

RECENZY

in a competition for the academic position of Professor" by. professional field 5.2 Electrical Engineering, Electronics and Automation, Scientific specialty "Application of the principles and methods of cybernetics in various fields of science" (Robotic technologies with human-machine interface), announced in the State Gazette, issue 1. 26 of 21.03.2023, p. 34 with candidate Assoc. Dr. Ing. Maya Ivanova Dimitrova

Reviewer: prof. Dr. Ing. Dimcho Stoilkov Chakarski

General and biographical data

1. Ass. Dr. Maya Dimitrova was born on 12/05/1961. In 1994 she acquired a Master's Degree (Research Program) (with Honors) EQF level 7, Faculty of Psychology, University of Warwick, UK. In 2002 he obtained the educational and scientific degree of Doctor at EQF level 8 Institute of Management and Systems Research - BAS, Sofia, Bulgaria. Dissertation topic: "Adaptive human-computer interface."

The applicant has the following work experience:

- 1993-1994 - Assistant Department of Systems with Artificial or Hybrid Intelligence Central Laboratory of Control Systems at the Bulgarian Academy of Sciences (CLSU-BAS) (transformed into ISI - BAS in 1994) - Plans, conducts and publishes scientific research on analysis and design of systems with hybrid intelligence. 1994-2007 - Chief Assistant Professor Department of Hybrid Systems and Management Institute of Management and Systems Research at the Bulgarian Academy of Sciences (ISI-BAS) Plans, conducts and publishes scientific research on analysis and design of hybrid (human-machine) systems, human-computer interaction, design of Web agents, cognitive modeling and neural networks, intelligent systems for cardiac diagnostics. 2007-2010 - Associate Professor, PhD Section Hybrid Systems and Management Institute of Management and Systems Research at the Bulgarian Academy of Sciences (ISI-BAS) (transformed into ICRI BAS in 2010) • Plans, conducts and publishes scientific research on medical information systems, design of cognitive Web agents, Internet genres, semantic Web.
- 2017 – present - Associate Professor, PhD Section "Interactive Robotics and Control Systems" IRSU Institute of Robotics - BAS (IR-BAS). 2010 – 2017 – Associate Professor, PhD Department of Hybrid Systems (2010-2016), Department of Interactive Robotics and Control Systems (since 2017) Institute of Systems Engineering and Robotics - BAS (ISR-BAS) (since 2017 – IR-BAS) • Plans, conducts and publishes research on cloud health services, social sensor design, rehabilitation robotics and socially competent robotic systems. Plans, conducts and publishes research on human-robot systems, humanoid robots, rehabilitation robotics and

socially competent robotic systems. **Езикови умения** – английски и руски езици;

The decisions for announcing the competition were taken by the Department of Interactive Robotics and Control Systems at the Institute of Robotics and the Robotics Institute. The announcement of the competition is a decision of the Scientific Council of the Institute of Robotics at the Bulgarian Academy of Sciences.

The announcement of the competition is the State Gazette, no. 26 of 21.03.2023. The candidate has submitted for review a total of 32 scientific papers and a list of 6 research developments. All submitted scientific papers that are outside the dissertation and are taken into account in the final evaluation of 6 research projects are accepted for review. The distribution of scientific works is as follows: Habilitation – scientific publications (not less than 10) in issues that are referenced and indexed in world-famous databases with scientific information - 60/n for each publication – 11 pcs. Scientific publication in publications that are referenced and indexed in world-famous databases with scientific information – 1 pc. Scientific publication in non-refereed journals with scientific review or in edited collective volumes – 15 pcs.

- Published chapter of collective monograph – 5 pcs.
- The research projects have the following topics:
 - Methodologies and technologies for enhancing motor and social skills of children with developmental problems.
 - Improving the well-being of the population through innovative education based on robotics and information technology.
 - IMEEST Competence Centre "Intelligent mechatronic, eco- and energy-saving systems and technologies.
 - Methodology for determining the functional parameters of a mobile collaborative service robot assistant in healthcare.
 - Digital accessibility for people with social needs: methodology, conceptual models and innovative systems.
 - Cyber physical systems for pedagogical rehabilitation in special education.

All projects are in the field of the competition and are developed after acquiring the academic position of Associate Professor.

The minimum national requirements have been exceeded more than 2.5 times. The candidate has submitted documents with a total of 1615 points and the minimum requirements for the academic position of professor are 600.

- The number of citations of scientific works of the candidate is extremely large - 114 pcs.
- Citations in scientific journals, referenced and indexed in world-famous databases with scientific information or in monographs and collective volumes – 73 pcs.

- Citations in monographs and collective volumes with scientific review – 12 pcs.

- Citations in non-refereed journals with scientific review – 29 pcs.

The table shows compliance with the minimum requirements of the competition and the candidate's points according to the individual criteria.

City. indicators	Minimum number of points	Number of points on the candidate
A	50	50
Б	-	-
В	100	191
Г	200	205
Д	100	824
Е	150	300
Ж	120	345
Total	600	1615

2. General characteristics of the applicant's research and application activities

The overall evaluation of the submitted materials in the competition is positive. Scientific works are presented, enriching the theory and practice of engineering sciences in the field of the competition.

The assessment of the candidate's pedagogical training and activity is also positive. Ass. Maya Dimitrova is an established scientist and is known in the scientific community.

3. Basic scientific and scientifically applied contributions

SCIENTIFIC CONTRIBUTIONS

Scientific contributions refer to the groups groups: Formulating or justifying a new scientific field or problem; Creation of new approaches, classifications, methods; Obtaining confirmatory facts.

The following scientific contributions can be distinguished:

- *An iterative approach has been developed and on this basis a formal game design method for cyber physical pedagogical systems has been established (publications 4.3, 8.1 and 8.2;)*
- *A cyber physical approach has been created to design games with non-humanoid robots that support children's socialization in inclusive education (publication 4.4;)*
- *A structural approach has been set up to analyse security aspects and user acceptance of socially competent robotic systems (publications 4.6, 4.7 and 4.8);*
- *An approach has been developed to design knowledge accessibility systems in digital and physical repositories – role of the "cyberphysical teacher" and the "cyberphysical museum guide"*

(publications 4.9, 8.3, 8.4 and 4.10);

- *A cognitive approach has been established to design intelligent agents supporting access to knowledge from the point of view of the user's preferences for expert or popular representation, as well as as detailed or synthesised text (publications 4.11, 8.5, 8.6 and 8.7);*
- *A neurocognitive approach has been developed to design intelligent agents with autobiographical memory (publications 9.2 and 8.13).*

▪ **SCIENTIFIC AND APPLIED CONTRIBUTIONS**

- *Cognitive, neuro-cognitive and social aspects of human-robot systems modelling have been developed;*
- *A cognitive architecture RELA (robot-enhanced learning architecture) of the learning process has been created, which develops the models reproducing the functional specialization of the human brain (publication 4.2), with the aim of application in special education assisted by humanoid robots;*
- *An approach has been developed to analyse attitudes of teachers and parents about the inclusion of robotics and information technology (IT) subjects in primary school (publication 4.5);*
- *Modular neural networks have been set up to diagnose a human-robot interaction style (publications 7.1, 8.8 and 8.9);*
- *A concept for the design of high level synthetic sensors for improved human-robot communication has been developed (publications 9.1, 8.10, 8.11 and 8.12);*
- A concept for modelling learning processes in human computer context has been established (publications 9.3 and 9.4);
- An approach has been developed to design humanoid robots capable of fulfilling professional roles (publications 8.14 and 9.5).

APPLIED CONTRIBUTIONS

The applied contributions to the publications consist mainly in the creation of laboratory experimental stands and software products implementing algorithms developed in the publications. All stands and programs are implemented in engineering practice and in the learning process. The main applied contributions are as follows:

Development of experimental stands, measuring systems and applied methodologies for measuring kinematic, power, electrical, temperature, etc. physical quantities of robotic systems.

4. Significance of contributions to science and practice

Significant contributions are made to the scientific works of the candidate. The quantitative indicators of the criteria for occupying the academic position of professor (exceeding 2.5 times) have been met and significantly exceeded.

The candidate is recognized among the scientific community at home and abroad.

5. Critical remarks and recommendations

I have no general remarks to the candidate. All documents are precisely developed and presented. I have some formal remarks which they diminish the merits of the presented scientific works.

- Not all contributions are shaped as required. A contribution is formulated in one complex sentence.
- Not all publications finally give the contributions.
- There are also some uncorrected technical errors.

6. Personal impressions and opinion of the reviewer

My personal impressions are positive. Ass. Maya Dimitrova is an active scientist. She is also engaged in numerous activities with the issuance and participation in organizing committees for conferences and the development of international projects.

CONCLUSION

My overall assessment of the presented scientific works is completely positive. There are enough significant scientific, applied and applied contributions.

Based on the familiarization with the presented scientific works, their significance, the scientific, applied and applied contributions contained therein, I find it legitimate to propose to the honorable scientific jury Assoc. Dr. Ing. Maya Ivanova Dimitrova to take the academic position of Professor" in the professional field 5.2 Electrical Engineering, Electronics and Automation, Scientific specialty "Application of the principles and methods of cybernetics in various fields of science" (Robotic technologies with human-machine interface).

Sofia 4.07.2023

Reviewer:

(Prof. Dr. Eng. Dimcho Chakarski)