

Review

in the competition for academic position

"Associate Professor"

in the professional field 4.6 "Informatics and and computer science" (Computer modeling of CAD systems with application in mechatronics and robotics)

for the needs of Sofia University "St. Kliment Ohridski"(SU)

Faculty of Mathematics and Informatics (FMI)

announced in State Gazette issue 20 of 08.03.2024 and on the Internet page of FMI of SU

The review was prepared by: Prof. PhD Stefka Stoyanova Fidanova, IICT-BAS, professional field 4.6 "Informatics and and computer science", as a member of the Scientific Jury of the competition according to order № 38-205/ 08.05.2024 of the Rector of Sofia University.

One candidate has submitted documents for participation in the announced competition:

Assoc. Prof. PhD Ivan Nikolov Chavdarov - SU "St. Kliment Ohridski"

I. General description of the materials presented

1. Data of the candidature

The submitted documents from the applicant meet the requirements of the Law on the Development of Academic Staff in the Republic of Bulgaria (LDASRB) and The Rules on the Terms and Conditions for Acquisition of Academic Degrees and Occupation of Academic Positions at Sofia University "St. Kliment Ohridski".

The candidate Kaloyan Yovchev has submitted a list of 16 titles for the competition. 14 publications in Bulgarian and foreign scientific publications and scientific forums, 0 studios, 0 monographs, 0 books, 2 certificates and patents, 0 textbooks and teaching aids. 8 other documents (in the form of job descriptions and certificates from an employer, project manager, project sponsor or sponsor, references and reviews, awards and other relevant evidence) supporting the applicant's achievements were also presented.

Notes and comments on the documents.

As a member of the scientific jury, I have received all the documents attached to the application to the Rector of SU "St. Kliment Ohridski" of the only candidate in the competition Assoc. Prof. PhD Ivan Nikolov Chavdarov.

2. Data of the candidate

Ivan Chavdarov obtained a Master's degree in Engineering Sciences, majoring in "Lifting-Transport, Road and Construction Machinery" at the Technical University of Sofia in 1991. He obtained an educational and scientific degree Doctorate in scientific specialty 02.01.52 "Robots and Manipulators" from VAK in 2006 based on a defended dissertation on the topic "Force-metric design of manipulation systems for robots" (diploma No. 30807 dated 21.08.2006). From 2006 he worked as an assistant, and from 2008 as a chief assistant, he worked as a chief assistant in the Central Laboratory of Mechatronics - BAS. Since 2011 he has been an associate professor at the Institute of Systems Engineering - BAS, and since 2017 he has been an associate professor at the Department of "Mechatronics, Robotics and Mechanics" at the Faculty of Mathematics and Informatics of Sofia University "St. Kliment Ohridski".

3. General characteristics of the applicant's scientific work and achievements

1. Have acquired a doctorate degree in education and science;
2. Have held the academic position of "Professor" at the same or another higher education institution or scientific organization for at least two academic years;
3. Have submitted published monographs or equivalent publications in specialized scientific editions which do not repeat the ones submitted for the degree of PhD, the Doctor of Sciences and the academic position of Associate Professor;
4. Have submitted other original research papers, publications, inventions and other scientific and applied research works which are evaluated in aggregate;
5. Meet the national minimum requirements;
6. Not to have the lawful plagiarism proven in scientific works.

For indicators from group B of the requirements, Ivan Chavdarov has submitted 5 publications, 1 of them has an impact factor in an issue in Q2, 3 of them have an impact factor in issues in Q4 and one has an impact rank. The total number of points is 198 out of 100 required.

For indicators from group D, a total of 9 publications are presented, with 2 having an impact factor in Q2 and Q4 respectively, 7 having an impact rank and 2 Bulgarian patents. Total points are 356 out of 200 required.

Assoc. Prof. Ivan Chavdarov has presented 25 citations of his publications. These citations are visible in Scopus. The total number of points is 200 with a required 100 for indicator D.

Associate Professor Ivan Chavdarov was the supervisor of two PhD students who successfully

defended their degrees. He participated in 8 national ones, two of which he was the head of, and he also participated in one international project. For indicator E, the total number of points is 170 out of the required 100.

- a) the scientific works comply with the minimum national requirements (under Art. 2b, para 2 and 3 of LDASRB) and respectively with the additional requirements of Sofia University "St. Kliment Ohridski "for the academic position of Associate Professor in the scientific field and professional direction of the competition;
- b) the scientific papers submitted by the applicant do not repeat those of previous procedures for the acquisition of a scientific title and occupation of an academic position;
- c) there is no proven plagiarism in the scientific works presented at the competition.

Associate Prof. Ivan Chavdarov fulfills and even exceeds the requirements for holding the academic position of professor.

4. Characterization and evaluation of the applicant's teaching activity

Ivan Chavdarov had a total of 4,748.9 hours of study, of which 3,907.5 were classroom hours for the period 2017-2024. He was the supervisor of 5 successfully defended masters and 2 successfully defended doctoral students. He is the supervisor of two more doctoral students whose doctoral studies have not yet expired.

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

Prof. Ivan Chavdarov's contributions are in 3 main scientific directions:

- Informatics and computer modeling through CAD systems of mobile robots
- Informatics and computer modeling of stationary robots
- Applications of informatics and computer modeling in mechatronics and medicine

The main contributions in the candidate's research activity can be systematized as follows:

1. Scientific contributions

- Creation of a method to optimize the main dimensions of a walking robot in order to reduce energy losses when moving on flat terrain and overcoming higher obstacles.
- Creating new methods and models for controlling the gait of a walking robot based on the

sensory information combined with its movements.

- Establishing a new method for solving the inverse kinematics problem for open-structure robots by dividing the solutions into types.
- Creation of methods and algorithms for robot movement in an obstacle environment taking into account joint constraints and different types of solutions to the inverse kinematics problem.

2. Scientific and applied contributions

- A walking robot prototype based on a minimalist principle was designed and built.
- Experimental validation of the method for optimizing the basic dimensions of a walking robot.
- Creating algorithms and conducting experiments to control the movements of a walking robot with the aim of reducing shock loads during its movement on flat terrain and researching irregularities.
- An algorithm was created to combine the control of the motors and the reading of information from sensors located at the base of the robot.
- Application of the walking robot "Big Foot" in the education and rehabilitation of children with special needs.
- A 3D printed prototype of a redundant robot has been created.
- A program running in a CAD environment was created to solve the inverse kinematics problem for a redundant robot.
- Creation of a 3D printed humanoid robotic arm built on a modular basis.
- An algorithm for determining the main kinematic characteristics of a finger from a humanoid hand is proposed and developed.
- An approach is proposed to control the feed rate during different stages of the bone drilling process, using an orthopedic robot.

It is noteworthy that the candidate's developments have a direct application in practice.

More than half of the candidate's publications have an impact factor or impact rank or are referenced in the global referencing and indexing system. He has a total of 36 publications and 41 citations visible in the worldwide referencing and indexing system. Its Hirsch index is $h=4$, according to Scopus.

All posts are co-authored. The field in which Ivan Chavdarov is developing is multidisciplinary and it is normal to work in a team. I do not know the candidate, but considering that he is the first co-author of some of the publications, I believe that he has a significant personal contribution in obtaining the results.

6. Critical notes and recommendations

I have no critical remarks on the layout of the applicant's documents. All necessary documents are prepared accurately and precisely.

7. Personal impressions of the applicant

I do not know the candidate and I have no personal impressions of him.

8. Conclusion on the application

After learning about the materials and scientific works presented in the competition, and on the basis of the analysis of their importance and the scientific and applied contributions contained therein, I confirm that the scientific achievements meet the requirements of LDASRB. The Regulations for its implementation and the corresponding Regulations of Sofia University "St. Kliment Ohridski "for the position of the candidate in the academic position of Assoc. Professor in the scientific field and professional direction of the competition. In particular, the applicant meets the minimum national requirements in the professional field and no plagiarism has been detected in the scientific papers submitted at the competition.

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

II. Overall Conclusion

On the basis of the above, I recommend that the scientific jury propose to the competent body of choice of the Faculty of Mathematics and Informatics at Sofia University "St. Kliment Ohridski "to choose Ivan Chavdarov to take the academic position of Professor in the professional field 4.6 "Informatics and and computer science".

10.06.2024

Written by:

(Prof. Stefka Fidanova)