

STATEMENT
on a competition for the academic position
"Professor"
in the field of higher education 5. Technical Sciences,
professional direction 5.1. Mechanical Engineering,
scientific specialty "Robots and Manipulators"
(Metrology of Mobile Robots – methods, models, evaluation and optimization of mobile collaborative service robots), announced in "State Gazette", issue 51/ 05.06.2026, p. 111 for the needs of the "RMIS" section, at the Institute of Robotics – BAS.

This statement was prepared by: **Prof. Dr. Ivan Nikolov Chavdarov**, SU, 4.6. Informatics and Computer Science and 5.1. Mechanical Engineering / Robotics, in my capacity of a member of the scientific jury for the competition according to Order No. 107/11.08.2026 of the Director of the Institute of Robotics – BAS.

A single candidate has submitted documents for participation in the announced competition: **Assoc. Prof. Dr. Eng. Nina Foteva Valchkova**, Institute of Robotics – BAS, "RIMIS" section.

I. General description of the submitted materials

1. Candidacy details

The documents submitted by the candidate for the competition comply with the requirements of the LTDASRB, the Rules for its Implementation (RILTASRB), and the Regulations on the conditions and procedure for acquiring scientific degrees and holding academic positions (RCPASDHAP) at the Institute of Robotics – BAS.

For participation in the competition, the candidate Nina Valchkova has submitted a list of a total of 25 titles, including 17 publications in Bulgarian and foreign scientific journals and scientific forums, 0 studies, 1 monograph, 0 books, 1 patent, 1 utility model, 1 rationalization certificate, 2 patent applications, 2 utility model applications, 0 textbooks and teaching aids. Other documents are also presented (an ORCID reference and certificates for participation in conferences), supporting the candidate's achievements. Documents for participation in national and international projects have been provided. The total number of points in relation to the Regulations for the Implementation of the Law on the Development of the Academic Staff in the Republic of Bulgaria is 600. The distribution of the candidate's points by indicators is as follows:

Indicator A1 – the candidate has 50 points (out of the required 50); For indicators B3 and B4 (out of the required 100), the candidate has 100 points; For indicators G5 to G11 (out of the required 200) there are 232; for indicator D12 to D15 there are 183 points (out of the required 100); For indicator E there are 234.53 points (out of the required 150), which satisfies the requirements for the position. Some inaccuracies may be noted in the information submitted by the candidate, such as: article №4 (from the list of articles for participation in the competition) has not yet been referenced in SCOPUS; Articles №1 and 3 lack an ISSN; some of the chapters in a scientific series lack an editorial team; and the same DOI and page range are listed for Articles №9 and 10, which I assume is a technical error.

Notes and comments on the documents. All submitted documents comply with the requirements and regulations of the Institute of Robotics – BAS.

2. Information on the candidate

Nina Valchkova graduated from "Angel Kanchev" University – Ruse, Specialty: Technology of Mechanical Engineering and Metal-Cutting Machines, Master of Mechanical Engineering, in 1983. In the period 1984–1989 she worked at the Scientific Research Institute of Robotics – Stara Zagora, as a Researcher III degree. From 1989–1991 she worked as a Researcher III degree at the Institute of Technical Cybernetics and Robotics – BAS, Sofia. From 1991–1994 she worked as a Researcher II degree at the Institute of Mechatronics – Bulgarian Academy of Sciences. From 1994–2010 she worked as a Researcher I degree at the Central Laboratory of Mechatronics and Instrumentation – BAS; from 2010 until now she has been working at the Institute of Robotics – BAS, initially as a senior assistant, and since 2017 as an associate professor. In 2013 she defended her PhD dissertation in Direction 5.1. "Mechanical Engineering", Scientific specialty "Robots and Manipulators", Code 02.01.52 on the topic: "Parametric identification and calibration of a manipulation system of a robot for synthesis of a model operator by studying the service coefficient" at IR–BAS.

3. General characteristics of the candidate's scientific works and achievements

The scientific-applied work and results of Nina Valchkova can be defined in four main areas:

- Design, research and control of mobile robots.
- Research related to the application of mobile robots.
- Systems for multi-sensor perception and autonomous navigation of mobile robots.
- Scientific models and technical implementation for control of the energy subsystems of autonomous mobile robots, based on hybrid energy sources and hydrogen technologies.

The works are mainly of a scientific-applied and applied nature, and the results of the candidate's activity have been presented at international scientific forums in the country and abroad. A total of 17 scientific articles have been submitted for the competition. Four of the refereed articles (out of 7 total) were published as chapters of a Springer series, and the remaining refereed articles were presented at international conferences. The remaining 10 articles are

published in non-refereed journals with scientific review. The works meet the minimum national requirements (under Art. 2b, paragraphs 2 and 3 of the LTDASRB) and accordingly the additional requirements of the Institute of Robotics at BAS for holding the academic position "Professor" in the scientific field and professional direction of the competition. The scientific works submitted by the candidate do not duplicate those from previous procedures for doctor and senior assistant. There is no proven plagiarism in the scientific works submitted for the competition, in accordance with the legally established procedure.

4. Characteristics and evaluation of the candidate's teaching activity

No documents have been submitted regarding the candidate's teaching activity.

5. Substantive analysis of the candidate's scientific and scientific-applied achievements contained in the materials for participation in the competition

The reference on the contributions provided by the candidate is too long and excessively detailed. I believe that it can be summarized, with some of the contributions being combined and repeating expressions removed. The main scientific-applied contributions can be summarized more briefly as follows:

1. Scientific research related to the design and control of mobile robots has been carried out. The contributions in this area include: a methodology for systematic comprehensive design; mathematical models; parametric synthesis and optimization; engineering criteria for the selection of mobile platforms have been proposed. The research has been validated in works [1, 2, 5, 6, 13, 15 and 17].

2. Research related to the applications of mobile robots has been carried out. The research includes medical, social and industrial applications; intelligent field medical stations; robots with high cross-country capability for operation in unstructured and high-risk environments [1, 4, 9, 10, 11, 12 and 16].

3. Systems for multi-sensor perception and autonomous navigation of mobile robots have been developed. A methodology for the selection and integration of sensor systems is proposed. Models for multi-sensor perception and information fusion in mobile robotic systems are being created. Algorithms for intelligent control of autonomous mobile collaborative robots are being developed. The results are presented in the following works [2, 3, 5, 6, 8, 10, 14 and 15].

4. Scientific models and technical implementation for control of the energy subsystems of autonomous mobile robots, based on hybrid energy sources and hydrogen technologies. A new hybrid power system has been created that combines a hydrogen fuel cell with a lithium-ion battery to power service robots. It dynamically distributes the energy flow between the fuel cell and the battery, using the battery for meeting peak energy needs and transient loads, and the fuel cell – as the main energy source for continuous operation. Engineering models for managing energy flows have been developed [1, 2, 7, 9, 12 and 15].

The articles have scientific-applied contributions related to enriching existing knowledge. The scientific-applied and applied results demonstrate the transformation of the developed models

and methodologies into engineering procedures, experimental prototypes and practical solutions. A large part of them find application of scientific achievements in practice. The candidate has described 9 applied contributions, which I accept. Of course, they too can be summarized and formulated more briefly.

Proof of the practical implementation and sustainability of the scientific research are the projects led by the candidate:

- Contract with the National Science Fund under project KP-06-N57/8-16.11.2021 – "Methodology for determining the functional parameters of a mobile collaborative service robot assistant in healthcare", under the Competition for funding fundamental scientific research – 2021.
- Contract No. PVU-44/05.12.2024, project BG-RRP-2.017-0011-C02 "Ecological collaborative robots powered by green hydrogen", under the Recovery and Resilience Mechanism, investment C2I2 "Increasing the innovation capacity of the Bulgarian Academy of Sciences in the field of green and digital technologies".

The works submitted for the competition are published in journals and at international conferences; they are 17 in total. Six of the articles are indexed in SCOPUS and have an SJR. All indexed articles are co-authored. Their distribution by scientometric indicators is as follows: Q3 (SCOPUS) – 4 articles; Q4 (SCOPUS) – 2 articles. The remaining scientific publications are in non-refereed journals with scientific review or in edited collective volumes. Three of the non-refereed articles are sole-authored, and the remaining works are co-authored with other authors. I accept that the authors' contribution is distributed equally. A list of 41 citations has been submitted, of which 12 of the citing articles are in journals refereed in SCOPUS or Web of Science; 8 – citations in monographs and collective volumes with scientific review; 21 – citations are in non-refereed journals with scientific review. These indicators confirm the value of the presented scientific works.

6. Critical notes and recommendations

I recommend that in the candidate's future works, the scientific and scientific-applied activity to be increased. The obtained results should be supported by in-depth theoretical and research that should be published in journals refereed and indexed in international databases such as Scopus and Web of Science.

7. Personal impressions of the candidate

I have known the candidate Nina Valchkova since 1996, and I have excellent impressions of her. I can also note important qualities: such as her ability to work in a team; excellent organizational skills and skills for supervising PhD students and administering projects. She possesses indisputable leadership skills; Assoc. Prof. Nina Valchkova is the head of the "Robotic and Mechatronic Intelligent Systems" section and Chairperson of the general assembly of the scientists at IR-BAS.

8. Conclusion on the candidacy

After familiarizing myself with the materials and scientific works presented in the competition and based on the analysis made of their significance and the scientific and scientific-applied contributions contained in them, **I confirm** that the scientific achievements meet the requirements of the LTDASRB, the Regulations for its Implementation and the corresponding Regulations of the Institute of Robotics – BAS for the candidate to hold the academic position "Professor" in the scientific field and professional direction of the competition. In particular, the candidate satisfies the minimum national requirements in the professional direction, and no plagiarism has been found in the scientific works submitted for the competition.

I give my positive assessment on the candidacy.

II. GENERAL CONCLUSION

Based on the above, **I recommend** to the scientific jury to propose to the competent body for the election – the Scientific Council of the Institute of Robotics – BAS – to elect **Assoc. Prof. Dr. Eng. Nina Foteva Valchkova** to hold the academic position "Professor" in professional direction 5.1. Mechanical Engineering, scientific specialty "Robots and Manipulators" (Metrology of Mobile Robots – methods, models, evaluation and optimization of mobile collaborative service robots).

Sofia, 29.09.2026

Statement prepared by: Prof. Dr. Ivan Chavdarov