

Review

of the thesis of Nektarios Moumoutzis
“Operational Conceptual Modeling in Building and Sustaining Virtual Communities”,
presented for awarding the educational and scientific degree “doctor”
in Professional area 4.6 Informatics and Computer Science

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Pursuant to Order 208/20.07.2022 of the Director of IMI – BAS I was appointed a member of the scientific jury for the defense of the submitted thesis in professional area 4.6 Informatics and Computer Science, entitled “Operational Conceptual Modeling in Building and Sustaining Virtual Communities”. At the first meeting of the scientific jury, I was designated as a reviewer for this procedure.

1. General characteristics of the dissertation and the presented materials

The dissertation is written in English. It contains 164 pages of text, including an introduction, five chapters and conclusion, as well as several sections with summary of the contributions, reference for the dissemination of results and directions for future work, list of publications, declaration of originality of the results, list of references, lists of tables and figures, list of abbreviations, two appendices.

In addition to the dissertation, the following documents are also presented:

- abstract in Bulgarian and abstract in English;
- list of publications on dissertation results;
- copies of publications on dissertation results;
- report on the contributions of the dissertation;
- European-style CV;
- evaluation of the PhD student’s work for admission to the pre-defense (according to the BAS model).

2. Applicant data

Nektarios Moumoutzis holds a bachelor's degree in computer science from the University of Crete, Greece, and a master's degree in electronics and computer engineering from the Technical University of Crete, Greece. He worked and continues to work as a researcher and project manager at the Technical University of Crete, Greece. He has gathered experience in teaching university courses on databases, computer graphics, software engineering, compilers, etc.

I have no immediate personal impressions of the applicant's work.

3. Relevance of the research area and significance of the research problem

The dissertation is devoted to research in the field of information and communication technologies, more specifically in the field of technologies for creating and maintaining onlife communities. It presents author's solutions to a number of issues related to the design and development of software tools supporting members of onlife communities in their collaborative activities.

The field of research is complex and topical, its relevance is determined by the rich potential applications of onlife communities in technology-enabled collaboration.

The goals of the dissertation and the tasks for achieving these goals, which the doctoral student defines, are determined after a thorough analysis of achievements and open questions in the chosen field. The goals set are meaningful, and the tasks are fully aligned with the goals.

4. Analysis of the content, results and contributions of the doctoral thesis

The dissertation consists of seven main parts: an introduction, five chapters and a conclusion.

The introduction presents the research area, the main achievements and open questions in it. The structure of the dissertation is outlined and the content of its particular chapters is summarized.

The first chapter motivates and formulates the goals and specific research tasks of the dissertation.

The second chapter is devoted to an in-depth analysis of the chosen research problem. The general concept of onlife communities and their importance for learning and creativity are discussed. The selected tools and platforms (Coursevo, ViSTPro, eShadow), which were extended and improved by the author of the dissertation and were used as a basis for validating the proposed framework and its practical applications, are presented in an argumentative manner.

Chapter three discusses the PerFECt framework created as part of the dissertation project. The concept of this framework and its particular components are presented in sufficient detail, with special attention paid to an analysis of the different roles that PerFECt users can have: end user, expert user, meta-designer and maieuta-designer.

The fourth chapter presents the results of the author related to applications of the PerFECt framework for creating and maintaining learning communities in real life. It is shown how using the PerFECt framework it is possible to design and validate the use of Coursevo for such purposes, as well as for the purpose of identifying significant improvements related to the introduction of gamification elements as a means of offering more engaging learning experiences. The development of a new version of eShadow that provides a link between learning and drama is discussed, providing opportunities to use the digital shadow theatre in new forms of learning experiences. An extension of the ViSTPro platform designed to create and maintain learning communities in the field of history teaching is presented. Developments of the author are presented in connection with the creation and maintenance of learning communities on basic principles of computer science and in particular the theatrical game “Human Calculator” and the board game “Binary Abacus”.

The fifth chapter is devoted to an analysis of the obtained experimental results, which shows the effectiveness of the PerFECt framework in creating software tools expanding the learning opportunities of various onlife communities.

The conclusion contains a summary of the results of the fulfillment of each of the research tasks of the dissertation project. As separate sections are included: formulation of the contributions of the dissertation; information about the dissemination of the obtained results and directions for future work in the field of research; list of publications; declaration of originality of the results; appendices illustrating some of the presented results.

The main scientific and applied scientific contributions of the doctoral thesis of Nektarios Moumoutzis may be formulated as follows:

- Concepts and principles of modern digital technologies that encourage learning and creativity and support computer-aided collaboration and participatory design are analyzed.
- A performative architectural structure for creating and maintaining onlife communities has been developed, which is based on a conceptual framework including models and specific guidelines for using digital systems to enrich the capabilities of such communities based on the analyzes performed.

The following can be mentioned as most significant applied contributions of the doctoral thesis:

- eShadow tools inspired by Greek traditional theater have been developed and refined. These tools have been applied to establish and maintain communities in digital cultural heritage.
- The ViSTPro platform designed for the visualization of spatio-temporal processes has been extended and improved.
- The Coursevo platform designed for community building and distance learning has been extended and refined.

The doctoral thesis makes an excellent impression with the scope and depth of its presentation. The field of research is modern and complex, and achieving significant results in it requires serious interdisciplinary knowledge and skills, constant and intensive work. The achieved results are original and significant and fully correspond to the defined objectives.

5. Publications on the doctoral thesis. Reflection on the works of other authors

The results obtained in the dissertation are presented in a total of 16 papers, 15 of which are published as follows:

- one – in the series *Advances in Intelligent Systems and Computing* (SJR 0.184 for the year of publication);
- three – in the series *Lecture Notes in Networks and Systems* (SJR 0.151 for the year of publication);
- one – in the journal *Informatics and Automation* (SJR 0.15 for the year of publication);
- five – in the series *Digital Presentation and Preservation of Cultural and Scientific Heritage*, referenced and indexed in WoS and Scopus;
- three – in IEEE editions, referenced and indexed in WoS and/or Scopus;
- one – in a Springer edition, referenced and indexed in Scopus;
- one – in an open access edition.

Also included in the applicant's documents is a manuscript, which is to be published in the series *Digital Presentation and Preservation of Cultural and Scientific Heritage*, referenced and indexed in WoS and Scopus.

All papers in this list are co-authored. I suppose that all co-authors have contributed equally to each of the collective publications.

In this way, the requirements of the Regulations for the terms and conditions for acquiring scientific degrees and for holding academic positions at the Institute of Mathematics and Informatics at the Bulgarian Academy of Sciences have been fulfilled and significantly exceeded.

6. Abstract

The abstract meets all the requirements for its preparation and fully and accurately presents the topic, purpose, content, achieved results and contributions of the dissertation.

7. Critical Remarks and Recommendations

I have no significant critical comments on the doctoral thesis of Nektarios Moumoutzis. I am aware of the fact that serious research in the scientific field in which he works is generally a collective matter, but I recommend him to aspire in his future work to some single-authored publications, presenting results to which he has a key contribution.

8. Summary

Summing up, I consider that the doctoral thesis of Nektarios Moumoutzis satisfies the requirements of the national regulations and the specific conditions and requirements of the Bulgarian Academy of Sciences. Its author has achieved significant research results that make an original contribution to the chosen field of study. My assessment of the dissertation, the abstract, the publications and the scientific contributions of their author, Nektarios Moumoutzis, is **positive**.

Therefore, I advise the honorable scientific jury to award to Nektarios Moumoutzis the educational and scientific degree “doctor” in professional area 4.6 Informatics and Computer Science.

Sofia, September 25, 2022

Prof. Dr. Maria Nisheva-Pavlova