

REVIEW

by Prof. Stanimir Nedyalkov Stoyanov, PhD
about the materials submitted for participation in the competition for
the academic position of 'Professor'
at the Plovdiv University "Paisii Hilendarski"
higher education field 4. Natural sciences, Mathematics and Informatics,
professional direction 4.6 Informatics and Computer Science
(Context modeling)

In the 'Professor' application, announced in the State Gazette, issue 92 from 18.11. 2022, and on the website of Plovdiv University "Paisii Hilendarski" (PU) at the Faculty of Mathematics and Informatics for the needs of the Computer Systems Department at the Faculty of Mathematics and Informatics, as a candidate participates Associate Professor Todorka Glushkova, PhD, from the Faculty of Mathematics and Informatics at the University of Plovdiv.

1. General presentation of the received materials

By order № ПД-21-341 of 15.02.2023 of the Rector of PU I was appointed a member of the scientific jury in an application for the academic position of 'Professor' at PU in the higher education field 4. Natural Sciences, Mathematics and Informatics, professional direction 4.6 Informatics and Computer Sciences (Context-oriented modeling) announced for the needs of the Faculty of Mathematics and Informatics.

The only candidate in the announced competition is Assoc. Prof. Todorka Glushkova, PhD, from the Faculty of Mathematics and Informatics.

The set of materials presented by the candidate is in accordance with the Regulations for the development of the academic staff of the Plovdiv University and includes the following documents:

1. curriculum vitae in European format;
2. diploma for acquired educational and qualification degree "master" No. 003249, reg. No. 346-M, dated 30.08.1986;
3. diploma for acquired educational and qualification degree "master" No. 3525/ September 2003;
4. diploma for educational and scientific degree "doctor";
5. certificate for the academic position "associate professor";
6. list of scientific works:
7. list of all scientific works;
8. list of scientific works for participation in the competition;
9. list of noticed citations for participation in the contest;

10. copies of scientific works for participation in the competition;
11. references for compliance with the minimum national requirements and the additional requirements of the FMI at the PU:
12. annotations of materials, including self-assessment of contributions;
13. documents for academic work;
14. documents for scientific research activity. автобиография по европейски формат;

2. Brief biographical data of the candidate

In 1986 and 2003, Associate Professor Todorka Glushkova, PhD, graduated as a Master of Mathematics and a Master of Informatics respectively at the Faculty of Mathematics and Informatics of the University of Plovdiv. In 2011, she defended his doctoral thesis at the FMI of the PU. From 2013 to 2018 she was the shief assistant, and from 2018 she was an associate professor at the FMI of the PU. Since 1991, she has been a teacher at Hristo Smirnenski Secondary School, Brezovo.

3. General characteristics of the candidate's research activities

Until now, Associate Professor Todorka Glushkova, PhD, has prepared and led lectures on the following mandatory subjects in FMI's bachelor's programs: "Discrete Mathematics" and "Web Design". She also leads elective courses "Block programming" and "WEB design" at the branch of PU in Smolyan. In the master's programs, she leads classes in the subjects "Data bases", "Block programming" and "Computer modeling".

In her lecturing activity, Assoc. Prof. Todorka Glushkova appears as a highly competent and demanding teacher, applying new technologies in education and actively supporting PhD and graduate students. She is the scientific supervisor of four doctoral students, one of whom has successfully defended and three during the training period. She was the supervisor of over twenty graduates.

For the application, the candidate submitted a total of 44 scientific works, of which: 18 are in journals and book chapters, 17 are in the proceedings of scientific conferences, 3 books and 6 textbooks. Also: 2 with IF, 9 with SJR, 8 referenced WoS, 20 referenced Scopus. Also 1 with Q1, 1 with Q3 and 2 with Q4. I accept for review all publications submitted for participation in the application. Except for the textbooks, the monograph and two articles, all other publications are in English. All publications are co-authored (except for the monograph).

Partially accepting the statements in the author's reference, I would summarize the candidate's contributions into groups as presented below.

Modeling in virtual-physical space (ViPS). The publications (№№ 18, 21, 22, 27, 33, 34, 38) are in this topic. In order for the virtualization of the physical objects of interest for such type of systems to be possible, it is necessary to take into account their temporal and spatial aspects. CCA

(Calculus of Context-Aware Ambients) is a possible formalism for modeling primarily the spatial aspects of "things". Ambient-oriented modeling and the application of the mathematical notation and formal semantics of CCA (Calculus of Context-Aware Ambients) for modeling primarily the spatial aspects of "things" are discussed in publications (№№ 18, 34). Ambients virtualize the objects in the cyber-physical systems, and with their support, the characteristics, dependencies and dynamics of the physical objects can be presented in a unified way. In the scenarios discussed, the ambients are "mobile" and can become part of or include other ambients. This characteristic of them allows to describe the processes in the course of their progress. This modeling approach can be used in combination with other formal systems – for example, in modeling the temporal aspects and states through which the observed objects pass (№№ 22, 20, 38) or in modeling decision-making through the formalism of the complex hierarchical logic (№ 27). The articles (№№ 21, 25, 26, 30, 38) discuss the design, structure and functionalities of a modeling component in a cyber-physical environment. In articles (№№ 7, 25, 26, 38), the prototype implementations of some of the modules in this component related to the environment-oriented modeling of the spatial aspects of "things" are considered, such as: the visual editor for CCA-modeling, the modules for analysis and generation of routes and plans. These publications also discuss some results of testing these prototypes when modeling scenarios from different application areas - agriculture, "smart city", tourism, education.

ViPS and its adaptation for various applications. In my opinion, this is the topic in which the main scientific results of the candidate are. The candidate's contributions in this topic are in three application areas. The first is cultural-historical heritage and tourism (№№ 6, 12, 14, 35). The architecture of ViPS is adapted to develop an intelligent tourist guide, assisting tourists by generating virtual and real routes for visiting cultural and historical sites. The implementation of the tourist guide as a multi-agent system is discussed in the publications (№№ 12, 14). Users interact with the tour guide through a personal assistant that is able to conduct surveys with the tourist to understand his preferences and free time. For this purpose, the agent takes into account the physical characteristics of cultural and historical sites such as working hours, location, conditions for visiting. As a result, a route is generated that the tourist can follow. The tourist guide makes a connection between the physical and the virtual, using the presentation of the cultural-historical objects as ontologies and through a specially developed database in CSO (Cataloging Cultural Objects) (№ 35).

The second application area is intelligent agriculture, to which articles №№ 3, 7, 22, 26, 27, 31 refer. The architecture of ViPS is adapted and expanded with additional components implementing the main functionalities. Special attention is paid to the possibilities of modeling an irrigation system (№ 17). Furthermore, an abstract model (№ 22) was developed to track the life cycle, phases and

states of winter wheat cultivation. Models of specific scenarios have been developed. A block chain model has also been proposed to ensure transaction trust and data security (№№ 28, 32).

The third application area is smart cities, the results of which are summarized in papers (№№ 25, 33, 38, 37). The goal of the Health-route-search model discussed in (№ 33) is to design a service that offers possible healthy routes for residents of a city and in particular by people with various respiratory and health problems. In publication (№ 25) attention is focused on the design of scenarios for a small smart city. An approach is applied to represent the spatial aspects of "things" and their modeling through the mathematical notation CCA (Calculus Context-aware Ambients).

The books (№№ 36, 37) summarize the results of research related to applications of the ViPS architecture.

Other contributions of the candidate relate to the design and development of modeling capabilities in the reference architecture and its adaptation for e-learning. Publications (№№ 13, 17, 30, 36, 37) can be partially attributed to the creation of modeling tools that take into account spatial aspects in ViPS.

Modeling in a virtual educational space (VES). The third thematic area to which I would classify the candidate's contributions are the publications (№№ 8, 9, 11, 23, 24), which present research results related to the candidate's PhD thesis. Problems of integrated learning in school STEM centers are considered in publications (№№ 1, 5, 10). Adaptation of the environment virtual educational space for lifelong learning is considered in articles (№№ 15, 16, 23, 24). Various services intended for students of an independent form of education such as: delivery of study materials; conducting examinations and tests; getting support and counseling from the teachers etc. In addition, the environment provides support for the movement of people with physical disabilities in the physical space of educational buildings (№№ 20, 38). Use of ontologies and CCOstandardized databases in school education is presented in publications (№№ 4, 19).

Textbooks and study aids. Textbooks and teaching aids intended for teaching pupils and students are also presented for participation in the competition. Publications (№№ 39, 40, 41) are the textbooks approved by the Ministry of Education and Culture for compulsory education of students in the discipline "Computer Modeling and Information Technologies" in the 4th, 5th and 6th grades of secondary school. Publications (№№ 42, 43) are teaching aids for training students in elective modules and interest clubs in school STEM centers in artificial intelligence. Publication (№ 44) is a study guide for Artificial Intelligence at Paisii Hilendarski University of Plovdiv.

The applicant has attached a list of 171 citations (45 in SCOPUS or WoS) in which I found no self-citations.

Associate Professor Todorka Glushkova, PhD, participated in a total of 10 international, national and university projects.

Summarizing, I want to emphasize that the publications present considerable originality, innovation and number of results, with a significant scientific and practical contribution. I believe that all presented scientific works are from the field of the competition. Publications in renowned publications and conference materials acquaint interested researchers with the results obtained by Associate Professor Todorka Glushkova, PhD. in the professional field "Informatics and Computer Sciences (Context Modeling)".

4. Evaluation of the candidate's personal contribution

From the documents provided for participation in the application and my personal impressions of our joint work, I can conclude that the presented results, relating to modeling in virtual-physical space applications, are the personal work of the candidate. I think that the publications, although co-authored, undoubtedly include the contribution of the applicant.

5. Critical notes

I think that in certain places the concepts of virtual-physical space (ViPS) and cyber-physical systems (CPS) cyber-physical-social systems (CPSS) are mixed up. In the specialized literature, two concepts have been introduced to characterize the integration between the physical and cyber (virtual) worlds. At ViPS, we have chosen the notion of space emphasizing (besides this integration) the use of an agent-oriented approach, for which classical multilayered architectures are inadequate.

In my opinion, the self-assessment of personal contributions should have outlined the candidate's personal contributions more clearly. It is also desirable, the applicant to focus on a more limited range of topics in order to achieve more significant results.

6. Personal impressions

I personally know Assoc. Prof. Todorka Glushkova, PhD, from our many years of joint work. I would like to point out that I am impressed by the strict logical sequence of her research interests and the conduct of her research. I am convinced that Assoc. Prof. Asya Todorka Glushkova, PhD, is a good trained and highly competent lecturer, responsible and in-depth scientist, successful participant in research projects.

CONCLUSION

The documents and materials applied by Assoc. Prof. Todorka Glushkova, PhD, meet all the requirements of the Law and the Regulations on the Development of Academic Staff in the Republic

of Bulgaria and the relevant Regulations of the University of Plovdiv "Paisii Hilendarski". The applicant has submitted a sufficient number of scientific papers, apart from those used in the defense of her PhD thesis and her application for the position of an Assoc. Professor.

The applicant demonstrates original scientific and applied contributions, which have enjoyed international recognition, and representative parts of them are summarized and published in conference proceedings and approved scientific journals. The applicant's theoretical results have practical applicability, as some of them are directly oriented to education.

The scientific and teaching qualification of Assoc. Prof. Todorka Glushkova, PhD, is undoubted. The candidate's teaching and research achievements fully comply with the specific requirements of the Faculty of Mathematics and Informatics.

After becoming acquainted with the materials and scientific works presented in the application and analyzing their significance and scientific, scientific-applied, and applied contributions, I find it reasonable to give my positive assessment and recommend to the Scientific Jury to propose to The Faculty Council of the Faculty of Mathematics and Informatics to elect Assoc. Prof. Todorka Glushkova, PhD, for the academic position of 'Professor' at the University of Plovdiv in professional direction 4.6 Informatics and Computer Science (Context modeling).

23.03.2023

Reviewer:
(Prof. Stanimir Stoyanov)