

REVIEW

in competition for the academic position of "Associate Professor" in the professional field 5.3. Communication and Computer Technique, scientific specialty "Communication Networks and Systems" for the needs of the section "Distributed Information and Control Systems", at the Institute of Information and Communication Technologies - Bulgarian Academy of Sciences, announced in SG, issue 45 of 28.05.2021. with candidate Chief Assistant Dr. Eng. Vladimir Nikolayev Ivanov.

Reviewer Prof. Dr. Eng. Kosta Boshnakov, University of Chemical Technology and Metallurgy, Sofia

1. Biographical data about the candidate

Chief Assistant Dr. Eng. Vladimir Nikolayev Ivanov graduated with a bachelor's degree in 2006 and a master's degree in 2008 at the University of Chemical Technology and Metallurgy, Sofia. In 2015 defended his doctoral dissertation at the Institute of Information and Communication Technologies (IICT) - BAS on "Development of software for modeling multifunctional electronic circuits." From 2008 to 2015 works as a programmer, and since 2015 until now as a Chief Assistant at IICT - BAS.

2. General description of the submitted materials

The following documents and materials have been submitted for participation in the competition: (0) application for admission, (1) curriculum vitae according to European standard, (2) copy of diploma for educational and scientific degree "doctor", (3) in connection with medical certificate - reference that the applicant is an employee of IICT-BAS, (4) in connection with a criminal record certificate - reference that the applicant is an employee of IICT-BAS, (5) certificate of internship in the specialty, (6) list of scientific publications of Chief Assistant Dr. Vladimir Ivanov, (7) list of citations, (8) abstracts of scientific publications - in Bulgarian and English, (9) copies of scientific publications, (10) reference for fulfillment of the minimum requirements of IICT for Associate Professor, (11) reference for the original scientific and scientific-applied contributions, (12) declaration that there is no legally proven plagiarism in the scientific works of the candidate, (13) electronic media according to the requirements of IICT-BAS, appendices, (14) appendix, reference on indicators group D, (15) appendix, reference for indicators group E, (16) copy of the State Gazette, issue 45 of 28.05.2021.

The candidate has submitted for review a total of: 23 scientific papers and 1 monograph.

3. Satisfaction of the minimum requirements, according to the Regulations

Table 1 presents the minimum requirements for taking the academic position of "Associate Professor" according to the Regulations for the implementation of ZRASRB, and the achievements of Chief Assistant Dr. Eng. Vladimir Ivanov.

From the data presented in Table 1 it can be seen that the candidate for the academic position of "Associate Professor" in the group of indicators A and B fulfills the minimum required points, and in indicators G, D and E significantly exceeds them.

Table 1

Group of indicators	Content	Minimum required points	Achieved points by Chief Assistant Dr. Eng. Vladimir Ivanov
A	Dissertation for the award of educational and scientific degree "Doctor"	50	50
B (B3)	Habilitation work - monograph	100	100
G	G7. Scientific publications in publications that are referenced and indexed in world-famous databases of scientific information		173,33
	G8. Scientific publications in non-peer-reviewed journals with scientific reviewing or in edited collective volumes		250
	Sum of indicators from G5-G11	200	423,33
D	D12. Citation in scientific journals, referenced and indexed in world-famous databases of scientific information, or in monographs and collective volumes		110
	D14. Citation or review in non-peer-reviewed journals with scientific reviewing		10
	Sum of indicators from D12 to D15	60	120
E	E18. Participation in a national scientific or educational project		40
	E19. Participation in an international scientific or educational project		20
	E20. Management of a national scientific or educational project		40
	E22. Raised funds for projects managed by the applicant		5
	Sum of indicators from E16 to the end	20	105
	Total number of points		798,33

3. General characteristics of the research and scientific-applied activity of the candidate

Attached to the documents for participation in the competition is a monographic work: Ivanov, V., Control of Transport Systems and Processes, Avangard Prima, Sofia, 2021. The monographic work has a volume of 209 pages. The text is structured in the following chapters: Types of transport and criteria for control, Analysis of transport traffic in urban conditions, Modern reprogrammable devices, Practical application of FPGA (Field Programmable Gate Array) devices in transport. The monograph is accompanied by a list of 199 literary sources, of which [25,46,80,84,111] are co-authored by Chief Assistant VI. Ivanov. The monographic work was reviewed by Prof. Todor Stoilov and Prof. Ivan Garvanov.

Seven publications in refereed and indexed editions are attached. They address the following issues: a device based on a PicoBlaze microprocessor built into the Spartan6 FPGA for traffic control by traffic lights; the design and implementation of the moving average procedure in the structure of the FPGA are considered; hierarchical, two-level optimization is applied to estimate the duration of the traffic light cycle at the intersection and the duration of the green lights; the possibility of using digital DSP48xx signal processing devices built into Xilinx FPGA devices to build PID controllers was explored; an algorithm for processing video information obtained from traffic monitoring is proposed, in order to automatically detect moving objects

and evaluate some of their parameters; a selected road network is investigated, which is modeled using the software product AIMSUN, optimized in TRANSYT and in the AIMSUN environment the results are validated; the modification of the moving average "jumping" crawling window and the possibilities for implementation in FPGA have been studied.

In addition to the listed publications, sixteen publications in non-refereed editions with scientific reviewing were submitted for participation in the competition, in which the following problems were considered: reprogrammable devices of the CPLD type and the possibilities for creating control devices with them; the development of a device for generating a clock frequency using an FPGA is presented; a system for color lighting effects based on a built-in PicoBlaze processor has been developed; on the basis of video surveillance information on the current state of the monitored traffic is extracted and the management of traffic lights is considered on the basis of the incoming information; a methodology for automatic generation of embedded PicoBlaze systems has been developed and a program implementing the methodology has been created; a block diagram of a traffic light control device based on a built-in PicoBlaze processor is presented; an analysis of the methods used to determine the basic parameters of road traffic based on different types of sensor elements is made and a device is given that gives an integrated estimate of the number of cars in front of a particular intersection; on the basis of video surveillance the density of the automobile traffic is estimated; a comparative analysis of the means for monitoring the road traffic has been made; a comparison is made between development environments for working with FPGA devices; an analysis of the methods and means for measuring the characteristics of the transport traffic has been made; an algorithm with an averaging "jumping" window for processing pulsar signals in a block for processing digital signals has been implemented; a device realizing the operation moving average with the resources of FPGA based DSP blocks is designed and a simulation of the device is presented; a procedure for optimizing the size of the "jumping" window in order to increase the signal-to-noise ratio is proposed; an overview of the modern families of FPGA devices of the company Xilinx is made and examples of the application for solving practical problems are presented; the goals, tasks and problems of space transport in terms of pollution of the Earth's atmosphere and outer space, as well as issues related to navigation are analyzed.

The scientific works of Chief Assistant Vladimir Ivanov presented for participation in the competition are cited eleven times in scientific journals, referenced and indexed in world-famous databases with scientific information and five - in non-refereed journals with scientific reviewing.

Chief Assistant Vladimir Ivanov has participated in the development of four national and one international research project and has led two national research projects. Under the projects managed by him, BGN 29 000 were attracted.

4. Main scientific, scientific-applied and applied contributions

Based on the analysis of the monograph and scientific works submitted for participation in the competition by Chief Assistant Vladimir Ivanov, I believe that they contain the following more important scientific-applied and applied contributions:

1. A mathematical model and procedure for hierarchical, two-level optimization for estimating the duration of the traffic light cycle at the intersection and the duration of the green lights have been developed.
2. For a selected road network, including four intersections, a mathematical model has been developed, optimization of the duration of the green signal and the offsets of the signals for the traffic lights has been made.
3. An algorithm has been developed for detecting moving objects and estimating some of their parameters based on video surveillance of traffic.
4. The parameters are studied and a procedure for optimizing the size of the "jumping" window is proposed in order to increase the signal-to-noise ratio.
5. Adaptive management of traffic lights is proposed on the basis of online incoming information about the current state of traffic.
6. The possibilities of the modern reprogrammable devices (FPGA) and the development environments for work with them are analyzed.
7. A hardware development environment, a methodology for automatic generation of embedded PicoBlaze systems have been developed and a program implementing the methodology has been created.
8. Technical means have been designed and developed through FPGA devices, which realize a moving average, PID controller, pulsar signal processing, system for color light effects, traffic management, etc.

5. Significance of the contributions to science and practice

The overall research work of Chief Assistant Vladimir Ivanov is predominantly scientific-applied. Developments related to car traffic management and reprogrammable instruments (FPGA) have multiplier potential. The number of observed citations is also an indicator of the significance of the developments made.

6. Critical remarks and recommendations

I have no significant remarks other than that I noticed an error in group of indicators D in the table submitted by the applicant for the implementation of the minimum requirements.

7. Personal impressions and opinion of the reviewer

I have known Chief Assistant Vladimir Ivanov since his student years. I was a reviewer of his dissertation. I believe that he is a promising young scientist with a very good basis for scientific and applied research.

CONCLUSION

Chief Assistant Vladimir Ivanov has submitted a peer-reviewed and published monograph, seven publications in refereed and indexed editions and sixteen publications in non-refereed editions with scientific reviewing. The publications have eleven citations in scientific journals, referenced and indexed in world-famous databases with scientific information and five - in non-refereed journals with scientific reviewing. The candidate has taken part in the development of four national and one international research project and has managed two national research projects and the last two have attracted BGN 29,000. He has a sufficient number of scientific-applied and applied contributions, he has performed, and in some groups

of indicators he has exceeded the minimum requirements for occupying the academic position "Associate Professor".

All requirements of ZRASRB, the Regulations for its implementation, the Regulations for the terms and conditions for acquiring scientific degrees and holding academic positions at BAS, as well as the Regulations for the specific conditions for acquiring scientific degrees and acquisition academic positions in IICT are satisfied. My assessment of the overall activity of the candidate is positive.

Everything set out in the review gives me reason to suggest Chief Assistant Dr. Eng. Vladimir Nikolayev Ivanov to take the academic position "Associate Professor" in the professional field 5.3. Communication and Computer Technique, scientific specialty "Communication Networks and Systems" for the needs of the section "Distributed Information and Control Systems", at the Institute of Information and Communication Technologies - Bulgarian Academy of Sciences.

Date: 9.09.2021



/ Prof. Dr. Eng. Kosta Boshnakov /