REVIEW

from professor Daniela Borissova, D.Sc. – IICT-BAS
Member of the Scientific Jury appointed by the Director of IMI-BAS via
Order No 210/02.12.2020

About: Dissertation thesis of Oleg Petrov Iliev with title "*Methods and models for personalization of a thematic-oriented learning content*", presented for the acquisition of educational and scientific degree "doctor" in a doctoral program "Informatics", Professional field 4.6. "Informatics and Computer Science"

ACTUALITY

The rapid development of information and communication technologies is a prerequisite for the development of new methods and models for personalization of thematic-oriented learning content. On the other hand, the specific pandemic situation is another motivation for optimizing the use of learning resources in modern e-learning environments. The development of such a flexible software architecture should allow both the ability to update the version of the environment and ensure the security of user data, incl. possibility for verification of the user identity of the participants in the training process. Therefore, conducting research related to the development of methods, models and algorithms for personalization of thematic-oriented learning content is a current research area.

KNOWLEDGE OF THE PROBLEM

From the review, as well as from the published results on the topic of the dissertation, it can be established that the doctoral student is well aware of the nature

of the researched problems. Additional proof of this is the presence of software implementation of the proposed methods, models and algorithms, which allows the generation of functional tests to validate the performance of the web-based training system.

ANALYTICAL CHARACTERISTIC

The dissertation has a total volume of 145 pages and contains 16 tables and 35 figures. It is structured as follows: introduction, 8 chapters, contributions, conclusion and conclusions, bibliography, list of figures, list of tables, list of publications on the topic of the dissertation, citations of publications on the topic of the dissertation. In Chapter 1, the author defines the object and subject of the study. Here is defined also the goal of the dissertation (page 12) and 6 tasks are formulated to achieve it.

Chapter 2 presents an analysis of existing models and theories used in the learning process, as well as the ways of their software presentation. Modern methods and approaches for personalized delivery of learning content to the cognitive abilities, preferences and learning style of students are presented.

Chapter 3 presents a model for the preparation of personalized learning materials from thematically oriented content, which provides multiple uses of basic learning objects and the creation of new learning resources. The process of designing structures and components, providing granularity and multiple uses of resources in the repository for educational content, is also presented. The proposed algorithms and methods for automatic generation of teaching materials with the possibility of collecting feedback on the quality of training are described.

Chapter 4 describes the way to perform an evaluation of the effectiveness of the presented model for generating thematic-oriented and personalized learning content through the method of A/B testing with real subjects.

The software architecture of the training system with personalized thematic-oriented learning content is presented in Chapter 5. This architecture describes the

proposed "concept of scaling in software development" as a universal guide used in planning the stages of software development.

Chapter 6 describes the ways to establish the user identity in a training system, as well as the possibility for verification of the users in the training process - learners and trainers. A method for identifying the user, which has legal weight and which provides an opportunity to issue official certificates of completion, is presented.

Chapter 7 presents the results of the validation and verification of the methods and models for personalization of thematic-oriented learning content. Chapter 8 identifies some potential problems and opportunities for future research.

RESEARCH METHODOLOGY

The object of the research are the e-learning environments, where through the use of modern information and communication technologies the support of a variety of organizational forms and models for assessment of students is ensured. The research methodology is based on the use of methods for preparing personalized learning materials from thematically oriented content, which provides multiple use and algorithms for automatic generation of learning materials with the ability to collect feedback on the quality of education. The chosen methodology, as well as the techniques used are approaches corresponding to the goal and the tasks formulated in the dissertation.

ABSTRACT AND AUTHOR'S REFERENCE

The presented abstract in Bulgarian with a summary in English reliably reflects the content of the dissertation and meets the requirements of Law for the development of the academic staff in the Republic of Bulgaria, and the Regulations for its implementation. From the presented declaration of originality, as well as from the published papers on the dissertation theme, it can be judged that the described results are the personal work of the author.

ASSESSMENT OF COMPLIANCE WITH THE MINIMUM NATIONAL REQUIREMENTS

The presented 7 publications correspond to the topic and content of the dissertation. Two of these publications are indexed in Scopus and in publications with SJR, and the rest are in proceedings of national and international scientific conferences. It should be noted that 3 citations were also noticed.

According to the minimum national requirements for obtaining of the educational and scientific degree "Doctor" in the professional field 4.6 "Informatics and Computer Science", the required scores are to be at least 30 for the group of indicators G. The same number of points is required by the Regulations on the terms and conditions for acquiring scientific degrees and for holding academic positions at BAS and the Regulations on the specific conditions for acquiring scientific degrees and for holding academic positions in IMI-BAS.

The total amount of points for the indicators from Group G, taking into account the submitted publications on the dissertation, is equal to 40 points, which is higher than the required minimum points.

From such a reference it can be established that the presented publications and the attached citations fully meet the requirements of the internal criteria of IMI-BAS for the acquisition of the educational and scientific degree "Doctor".

CONTRIBUTIONS

I accept the contributions formulated by the doctoral student with the exception of the first one. I evaluate the other contributions as scientific and applied, namely:

1. A model for automated preparation of personalized learning materials from thematically oriented educational content using a descriptive structure created for use in the repositories for learning content has been developed.

2. A scheme for validation and verification of the model for the preparation of personalized learning materials is proposed, oriented towards achieving effective and quality transfer of knowledge to students with different cognitive abilities.

3. A software architecture of an e-learning environment is proposed that provides personalization of the learning content.

4. A concept for scaling a software learning environment, consisting of seven stages, has been developed and experimentally tested, which is based on a new type of flexible architecture, allowing updating the version of the environment.

5. A model for secure user authentication has been proposed and tested, which allows identification of the user's identity and which provides an opportunity for issuing official certificates for completed training.

CRITICAL COMMENTS AND RECOMMENDATIONS

The dissertation is well balanced, but it would be good if the author's contributions are presented in more detail. The results described in the dissertation and the publications convincingly show that the doctoral student Oleg Iliev has the necessary theoretical knowledge and practical skills in the specialty, as well as proven abilities for independent research.

I have the following questions:

1. What is the role of the use of gamification as part of the model for automatic generation of learning materials?
2. How does the size of the control group affect the evaluation of the effectiveness of the generated thematic-oriented and personalized learning content?
3. What are the advantages of using the N-layer architecture and REST implemented in the e-learning system with personalized thematic-oriented learning content?

CONCLUSION

The results obtained on the topic of the dissertation convincingly show that the doctoral student **Oleg Iliev** has the necessary theoretical knowledge and practical skills in the field of informatics and computer science, as well as proven abilities for independent research. The presented dissertation meets the requirements of the Law for the development of the academic staff in the Republic of Bulgaria, the

Regulations for its implementation and the Regulations for the specific conditions for acquiring scientific degrees and for holding academic positions in IMI-BAS. The obtained results on the topic of the dissertation give me enough grounds to give a positive assessment of the presented dissertation and **I suggest to the honourable scientific jury to award to Oleg Petrov Iliev the educational and scientific degree "Doctor" in the doctoral program "Informatics", professional field 4.6. "Informatics and Computer Science"**.

16 December 2020 Reviewer: .....….

(prof. Daniela Borissova, D.Sc.)