Opinion

On materials of Assoc. Prof. Ivan Dimov Lirkov, submitted for competition

To take the academic position "professor" at IICT-BAS

In professional field 4.5. Mathematics,

Scientific subject: Computational Mathematics (High-performance methods and algorithms)

of juri member Natalia Kolkovska,

Prof. Dr. at the Institute of Mathematics and Informatics of BAS,

Nominated by the order 166/13.07.2021 of the Director of IICT-BAS

1. Brief biographical information

Assoc. Prof. Ivan Lirkov graduated from the Faculty of Mathematics and Informatics at Sofia University 'St. Kliment Ochridski' in 1988 with Master's degree in 'Mathematics'. He received his doctoral degree (PhD) in 1997 and became Assoc. Prof. in 2002 at the Central Laboratory for Parallel Processing, today the Institute for information and communication technologies.

2. General description of the materials presented

The materials presented by Assoc. Prof. Ivan Lirkov are in accordance with the Development of Academic Staff in the Republic of Bulgaria Act (DASRBA), the Regulation of the Application of DASRBA, as well as with the specific requirements of IICT and BAS. They include: European CV; diploma for doctoral degree (PhD); statement of occupied academic position at IICT; list of scientific papers submitted for participation in the competition; list of citations; summaries of scientific publications in Bulgarian and English; reference for the fulfillment of the minimum requirements of IICT; reference of original scientific and applied scientific contributions; declaration for nonexistence of plagiarism; diploma for Senior Researcher II; certificates from 8 project leaders of the scientific Bulgarian and international research projects where the applicant took part in; electronic copies of 44 papers submitted for participation in the competition. I have no critical remarks on the documents of Assoc. Prof. I. Lirkov. They are very carefully prepared.

3. General characterization of the research and applied activities

The applicant presents for this competition forty four (44) publications from the period 2007-2021. All papers are referred and indexed in the scientific databases WoS or Scopus. Five of the papers are in journals with impact factor (Computers & Mathematics with Applications (quartile Q1), Information Technology and Control (quartile Q4), Journal of Computational and Applied Mathematics (quartile Q1), Concurrency and Computation: Practice and Experience (quartile Q3)). Twenty-five papers are in journals or book series with impact rank (SJR).

Among all papers of the applicant presented for this competition, two papers are with one author; four papers are with two authors; sixteen (16) papers are with three or four authors and the authors in twenty-two (22) papers are more than four. I assume that all authors contribute equally to the results in the papers.

Assoc. Prof. I. Lirkov took part in ten national projects and ten international scientific projects. Between them are Copernicus, BIS-21, BIS-21++, SEE-GRID, SEEGRID-2, Operational programme innovation and technologies, FP7 Capacity Programme, Science and Education for Smart Growth Operational Program. Moreover, the applicant is scientific leader of four national projects and two international projects with System Research Institute of Polish Academy of Sciences.

The contributions of Assoc. Prof. I. Lirkov exceed several times the minimal requirements of IICT-BAS, as well as the minimal NACID requirements. For the IICT group of indicators B, Г, D and E the minimal requirements of IICT are 100, 260, 140 and 150 respectively, while the presented materials count for 162, 572, 384 and 498.9 points respectively.

I have not found any scientific plagiarism in the papers of the applicant.

4. Analysis of the scientific and applied contributions

The scientific publications of Assoc. Prof. I. Lirkov are in the field of the announced competition. The first group of results includes several numerical methods for solution of 2D and 3D boundary problems, e.g. Stokes equations, Maxwell equations, convection-diffusion systems, elasticity problems and heat transfer problems. The second group of the research of Assoc. Prof. I. Lirkov is devoted to the development of methods and algorithms for some optimization problems. Between them are the protein folding problem, which is fundamental for molecular biology, and Poissonian image restoration as a part of the computer tomography. Assoc. Prof. I. Lirkov with co-authors model also thermal and electrical processes, involved in a radiofrequency ablation procedure. Many parallel algorithms and applications on distributed computing systems are presented in the third group of results.

The considered mathematical problems are discretized by finite difference methods or conforming/nonconforming finite element methods. Assoc. Prof. I. Lirkov applies different techniques in his investigations, e.g. splitting methods for solving multidimensional problems, different preconditioners for the iterative solving of large linear algebraic systems (e.g. preconditioned conjugate gradient method, modified incomplete Cholesky factorization, circulant block-factorization) and Helmholtz numerical homogenization for strongly heterogeneous micro-structures.

Parallel algorithms for MPI and Open MPI standards, multiprocessor workstation environment, Grid and Cloud and supercomputers are a big part of the research of Assoc. Prof. I. Lirkov. All methods are tested on parallel computer systems and their performance is compared with some existing in the computer libraries methods. The efficiency of the developed methods and algorithms is demonstrated on many numerical tests.

Assoc. Prof. I. Lirkov proposes and implements high-performance methods and algorithms for scientific calculations in different application areas. His research contributes both to the theory of parallel numerical methods, as well as to the computer modeling of physical and biological processes on several computer architectures.

5. Impact of the applicant's scientific publications

The applicant provides sixty-four (64) citations in referred and indexed publications in WoS or Scopus. Let us mention that one paper with co-authors dated 1994 is cited eighteen (18) times, seventeen (17) of them in highly ranked international journals with impact factor. Paper [11] included in applicant's publications for this competition is cited fifteen (15) times. All citations are in papers of foreign authors. This is an indication for the high scientific level of the published results.

Conclusion

Based on the complex evaluation of the applicant's achievements I give a positive assessment of the scientific and applied contributions of Assoc. Prof. Dr. I. Lirkov.

I strongly recommend Assoc. Prof. Dr. Ivan Dimov Lirkov to be elected to the academic position 'Professor' at IICT-BAS in professional field 4.5. Mathematics, scientific subject 'Computational Mathematics' (High-performance methods and algorithms).

August 31th, 2021   Signature:

Sofia   Prof. Dr. Natalia Kolkovska