015. No. 3. P. 144-159.

29. Sandu R.A., Varlamov O.O., Ostroukh A.V. *Mivarnye avtomatizirovannye sistemy upravlenija tehnologicheskimi processami dlja nefljanoy promyshlennosti Rossii* [Mivar automated process control systems for the Russian oil industry] // *Avtomatizacija,*

telemehanizacija i svjaz' v neftjanoj promyshlennosti [Automation, telemechanization and communication in the oil industry]. 2011. No. 11. Pp. 37-40.

30. Varlamov O.O. *Rol' i mesto mivarov v komp'yuternyh naukah, sistemah iskusstvennogo intellekta i informatike* [The role and place of mivars in computer science, systems of artificial intelligence and computer science] // *Radiopromyshlennost'* [Radio industry]. 2015. No 3. Pp.10-27.

31. Varlamov O.O. and Aladin D.V.. Successful application of mivar expert systems for MIPRA – solving action planning problems for robotic systems in real time Radio industry (Russia). 2019. 29(3). 15-25.

32. Varlamov O.O., Chuvikov D.A., Aladin D.V., Adamova L.E. and Osipov V.G. Logical artificial intelligence Mivar technologies for autonomous road vehicles IOP Conference Series: Materials Science and Engineering. 2019. 534(1). 012015.

33. Chuvikov D.A., Varlamov O.O., Aladin D.V., Chernenkiy V.M. and Baldin A.V. Mivar models of reconstruction and expertise of emergency events of road accidents IOP Conference Series: Materials Science and Engineering. 2019. 534(1). 012007.

34. Varlamov O.O., Chuvikov D.A., Adamova L.E., Petrov M.A., Zabolotskaya I.K. and Zhilina T.N. Logical, Philosophical and Ethical Aspects of AI in Medicine International Journal of Machine Learning and Computing (IJMLC). 2019. 9(6). 868-873.

35. Aladin D.V., Varlamov O.O., Chuvikov D.A., Chernenkiy V.M., Smelkova E.A. and Baldin A.V. Logic-based artificial intelligence in systems for monitoring the enforcing traffic regulations IOP Conference Series: Materials Science and Engineering. 2019. 534(1). 012025.