

REVIEW

on a competition for the academic position of "Associate Professor" in the section "Robotic and Mechatronic Intelligent Systems" in the professional field 5.1. Mechanical Engineering, scientific specialty "Robots and Manipulators" (Electronic Control and Power Systems in Service Robotics). The competition was announced in the "State Gazette", issue 61 of 29.07.2025.

Candidate: . Yassen Kirov Paunski, mag. , doctor .

Reviewer: Prof. Dr. Eng. Nikola Vichev Kolev, doctor of sciences, member of the jury, according to the Order of the Director of the Institute of Robotics at the Bulgarian Academy of Sciences.

1. General information and biographical data

The candidate for the competition, Dr. Yassen Kirov Paunski, was born in 1977 and in 2001 graduated with a Master's degree in Engineering Physics at the Faculty of Physics of Sofia University "Kliment Ohridski". He worked from 2005 to 2017 in private companies (Pixay, Robotik and MDM97 OOD), and then - as an assistant and chief assistant at the Institute of Robotics at the Bulgarian Academy of Sciences.

In 2018, Dr. Paunski defended a dissertation on the topic "Research, modeling and implementation of a class of microprocessor systems based on modern RISC architectures for controlling mobile service robots" and received the educational and scientific degree "doctor".

Since 2019, Dr. Paunski has been responsible for the "Electronics" department at the National Laboratory of Robotics and Artificial Intelligence at the Institute of Robotics.

He is a co-founder of the first Bulgarian Robotics Forum. His total work experience in the specialty is 24 years, having qualified in: robotics and mechatronics. He has participated in 14 innovation projects: three under the National Science Foundation, two projects funded by the EU and the rest – under ministries, BAS and other funds. All projects implemented by him are for the needs of management in practice. In 2008, he and the participants in the team received a gold medal from the International Technical Fair in Plovdiv for a series of IP cameras for video surveillance.

Dr. Paunski is the only candidate and submitted his documents for the competition within the legal deadline.

2. General description of the submitted materials

The candidate in the competition for the academic position of "associate professor" Dr. Yassen Paunski has submitted the following materials: an application to the Director of the Institute of Research; a CV; copies of the diploma for the educational and scientific degree "doctor", lists of scientific works in specialized scientific publications; separate copies of the scientific publications and the abstracts for participation in the competition; an author's reference for citations of his works; an author's reference for scientific and scientific-applied contributions; a reference for participation in scientific and educational projects; a certificate of compliance of the candidate's materials with the minimum requirements for candidates for the academic position of "associate professor", according to the Appendix from the PURZAD of the Bulgarian Academy of Sciences, declarations 1 and 2 of the Bulgarian Academy of Sciences, as well as a monograph published in 2025 ".

2. General characteristics of the candidate's research and applied scientific activities

The candidate in the competition Yassen Paunski has worked in the field of electronics and robotics throughout his working life. He has submitted for review 23 scientific works outside the publications on the dissertation and one monograph published in 2025: Paunski Ya., "Power and drive systems for mobile robots", Robotic Publishing, 2025, ISBN: 978-619-93266-1-9

The results achieved and scientific contributions of Dr. Paunski in these publications as a participant in scientific projects are the result of work in scientific research projects implemented in Institute of Robotics. The development of robotic technologies in education, medicine and biology determines their increasingly widespread application. These technologies play a key role in improving robots for educational and medical purposes, and in helping people with various mobility limitations. Improving the functionality and precision of electronic equipment is essential for increasing the efficiency of robotic systems and is an element of the engineering activity of the candidate in the competition..

The candidate has presented a list of 23 publications - registered in global databases. The results of these scientific works are in the field of medical and collaborative systems related to service activities in the field of education and healthcare. A number of articles are aimed at effective user interfaces necessary for people and for their medical care, such as voice-controlled interfaces with application in medical institutions and others. Dr. Paunsky pays serious attention to the creation of service robots for security and maintaining security in the working environment, as well as the security of service robots for medical purposes (Monograph: Publications: G8.4, G8.5).

In the management of energy systems of mobile service robots, the main focus is on efficiency, functionality, reliability and duration of operation, which parameters are pursued by the creators of this type of robots (Publications: G7.6, G8.3, G8.13, Monograph)

In a number of Dr. Paunsky's articles, tasks for the application of green hydrogen technologies in mobile service robots operating in field conditions are solved - work in remote places without mains power supply, creation of a collaborative service robot powered by a hydrogen fuel cell and in places with difficult working conditions, as well as in support of healthcare and in serving people with disabilities. (Publications: G7.1, G7.2).

In his other publications, technical means for ensuring digital accessibility for learners - their different needs - sensory support and application of various types of sensory systems and others are discussed. Also presented are technical solutions for ensuring autonomous operation of mobile service robots with battery power to help people with disabilities and when using them in the field of special educational needs. An interesting publication is related to the power supply of service robots in autonomous mode at high power supplies. A new hybrid power supply system is presented, which combines a hydrogen fuel cell with a lithium-ion battery, in which a system architecture is used to distribute the energy flow between the fuel cell and the battery. In this way, the operational capabilities of service robots in various working environments are improved (Publications: G7.1, G7.2, Monograph) .

Dr. Paunski also offers a specialized application for the created educational service robots BEBOT and MAXIBOT in the field of STEM education and social pedagogy. The created robots have a modular architecture and open access, which makes them flexible in configuration and with the ability to upgrade and adapt. This achieves a significant increase in the accuracy and quality of the data necessary for the functioning of the robots, which is

essential for the reliable operation of service robotic systems in their various applications (Publications D7.4; D7.8; D8.12).

Dr. Paunsky has co-authored collaborative service robots with the ability to help people in disadvantaged situations and to assist social workers and psychologists. He has proposed technical solutions for autonomous operation of mobile service robots. He has co-authored the implementation of innovative approaches for building intelligent robotic systems aimed at improving the quality of life, such as the AnRI model (anthropomorphic robot with intelligence) (Publications G7.4, G7.8, G8.9, G8.10).

He has co-authored a review of the most popular and economical single-board computers for educational service robots (Publication: G7.9). Other innovations in which Dr. Paunsky is a participant are related to the creation of a transport and logistics robot "Spartak" with the main mission to optimize systems in logistics by organizing reliable cargo movement (Publications: G7.3).

In the field of medical robotics, the candidate participated in the development of specialized measuring equipment - a tribometer intended for research in the field of ophthalmology (publication G7.7) and in the creation of a prototype of a medical elbow prosthesis controlled by EMG signals (publication G8.8).

Dr. Yassen Paunski has fulfilled the requirement of Art.29(1), item 3 of the Regulations by presenting a monographic work. Dr. Paunski's scientific works have been published in journals: "Compte Rendus de l' Academie Bulgare des sciences", in Journal of Biomaterials, Complex Control Systems (8 issues), scientific publications of international conferences and others.

The list of citations under the procedure includes 7 citations of the candidate's publications by scientists from the country and abroad.

The complex nature of the developments with which the candidate participated in the competition required him to work in a team and therefore his works are mainly collective (one publication is independent and in four he is the first author). The scientometric report on the candidate's activities in the competition shows that with a minimum requirement of 400 points for an associate professor in the Institute of Robotics of the Bulgarian Academy of Sciences.

Dr. Paunski has covered or exceeded the required minimum points for all positions (a total of 431.4 points).

The review of the candidate's documents shows that the procedural and legal requirements arising from the Law on the Administration of Scientific and Technological Research of the Republic of Bulgaria (Art. 29, para. 1), the Regulations thereto (Art. 60) and the Regulations on the terms and conditions for holding academic positions at the Institute of Robotics of the Bulgarian Academy of Sciences have been complied with.

4. Main scientific and applied scientific contributions

I will present the candidate's contributions to the competition in a systematic manner, which are of a scientific and applied scientific nature.

Scientific contributions:

1. A new educational specialty in robotics was created Dr. Ya. Paunski is among the main implementers of the state educational standard (SES), as well as a curriculum, syllabus and examination program for the first specialty in Bulgaria "Robot Programmer". This contribution has strategic importance, as it opens a new direction in the national educational

system and lays the foundations for the training of a new generation of specialists - engineers and programmers, capable of working with modern robotic systems. This builds a sustainable connection between education and the dynamically changing requirements of the labor market, where the need for experts in the field of artificial intelligence and robotics is constantly growing. (Publications: Curriculum and curricula "Robot programmer", exam program in the Ministry of Education and Science, Monograph)

2. A low-latency control system for mobile service robots has been created using mobile and wireless (Wi-Fi) networks A low-latency control system for mobile service robots has been developed, ensuring effective operation in remote and difficult-to-reach conditions using the latest generation mobile networks (4G and 5G) and high-speed wireless standard (Wi-Fi). A method for assessing the speed and latency of the communication channel when using the Robot Operating System (ROS) has been created (Publications: G7.3, G8.4, G8.5, G8.6);

Scientific and applied contributions:

1. An integrated system for managing and charging lithium-ion batteries in mobile service robots has been created A comprehensive solution for power management in mobile service robots based on lithium-ion batteries has been proposed. The system includes two main modules: the first is for battery management (BMS) and an intelligent charging module with a USB-C input, the architecture of which ensures safe and reliable operation of the battery in various operating modes by providing full access to the data of the power module through a standardized communication interface. The proposed system allows real-time monitoring of the robot's energy consumption and optimization of its efficiency. (Publications: G7.6, G7.8, G8.3, G8.13, Monograph).

2. Hydrogen Fuel Cell-Based Power Supply System for Service Robots Developed A hydrogen fuel cell-based power supply system for service robots has been implemented, offering an innovative solution to one of the key tasks in robotics – sustainable and reliable energy supply. The use of green hydrogen as an energy carrier allows robots to be environmentally friendly, autonomous and have a long operating time without the need for frequent recharging. These results combine robotics with modern energy technologies and open up new possibilities for their application. (Publications: G7.1, G7.2, Monograph)

Applied contributions: 1. A series of educational service robots designed for use in education and social pedagogy was designed and developed. They are built on the basis of a modular architecture with open access, which allows adaptation of the structure and control systems to specific needs. The robots have a built-in interface for program control, providing high flexibility and expandability of their functionality. (Publications: G 7.4, G7.8, G7.9, G8.10);

3. The transport and logistics robot "Spartak" was designed and implemented, distinguished by an innovative architecture and high adaptability. The robot uses a four-wheel drive (4WD) with hub motors, which increases energy efficiency and reliability when working on different surfaces. The integration of the ROS operating system provides an open environment for development and expandability of functionality. The robot is designed for transporting loads up to 100 kg, combining flexibility, autonomy and the possibility of integration into intelligent logistics systems (Publications: D 7.3);

4. A unique scientific apparatus has been developed - a tribometer for measuring extremely small friction forces (of the order of mN) between moving surfaces. The device allows for the

study of the characteristics of various contact lenses and wetting agents used in ophthalmology. With its application, experimental studies on silicone hydrogels have been conducted, and the positive results achieved are presented in (Publication D7.7).

5. A control system for an innovative elbow prosthesis has been developed, based on electromyographic (EMG) signals from the active muscles of the hand. An algorithm for signal filtration has been created, which increases the noise immunity and reliability of the functioning of the prosthesis. Additionally, a control panel has been built, allowing the adjustment of various parameters of the system. The elbow prosthesis project has been filed for patenting given the innovative results achieved in its implementation (Publications: D 8.8).

5. Significance of contributions to science and practice

The significance of the created devices and robotic systems is undeniable, because technical developments are proposed, implemented in practice in the implementation of scientific projects and contracts. The works of the candidate in the competition are prepared qualitatively, with an extensive literary justification, analytical part and conclusion.

6. Critical notes and recommendations

The author's reference for the contributions with the publications is verbose.

7. Personal impressions and opinion of the reviewer

I do not know Dr. Paunski, but from the publications and the monograph I was impressed by the in-depth knowledge of the processes that he has studied. I positively evaluate the results of the candidate's developments, included in the scientific publications and the monograph with which the candidate participates in the competition, as well as the knowledge and experience gained at the Institute of Robotics at the Bulgarian Academy of Sciences. I note that the candidate in the competition has no proven plagiarism in scientific works (Art. 24, para. 5 of the Law on the Protection of Scientific and Technological Development of the Republic of Bulgaria).

I have no joint publications with Dr. Paunski and am not a person related to him within the meaning of paragraph 1, item 5 of the Additional Provisions of the Law on the Protection of Scientific and Technological Development of the Republic of Bulgaria.

8. CONCLUSION

Based on the familiarization with the materials presented by the candidate in the competition (biography, scientific works, participation in projects and contracts, their significance, the scientific and scientific-applied contributions contained in them), I find it reasonable to propose to the Scientific Jury to make a positive decision on the election of Dr. Yassen Kirov Paunski as "Associate Professor", and to propose to the Scientific Council of the Institute of Robotics that he be elected to occupy the academic position of "Associate Professor" in professional field 5.1. Mechanical Engineering, scientific specialty "Robots and Manipulators" (Electronic Control and Power Systems in Service Robotics) in the "RiMIS" section, NLRH laboratory of the Institute of Robotics at the Bulgarian Academy of Sciences.

Sofia
25.10.2025.


Reviewer: Prof. Dr. Eng. Nikola V. Kolev, D.Sc.