OPINION

in a competition for an academic position
" Associate Professor "
in a professional direction 4.6. Informatics and computer science (Software and hardware implementation of models and algorithms for controlling the movement of manipulators),
for the needs of Sofia University "St. Kliment Ohridski "(SU),
Faculty of Mathematics and Informatics (FMI),
Announced in SG no. 61 of 02.08.2022 and on the websites of FMI and Sofia University

The review was prepared by: Prof. Dr. George Vencislavov Boiadjiev - FMI, Sofia University, 4.5. Mathematics, "Mathematics, theoretical mechanics and robotics", in my capacity as a member of the scientific jury of the competition according to Order № RD-38-562 / 28.09.2022 of the Rector of Sofia University

Only a candidate has submitted documents for participation in the announced competition:
Ch. Assistant Professor Dr. Kaloyan Marianov Yovchev
Faculty of Mathematics and Informatics, Sofia University "St. Kliment Ohridski "

I. General description of the presented materials.

1. Details of the application.

The documents submitted by the competition by the candidate comply with the requirements of ZRASRB, PPZRASRB and the Regulations on the terms and conditions for acquiring scientific degrees and holding academic positions at Sofia University "St. Kliment Ohridski " (PURPNSZADSU).

For participation in the competition the candidate **Ch. Assistant Professor Dr. Kaloyan Marianov Yovchev** presented a list of a total of 14 titles (after his procedure for chief assistant in 1919 they are 12). All publications are in refereed and indexed scientific journals and scientific forums (Scopus, Web of Science, IEEE Xplore) and have corresponding SJR, quartiles or IF.

2. Details of the candidate.

The candidate graduated from secondary education in 2009 at the Sofia Mathematics High School. Immediately after that, he was admitted to the Sofia University "St. Kliment Ohridski", Faculty of Mathematics and Informatics, where he successively received the degrees of Bachelor of Informatics, majoring in "Computer Science" (2009-2013), Master of Informatics, majoring in "Mechatronics and Robotics" (2013-2015), Ph.D. in Informatics and Computer Sciences

(Information Technologies) (2015-2018), and since October 1, 2019, he has been working as a senior assistant in the Department of Mechatronics, Robotics and Mechanics of the Faculty of Mathematics and Informatics. During the same period, the candidate also worked at the Institute of Robotics of the Bulgarian Academy of Sciences as an information technology planning specialist, and a month before that - as an assistant at the same institute. In addition, he worked as a part-time lecturer at FMI, leading courses "Functional programming" for bachelors and "Image processing" for masters (2015-2019), and also as a member of the permanent commission for natural sciences, mathematics and informatics at The National Assessment and Accreditation Agency of the Council of Ministers (2015-2018).

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

In the publications submitted for participation in the competition, the candidate is the first author in 4 of them, in 1 he is second, in 5 – third, and in the rest it ranks further back.

No evidence was presented for the individual contribution in the collective works, therefore the author of the opinion assumes that the contributions in them are equal, although the works where the candidate is the first author suggest his leading participation.

There is no legally proven plagiarism in the scientific papers submitted at the competition.

The scientific works meet the minimum national requirements (under Article 2b, Paragraphs 2 and 3 of the RSARB) and, accordingly, the additional requirements of SU "St. Kliment Ohridski" for occupying the academic position of "associate professor" in the scientific field and professional direction of the competition.

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

The candidate's teaching activity began when he was a student, leading exercises for the courses mentioned above, and as a doctoral student he also took the course "Image Processing" for the Master's program "Mechatronics and Robotics" of the Department "Mechatronics, Robotics and Mechanics" ", in which he works.

The lectures and exercises prepared by him are clear and logical. His classroom employment in all school years, during which he has been teaching so far, is more than enough and even exceeds the established norms for workload, which is evident from the submitted and approved personal reports for the respective semesters.

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

The candidate's contributions are analyzed below, which in this case are in their full range - scientific, scientific-applied and applied. The numbering of the publications related to a specific contribution is according to the numbering of the list submitted by the applicant. The scientific contributions are mainly related to a completely new method of controlling various systems that

have a limited space of their initial states (and in particular - robots and manipulators), based on iterative self-learning (Iterative Learning Control, ILC) with a limited output (Constrained Output ILC, COILC). Difficulties in applying the ordinary iterative self-learning (ILC) method to constrained nonlinear systems are addressed here in output-constrained iterative self-learning control (COILC) both in terms of state space constraints and the presence of transient error. The convergence of the method was proved in [1,2].

Scientific-applied contributions include: an iterative self-learning control method that has been experimentally verified through a purpose-built computer simulation of manipulator robots. Using computer simulation, the zero-moment method for the movement of a two-leg robot with 10 degrees of freedom was investigated and evaluated [6]. Among the scientific and applied contributions is the proposed approach for precise positioning of the gripper of a manipulation robot, which combines computer vision and control with iterative self-learning [9]. Also, the development of an intelligent remote control and communication system for service robots, which has been put into practice and its capabilities are presented [5, 7, 11]. In [4, 6], a hardware and software design for controlling anthropomorphic robots with additional degrees of freedom in performing point-to-point or trajectory movements is presented, which can be applied to both scientific and applied contributions.

Applied contributions cover the development of learning anthropomorphic mobile service robots [6, 9, 10] as well as their programming with a user interface [7]. Real experiments of remote-controlled service robots in their interaction with elderly people were carried out, where the control of the robots is based on a multi-channel system for distributing data from external devices (joystick, virtual joystick, microphone) [3, 8]. An applied contribution is the development of a MATLAB computer simulation of quadcopter control, allowing to track the deviation from the desired flight path in turbulence conditions [12].

The reflection of the candidate's results in the works of other authors is proven by the presented 52 citations, where almost all cited publications are in refereed and indexed journals in Scopus, WoS, IEEE, Elsevier, IFAC, Springer, etc. The publication "Constrained Iterative Learning Control for Robotic Manipulators", ASIAN JOURNAL OF CONTROL, which has a high impact factor - IF 2.005 (2018) and is cited 20 times, is noteworthy.

6. Critical remarks and recommendations.

I have no critical remarks regarding the peer-reviewed works of the candidate. In them the statement of the task is clearly formulated, the results are summarized as a result of in-depth analysis, proving their completeness.

The exposition is convincing, which shows the good methodological level of the respective publication, the quality and completeness of the cited literature, which testifies to the literary awareness of the author.

7. Personal impressions of the candidate.

I know the candidate from the time he was a student in the Master's program "Mechatronics, Robotics" at the Department of "Mechatronics, Robotics and Mechanics", which he graduated with honors. Later, he more than successfully defended his doctoral degree, and then appeared as a candidate for the position of chief assistant in the Department of "Mechatronics, Robotics and Mechanics", i.e. over 7 years. Since then, I have had an excellent relationship with him both professionally and personally. In his professional duties, the candidate demonstrates responsibility and competence based on deep knowledge of mathematics, robotics and programming. He has all the necessary qualities and pedagogical skills of an excellent teacher. He works very well in a team. On a personal level, I will emphasize only some of my impressions - he is always serious in necessary situations; a friend and colleague who can always be counted on.

8. Conclusion on the application.

After getting acquainted with the materials and scientific works presented in the competition and on the basis of the analysis of their significance and the scientific and scientific-applied contributions contained in them, **I confirm** that the scientific achievements meet the requirements of ZRASRB, the Regulations for its application and the respective Regulations of Sofia University "St. Kliment Ohridski "for holding the candidate for the academic position" Associate Professor "in the scientific field and professional direction of the competition.

In particular, the candidate satisfies the minimum national requirements in the professional field and no plagiarism has been established in the scientific papers submitted at the competition.

I give my **positive** assessment to the application.

II. OVERALL CONCLUSION.

Based on the above, **I recommend** the scientific jury to propose to the competent authority for the selection of the Faculty of Mathematics and Informatics at Sofia University "St. Kliment Ohridski" to elect **Ch. Assistant Professor Kaloyan Marianov Yovchev to take the academic position of "Associate Professor"** in the professional field 4.6. Informatics and computer science (Software and hardware implementation of models and algorithms for controlling the movement of manipulators).

11.11. 2022   Prepared by the opinion: Prof. Dr. George Boiadjiev

                                              (academic position, scientific degree, name, surname)