OPINION

on a competition for the academic position of " **Associated Professor** " in the field of higher education 5. Technical Sciences ; Professional field 5.1. " Mechanical Engineering ", Scientific specialty "Robots and Manipulators" (Applications of service robotics and control systems with elements of artificial intelligence), announced in "State Gazette", No. 61/ 29.07.2025, for the needs of the "RiMIS" section with a candidate **Dr. George Tsvetanov Angelov .**

Reviewer : Prof. Dr. Eng. Siya Lozanova, member of the scientific jury, according to Order No. 81/ 30.09.2025 of the Director of the Institute of Robotics-BAS

1. Introductory words

Regular documents for the competition within the legal deadline Chief Assistant Dr. George Angelov has submitted. The candidate defended in 2018 a PhD dissertation on the topic "Research, modeling and implementation of software systems for control and communication of service mobile robots in the TCP / IP network environment " for the PhD degree. Since 2019, he has headed the National Laboratory of Robotics and Artificial Intelligence at the Institute of Robotics. G. Angelov has participated in a total of 14 projects, of which 3 international, 3 national at the National Science Foundation, etc. Also indicative is his active participation in two National Centers of competence at OP NOIR. In 2008, he was awarded a gold medal at the International Technical Fair in Plovdiv for the innovation "Megapixel IP cameras for video surveillance" .

2. General review of materials

Dr. G. Angelov, in addition to the documents required for the competition, such as an application for participation, CV, PhD diploma, lists of scientific works, a list of citations of his works, a reference for his scientific and applied scientific contributions; a reference for participation in scientific and educational projects, etc., highly appreciated for the competition is his monograph in English “Modern Applied Service Robotics”, which I will specifically analyze. He has also presented 10 publications on the topic of the competition in publications that are referenced in global databases, as well as 14 works in non-refereed journals. According to the candidate's statement of compliance of his publication activity with the minimum national requirements for the academic position "Associated Professor", it is seen that he covers the required number of points according to the relevant criteria.

3. On the monography

The monograph "Modern Applied Service Robotics" is a profound work on a wide range of theory and experiment of modern service robotics, and more specifically on its educational applications. The scientific book is developed on 220 pages, and is arranged in six logically connected chapters . The material has 32 more figures, supporting the assimilation of the material and supporting its practical nature. G. Angelov examines the complex structure-defining ideas , determining service robotics. Also, the hardware and software products for creating modern robotic platforms are analytically described. It is presented profound analysis of Linux in robotics, with an emphasis on open source and the most popular distributions suitable for the applications. The architecture of Linux and The monograph contains detailed information about the ROS robot operating system and its latest version ROS 2. It includes numerous solutions such as FreeRTOS , VxWorks and RTLinux, etc., which are relevant for robotics requiring high accuracy and speed of response. The various programming languages, such as C and C ++, Python and web-based languages (JavaScript , HTML , CSS and PHP), are successively presented. The candidate also examines the main types of databases – relational, vector, etc., which are the basis of the intelligence and adaptability of robots. Descriptions of basic software libraries and tools such as OpenCV, Point Cloud Library (PCL), MoveIt, etc.

Special attention is paid to communication technologies – serial interfaces, TCP / IP networks, IoT communication standards and cloud services, motivating their important role in the construction of robotic systems. A significant contribution of the book is the information on the detailed presentation of the educational robots ANRi2, MaxiBot and BeBot, integrated into the OPERA platform (Open Platform for Education in Robotics and AI). These developments were designed, prototyped and implemented with the personal participation of Dr. G. Angelov at the National Laboratory of Robotics and Artificial Intelligence (NLRAI) at the Institute of Robotics at Bulgarian Academy of Sciences. The emphasis is on the use of innovative design, combinability, easy maintenance, etc. components when working with robots in an educational environment. The many practical applications such as programming lessons in robotics for beginners and advanced users, robot-assisted games and educational scenarios for children with specific educational needs are especially valuable. All this shows the potential of robotics for improving the effectiveness of education. Trends and new directions in service robotics are described in detail. I evaluate the book as a highly professional guide in the field of robotics. The work is a significant contribution to the field of educational service robotics and a practical guide for a wide range of scientists, PhD students, students and specialists . The contributions contained in the monograph, in their unity, are on the topic of the announced competition.

4. Significant contributions and results

I will present my assessment of the contributions and results contained in the works of Dr. G. Angelov in the competition for "Associated Professor", rearranging them from my point of view. I note, however, that I accept the contributions and results formulated by the candidate in their presented form.

4.1. Scientific contributions and results

1. A model and user interface for controlling service robots for training with an integrated web-based programming editor has been implemented, compliant with the specific requirements of the educational process, primarily in the middle school.

2. A model and software system for controlling service robots for training has been developed and verified. Formulated are algorithms for managing service robots for the purposes of the educational process. A programming framework is proposed in which students can directly train without additional software .

4.2. Scientific - applied contributions and results

3. Implemented are cyber-physical systems for educational purposes , containing software for service robots , for teachers and students in a networked environment, which is of particular importance for online learning. My rating for these results is too high, as it essentially introduces t innovative model of training – remote, interactive and based on real robots.

4. The logistics robot "Spartakus" has been designed, constructed and tested, featuring an original architecture and high adaptability depending on the type of cargo. The development has four-wheel drive (4WD), which increases energy efficiency and reliability on various surfaces. The robot is based on the ROS system. The load capacity is up to 100 kg and is too high for this class of robots . The innovation was presented at the fifth National Forum "Science for Business" – 2025 and was highly appreciated.

5. A charging system model for the production and storage of green hydrogen has been created and ecological energy solutions have been developed. systems in robotics. The device is the basis of a competitive project won by the candidate in the field of robotics. It enables robots to be environmentally friendly, autonomous and have the capacity for long periods of operation without frequent recharging.

6. Interfaces for service robots with elements of artificial intelligence and a methodology for a voice-controlled user interface have been designed, constructed and verified . A demonstration interface has been successfully implemented , using the created innovation methodology .

7. A new educational specialty in robotics has been created in secondary schools with the active participation of Dr. G. Angelov. He is among the initiators and implementers of a state program educational standard (DES), curriculum, syllabus and examination program for the first specialty in our country "Robot Programmer".

5. Final evaluation and recommendations

Dr. G. Angelov has a thorough knowledge in the field of service robotics. For me however, the role of his monographic work is of priority. I believe that the candidate's monograph is completely sufficient for the academic position of "Associated Professor". declare that I have no joint publications with the candidate, nor am I financially dependent or him. I am not aware of any problems with intellectual property in his works. I recommend tha G. Angelov formulate and submit some of the innovative solutions as applications for patents for inventions to the National Patent Office.

6. FINAL CONCLUSION

Based on the above, the contributions and results achieved, I propose to the Scientific Jury to make a positive decision on the election of Dr. George Tsvetanov Angelov as "Associated Professor", and to propose to the Scientific Council of the Institute of Robotics that he be elected to occupy the academic position of "Associated Professor" in the professional field 5.1. Mechanical Engineering (Applications of Service Robotics and Control Systems with Elements of Artificial Intelligence) in the "RiMIS" section and the NLRAI laboratory of the Institute of Robotics - BAS.

Sofia
03.11.2025

Reviewer :
Prof. Dr. Siya Lozanova