OPINION

by
Assoc. Prof. DSci. Miglena Nikolaeva Koleva,
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for
the competition for occupation of the academic position "Professor" in the professional field 4.5 „Mathematics", speciality „Computational mathematics (High- performance methods and algorithms), announced in the State Gazette, issue 45/ 28.05.2021 г. for the needs of „Scientific computations with laboratory on 3D digitization and microstructure analysis" section in IICT-BAS, with the only applicant
Assoc. Prof. Dr. Ivan Dimov Lirkov

1. Description of the presented materials

As a member of the Scientific Jury, determined on 13.07.2021 with order no. 166 of the Director of IICT-BAS and regarding to the decisions in the first meeting of the Scientific Jury on 3.08.2021 г. to prepare an opinion, I received the following documents:

- Curriculum vitae of the applicant;
- Copy of the diploma for Doctor of Philosophy;
- Certificate for Associate Professor;
- Certificate for professional experience;
- List of scientific publications with information about references;
- List of quotations with information about references;
- Abstracts of the scientific publications in Bulgarian and English languages;
- Copy of the scientific publications for the competition;
- Information about the implementation of the minimum requirements of IICT-BAS;
- Information about the scientific and applied-scientific contributions;
- Declarations for the participation of the candidate in scientific projects;
- Declaration of originality of results and lack of plagiarism.

The submitted documents are in accordance with Law for Development of Academic Staff in Republic of Bulgaria (LDASRB), the Regulations for the Application of LDASRB and the rules and conditions and specific requirements of IICT-BAS for the competition for occupation of the academic position "Professor".

2. Brief biographic information about the candidate

Assoc. Professor Ivan Lirkov was born in 1963. In 1988 he graduated from the Faculty of Mathematics and Informatics at Sofia University "St. Kliment Ohridski "with a degree in mathematics. He received an educational and scientific degree "Doctor" in 1991 at the "Coordination Center for Informatics and Computer Science" (CCICS), BAS. From

1987 to 1988 he worked at CCICS-BAS, then for a short time he was a teacher at the High School of Natural Sciences and Mathematics "Academician Nikola Obreshkov" and from 1994 until now he worked successively at CCICS-BAS, Central Laboratory for Parallel Processing (CLPP) -BAS, Institute for Parallel Processing (IPP) -BAS, IICT-BAS. Since 2003 he has been an associate professor.

3. General characteristics of the presented materials

Assoc. Prof. Dr. Ivan Lirkov has presented 44 publications for the competition for academic position "professor" - 37 are in international journals and series, 7 are in refereed proceedings at international conferences. Papers [6, 30, 34, 36, 44] from the list of publications submitted for the competition have an impact factor, with JCR quartiles of Web of Science as follows: [6, 34, 36] - Q1, [44] - Q3 и [30] - Q4. With SJR rank are 28 papers and 11 are referred in Scopus, Web of Science or Zentralblat. A list of 64 citations of publications visible in Scopus and/or Web of Science is presented.

The candidate has participated in 6 national and 10 international research projects as a member of the research team. He has led 4 projects under national programs and has been the leader of a Bulgarian team of 2 international research projects.

The following table summarizes the information submitted by the applicant for the implementation of the specific minimum requirements of IICT-BAS.

Indicators	Requirements of IICT for minimum credits	Credits
A	50	50
B	100	162
G	260	734
D	140	384
E	150	498,9

In group indicators B and G are presented publications, and in group E - participation as a member of the project team or leader of national and international research projects.

The minimum number of points, according to the specific requirements of IICT-BAS are fulfilled and in three of the indicators (G, D, E) they are almost three times more.

4. General characteristic of the scientific and applied-scientific contribution of the applicant

In the presented abstracts of the scientific publications, the obtained results are presented in four thematically separated groups:

1. Methods for approximate solution of 2D and 3D boundary value problems;
2. Methods and algorithms for solving optimization problems;
3. Parallel algorithms and applications on distributed computing systems;
4. New information technologies

The first group includes articles [1-7], [9], [13], [18], [22], [31] and [41] from the list of publications of Assoc. Prof. Dr. I. Lirkov for the competition.

In the presented publications are developed parallel algorithm for numerical solution of: two-dimensional and three-dimensional Stokes equation for incompressible fluid; systems partial differential equations of second order of convection-diffusion type, where for the discretization Courant-elements are used; systems with ill-conditioned sparse matrices; systems resulting from the numerical homogenization of human bone microstructures;

Computer models have been developed: for the simulation of thermal and electrical processes, involved in a radiofrequency ablation procedure for treatment of hepatic tumors utilizing AC current to destroy unwanted tissues by heating; of the processes during operation of a high-frequency interfering portable device for non-contact tick removal.

In the second group the following publications are presented [11], [16], [36], [40], [44] and [43]. Various optimization methods are applied, such as Monte Carlo methods, evolutionary algorithm, ant colony optimization algorithm for 3D hydrophobic-polar protein folding problem. An experimental performance study of a parallel implementation of the Poissonian image restoration algorithm is presented. Hybrid parallelization based on MPI and OpenMP standards is investigated. An analysis of the parallel implementation of the image recovery algorithm is performed, using Anscombe transformed constrained optimization problems.

The third group covers the largest number of articles, namely [8], [10], [12], [14], [15], [17], [19], [20], [21], [25] , [26-30], [32-34] and [42]. Undoubtedly, the results obtained are numerous and significant. In the reference for original scientific and scientific-applied contributions, the candidate has determined as novelty - the analysis of an algorithm for parallel realization of three-dimensional discrete transformation on a computer system in which the communications between the computing nodes are performed in a three-dimensional toroidal network.

The last group includes publications [23], [24], [35], [37-39]. Results of using raw sensor data and deep learning techniques for a transportation mode detection, in real-time, directly on a phone are presented. A system for managing access control in a port terminal, based on application of semantic technologies is proposed. A comparison has been made between different approaches to facilitate a collaborative recommender system for travelers who would like to visit "tourist sites".

Various applied mathematical problems are considered in the papers of Assoc. Prof. I. Lirkov In the numerical solution high-dimensional PDE and especially systems of evolution PDE, it is important to construct not only an adequate approximation, but also efficient algorithms for the realization of the corresponding discrete problem. The candidate is constructed discretizations based on the finite difference method and the finite element method, he also developed and implemented parallel algorithms, made a comparative analysis, studied the acceleration and their efficiency, made improvements in order to achieve maximum parallel efficiency in the implementation of the algorithms. He applied the developed methods and algorithms for solving real problems.

The research activity of Assoc. Prof. Dr. I. Lirkov fully corresponds to the scientific specialty "Computational Mathematics". The candidate has obtained new scientific and applied-scientific results.

5. Reflection of the candidate's works in the works of other scientists

The list provided by Assoc. Prof. Dr. I. Lirkov contains 64 citations. All citations are in the works of foreign authors, published in authoritative journals and periodicals.

6. Evaluation of the personal contribution of the candidate

Assoc. Prof. Dr. I. Lirkov participates in the competition with two self-authored and 42 collective publications. I have no doubt about his equal personal contribution in each of them.

7. Conclusion

On the based on the submitted documents for the competition, the contributions and the significance of the scientific works, I believe that Assoc. Prof. Dr. I. Lirkov fully satisfies the indicators for holding the academic position "professor", according to the criteria of LDASRB, the Regulations for the Application of LDASRB, BAS and the specific requirements of IICT-BAS.

My assessment is positive. I strongly recommend the scientific jury to propose to the Scientific Council of IICT-BAS to elect Assoc. Prof. Dr. I. Lirkov to hold the academic position "professor" in the field of higher education 4. "Natural Sciences, Mathematics and Informatics", professional field 4.5 " Mathematics ", specialty "Computational Mathematics " for the needs of section "Scientific computations with laboratory on 3D digitization and microstructure analysis" of IICT-BAS.

23.08.2021

Author of the opinion: ....

(Assoc. Prof. DSci Miglena Koleva)