REVIEW

by Assoc. Prof. Desislava Ivanova Paneva-Marinova, Ph.D,
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on the dissertation

by Oleg Petrov Iliev

titled "Methods and models for personalization of a thematic-oriented learning content", submitted for acquisition of the scientific and academic degree *doctor* in professional field *4.6. Informatics and computer sciences*, scientific specialty *Informatics*

In accordance with *Order No. 210/02.12.2020* of the president of IMI-BAS for the initiation of the procedure for a defense of the dissertation of the candidate for a doctor's degree Oleg Petrov Iliev, I have been approved for a member of the Scientific jury on the procedure. This Review is prepared and presented on the grounds of a Decision of the Scientific jury (*Protocol No.1/03.12.2020*) on the division of the proceedings among the members of the Scientific jury on the procedure.

The present Review is made in accordance to the *Act for the Development of the Academic Staff in the Republic of Bulgaria*, the *Rules for its implementation* and the *Rules on the Terms and Conditions for Acquisition of Academic Degrees and Occupation of Academic Positions at the Institute of Mathematics and Informatics – Bulgarian Academy of Sciences*.

As a member of the scientific jury, I have been presented with all the required documents including: an application to the president of IMI-BAS for admission to a defense of the dissertation; a curriculum vitae; an order for enrollment in a doctor's degree programme; protocols for the completed exams, according to the programme plan; an order for disenrollment from a doctor's degree programme; an order of the president of IMI-BAS for discussion of the dissertation by a primary section; a list of scientific publications on the dissertation; a list of quotations of the scientific publications on the dissertation; copies of the scientific publications on the dissertation;

the dissertation; a reference to the scientific contributions of the dissertation and the scientific publications on the dissertation; and the author's summary of the dissertation

1. General description of the dissertation

The submitted dissertation comprises of 145 pages, divided in a Table of Contents, Introduction, eight chapters, Scientific contributions of the dissertation, Conclusion, a list of Figures, a list of Tables, a list of Scientific publications on the topic of the dissertation, and a list of Quotations of the scientific publications on the dissertation. The Bibliography includes 51 scientific sources in Bulgarian and English.

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2. Evaluation of the structure and the contents of the dissertation

The dissertation "Methods and models for personalization of a thematic-oriented learning content" by Oleg Petrov Iliev presents an elaborate scientific study on the problems of the optimized use of learning resources in the modern e-learning environments. The main goals of the dissertation are the presentation of the learning contents in the most suitable way for the different learners, and the ensuring of multiple use and adaptation of the resources in a specific context and situation. The topic explored in the dissertation is of exceptional relevance also due to the small number of implementations in Bulgaria and the necessity for providing flexible solutions with high degree of adaptivity and portability. The themes developed have scientific and applicational aspects.

Chapter 1 of the dissertation comprises the necessary components – subject, topic, goals and aims of the research

Chapter 2 is of analytical character and presents the contemporary methods and approaches for personalized delivery of the learning content, according to defined cognitive abilities, preferences, and learners' learning style. Components such as learning goals, learning content model, learning objects and their multiple use are analyzed. The basic characteristics, features, problems and disadvantages of a specific e-learning environments are reviewed. Options for overcoming those disadvantages through involvement in the *"maturity"* phase and development of the environments are considered. Different methods for validation and verification of conceptual models during their software implementation are examined.

Chapter 3 presents a model for preparation of personalized learning materials from a theme-oriented content, which ensures the multiple use of the basic learning objects, and the creation of new learning resources, personalized according to the specific cognitive abilities of the learners. The model connects the adapted version of the Bloom's taxonomy with the Honey and Mumford's Learning Styles in order to create the targeted learning materials. The chapter also describes the design process of structures and components, ensuring the granularity and multiple use of the resources in a learning content repository. Algorithms and methods for automatic generation of learning materials and resources for quality of education feedback collection are created.

In *Chapter 4* the generated theme-oriented and personalized learning content is tested with the A/B method, and evaluated.

Chapter 5 describes the design of a digital learning system, which providing personalization of the learning content, its software architecture and components, following the established methods for software application development.

In *Chapter 6*, a model for specification and control of user identity, and securing the users' data is described.

In *Chapter 7* the verification of the effectiveness of the presented models, done during an experiment with real-life 7th grade students, is outlined.

In *Chapter 8* potential problems and directions for future advancement of the models and applications developed are presented.

3.   Scientific and applied achievements of the dissertation

In essence, the following scientific and applied contributions could be reported:

- A model for automatic preparation of personalized learning materials with theme-oriented educational content, utilizing a descriptive structure, created for use in learning content repositories, is developed.

- An outline for validation and verification of the model for preparation of personalized learning materials, oriented towards achieving effective and quality knowledge transfer to learners with different cognitive abilities, is proposed.

- A software architecture for a digital learning system, providing personalization of the learning content, is developed.

- A model for secure authentication of user identity in a digital learning system is developed

- A concept for scaling in a learning environment is developed.

4. Scientific publications on the topic. Faithfulness of the results.

The list of the author's publications on the essence of the dissertation includes seven titles, two of them indexed at Scopus and/or Web of Science in an edition with SJR. Five are in proceedings of national and international scientific conferences. There are three quotations noted. In six of the publications, the candidate is the first author. In three of them the candidate is the sole author. The publications reflect the main results, achieved in the dissertation. I deem the set of submitted publication indisputable in its completeness and representativeness. The requirements, according to the *Act for the Development of the Academic Staff in the Republic of Bulgaria*, the *Rules for its implementation*, and the *Rules on the Terms and Conditions for Acquisition of Academic Degrees and Occupation of Academic Positions at the Institute of Mathematics and Informatics – Bulgarian Academy of Sciences* for acquisition of the scientific and academic degree *doctor* in professional field *4.6. Informatics and computer sciences*, scientific specialty *Informatics*, are completely fulfilled.

5. Degree of independence of the contributions of the dissertation

From the attached papers and the list of the conferences, in which the candidate has participated, it is clear, that the main results are product of his work

6. Comments and recommendations

The critical remarks are related to instances of technical errors in the text layout, which have no influence on the quality of the scientific contributions and their presentation.

Conclusion: Based on the above said about the submitted dissertation, the scientific publications, their significance and their comprising scientific and applicational contributions, I deem the dissertation by Oleg Petrov Iliev "Methods and models for personalization of a thematic-oriented learning content" fulfilling all requirements of the the *Act for the Development of the Academic Staff in the Republic of Bulgaria*, the *Rules for its implementation* and the *Rules on the Terms and Conditions for Acquisition of Academic Degrees and Occupation of Academic Positions*

at the Institute of Mathematics and Informatics – Bulgarian Academy of Sciences for acquisition of the scientific and academic degree *doctor* in professional field 4.6. Informatics and computer sciences, scientific specialty *Informatics*. I give **a positive assessment** to the dissertation and recommend to the Honoured scientific jury to award Oleg Petrov Iliev the scientific and academic degree *doctor* in the scientific specialty of *Informatics* in professional field *4.6. Informatics and computer sciences.*

21.12.2020 г.   Reviewer:

Sofia   Assoc. Prof. Desislava Ivanova Paneva-Marinova, Ph.D