

STATEMENT REPORT

on PhD dissertation thesis "Instruments for Management and Evaluation Applying a User-Centered Approach for The Design of Video Games for Education"

submitted by Yavor Ivanov Dankov – Full-time doctoral student
at the Department of Computing Systems (Temporarily attached to the Department of Mechatronics, Robotics and Mechanics)
at the Faculty of Mathematics and Informatics
at Sofia University "St. Kl. Ohridski "

for obtaining a doctorate degree and educational degree,
field of higher education: 4. Natural sciences, mathematics, and informatics,
professional field: 4.6 Informatics and computer science,
doctoral program "Computer sciences"

prepared by: Prof. Boyan Bontchev, PhD, Department of Software Technology,
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By means of Order No. RD 38-170/30.03.2022 issued by the Rector of the Sofia University "St. Kliment Ohridski", I have been appointed a member of a scientific jury with regard of the defense of the PhD dissertation on "Instruments for Management and Evaluation Applying a User-Centered Approach for The Design of Video Games for Education" for the acquisition of educational and scientific degree "Doctor" in area of higher education: 4. Natural sciences, mathematics and informatics, professional field: 4.6 Informatics and computer science, doctoral program "Computer sciences", by Yavor Ivanov Dankov. According to Protocol №1 of the meeting of the scientific jury for the defense of the dissertation hold on 5th of May, 2022, I present this statement report on the dissertation in question. In creating the present statement, I was guided by the Act for the Development of the Academic Personnel of Republic of Bulgaria (ADAPRB) with its latest amendments announced in State Gazette No.17 of February 26, 2019, as well as by the Rules on the Terms and Requirements for Acquisition of Academic Degrees and Occupation of Academic Positions at the Faculty of Mathematics and Informatics at Sofia University "St. Kliment Ohridski " effective since June 26, 2017.

The PhD student Yavor Dankov has completed all PhD training activities, successfully passed the exams specified in the individual curriculum, and presented a fully completed dissertation in a form and volume corresponding to the specific requirements of the primary unit, as well as copies of scientific papers and abstracts in Bulgarian and English. The dissertation is written in Bulgarian language and contains 134 pages (including 24 figures and 17 tables), structured in a title page, contents, glossary of terms used, introduction, comparative analysis of video learning games and approaches and tools for their design; description of taxonomy of software tools for management and evaluation of video game design training, with a user-oriented approach; application of taxonomy in

the APOGEE software platform, practical validation of the proposed software tools, conclusion, formulation of dissertation contributions, list of scientific dissertation publications, declaration of originality, bibliography (containing 130 literature sources), and appendix with an excerpt from a XML document created to generate an educational video game of the "enriched maze" type. The subject of the research is "analysis, design, integration into software architecture and practical validation of specific software tools for design management and evaluation of video games of maze type applicable for learning". The aim of the dissertation is to design and validate "tools for management and evaluation of design with a user-centered approach, video games of maze type for learning with the help of a specially created taxonomy." In view of the rapid development of video games in recent decades in the context of technology-assisted learning, virtual environments and software services, I find the topic very relevant and significant. The described research tasks include:

- (1) Research and analysis of the design of video games for training and of the tools for analysis and management of the design of video games for training;
- (2) Creation of a general taxonomy of tools for management and evaluation of the design of educational video games and of a specific one for educational video games of the labyrinth type;
- (3) Design of the functionality of the tools for management and evaluation of the design of educational video games of the labyrinth type;
- (4) Analysis and description of the business processes of using the designed tools;
- (5) Design of software architecture of a system for creating video games for labyrinth type training, which includes the designed tools;
- (6) Validation of designed tools through practical experiments with experimental video learning games developed with these tools and analysis of the results.

The doctoral student has successfully completed the tasks stated at the beginning of the dissertation. The established general taxonomy of software instruments for management and evaluation of video game design training can be applied to support the design of a variety of video games. The specialized TIMED-VGE taxonomy of software instruments for management and evaluation of video game design training has been successfully implemented in the software architecture of the APOGEE platform for the design of tools to help manage and evaluate the design of educational video games-mazes. A methodology for validation of the designed software instruments, based on their practical use, has been proposed, through which three experimental video games have for learning been created - "Assenevtsi", "Valchan Voivoda", and "Let's save Venice". Practical validation of the tools based on the assessment of the user experience of the users in game sessions with the three experimental games was performed. The analysis of the results shows that there are strong relationships between all attributes of learnability, as well as between all components of the gaming experience.

As the research supervisor of the doctoral student, the reviewer confirms the main contributions of the dissertation of scientific, scientific-applied and applied nature, formulated on page 116.

The candidate presented copies of six scientific publications related to the topic of work - all in English. One of the publications is in the International Journal of Differential Equations and Applications, and the other five - in proceedings of scientific conferences in Bulgaria (one issue) and

abroad (four issues). All publications in proceedings of foreign conferences are made in Lecture Notes in Networks and Systems (Springer), Advances in Intelligent Systems and Computing (Springer), and CompSysTech (ACM), which are prestigious and well indexed (all three conferences have an impact rank - SJR). All publications are made during the doctoral period of the candidate - from 2019 to 2022. The six cited publications were co-authored with the PhD student's supervisor, with the PhD student being the first co-author in five of the publications. Considering all this together with the past years of joint work, I have no doubt in the significant creative contribution of the candidate. This is confirmed by the analysis of the similarity of the text of the dissertation, based on the result of the system of prevention against plagiarism, used at Sofia University "St. Kliment Ohridski"- the coefficients of similarity have close to zero values (0.14% and 0.07%). In addition, the candidate described the methodology for using the instruments for creating educational games in a new article recently published in the prestigious journal Sustainability, which has a Web of Science Impact Factor equal to 3.251 for 2020.

The reviewer has checked for citations citations of the dissertation's work by other authors using Google Scholar online platform and has identified a number of such citations, all over the past three years.

The abstract of the dissertation is 38 pages long and correctly reflects the contributions of the dissertation. It is presented in both Bulgarian and English.

All my critical remarks were reflected by the dissertation in the process of preparing the paper. As a recommendation to the work, I would suggest that the software instruments themselves be validated independently (in isolation from each other), by surveying stakeholders who create and/or use video games in the learning process.

I have excellent impressions of the candidate from our joint work since June 2019. He participated in the implementation of various tasks on four research projects and proved to be a persistent and consistent researcher and, at the same time, a responsive and executive member of the working team.

Having in mind everything said so far, I give a **POSITIVE** assessment of the dissertation, scientific papers and abstract. I propose to the esteemed jury to promote the acquisition of the degree "Doctor" by the candidate Yavor Ivanov Dankov in the field of higher education: 4. Natural Sciences, Mathematics and Informatics, professional field: 4.6 Informatics and Computer Science, doctoral program: "Computer Sciencea".

24/05/2022

Sofia

Signature:

/Prof. B. Bontchev/