

OPINION

For procedure for academic position „Associate Professor”, State Newspaper, No 85/29.10.2019.

Candidate: Chief assistant PhD **Nikolay Ivanov Stoimenov**

By Professor Krasimira Stoilova, DSc – Institute of Information and Communication Technologies – Bulgarian Academy of Sciences (IICT-BAS)

I am nominated as a member of the Scientific Jury according to Order № 347 from 30.12.2019 by the Director of IICT-BAS, on the base of solution of the Scientific Council of IICT-BAS about procedure for the academic position „Associate Professor” in the scientific domain 5.2 „Electrical Engineering, Electronics and Automation”, professional field „Automated Systems for Information Processing and Control” for the needs of „Embedded Intelligent Technologies” department of IICT-BAS. Only one candidate – Chief assistant PhD Nikolay Ivanov Stoimenov has submitted documents.

1. General description of the presented documents

Chief assistant N. Stoimenov has PhD Degree since 2016.

According to the official Document from 3.12.2019 about total work experience, which is 5 years and 2 months, he works as a chief assistant from 2 years and 8 months.

2. General characteristic of the scientific and applied activity

All presented publications for the procedure are 38. They are different from those submitted to PhD. From them 4 are individual [12, 15, 17, 26], and in 12 of them he is a first co-author.

The scientific interests of N. Stoimenov are in a wide range – approaches for creating innovative methods and means for digitizing cultural and historical heritage, health and quality of life, new materials and technologies, process automation.

3. Analysis of scientific and applied contributions

Contribution in the area of innovative technologies in the milling processes

- The Mining is associated with an enrichment process for the processing of minerals, where mills are used. Studies have been made, and very good results have been done related to increasing productivity, reliability, reducing energy costs, researching innovative grinding media and grinding bodies and increasing their wear resistance, reducing repair time and other factors affecting grinding processes [G2], [G10], [G13-17]. The analysis made in [G2] of different types of metals used for the inner lining of mills or mill lifts in autogenous, semi-autogenous and ball mills, shows that the type of material is determined by the type of mill; the most suitable lining metals for the three types of mills have been identified.
- A significant scientific contribution is research for the robotization of high-temperature processes for the production of milling materials using an innovative triangular lifter shape [B3]. This leads to a reduction in the energy used, which is an essential characteristic of the grinding processes. The controller of the high-temperature furnace system was investigated. An innovative construction of a robotic two-stage arm with a two-way open kinematic chain mounted on a rotating stand is proposed. Robotizing the high-temperature process used to produce materials and alloys for grinding media results in cheaper tools and increases personnel safety.

- A method for testing of grinding media by scanning and creating 3D models is proposed [B4]. Models have been synthesized by which the wear of the mills can be determined. Better results are predicted if using higher-resolution 3D sensors.
- Factors influencing the productivity and efficiency of grinding of the material in a drum mill have been identified [B2]. As a result of the research, the factors that influence to the load of the mill were determined: grinding media and grinding material. Ways for increasing the productivity and efficiency of grinding in three types of mills - drum, bar and ball mill are shown.
- Innovative grinding media are analysed, and are compared with existing grinding media [B5]. As a result of the research, it has been found that the innovative lifter increases the speed of grinding particles, which leads to a reduction in energy costs and increasing the production efficiency [G2], [G10], [G13-G18].
- The wear resistance of grinding processes in mills has been investigated and an innovative form of grinding media has been proposed [G15], [G16], [G17]. As a result of the comparisons made between existing and new solutions, recommendations have been made to improve production productivity, reliability, reduce electricity costs, and reduce repair time and other factors affecting grinding processes. It is concluded that lifters are made of stronger materials than grinding bodies for greater wear resistance.
- Stronger materials and the possibility of their use in the mining industry have been analysed [G4]. The technologies presented in [G10], [G23] and [G24] contribute to the production of materials, parts and alloys with high hardness and wear resistance. Innovative technology has been developed for the high-temperature production of nano-elements materials and alloys, which increases their strength and resistance, which is useful for special tools and hardened materials [G24].

Contributions in the field of non-destructive analysis and control

- 3D computerized industrial tomography was used to analyse the internal structure of different objects - pave used in construction, medicine, and foods. 3D computed tomography analysis of newly created yellow paving prototypes reveals no defects and demonstrates the homogeneous nature of the material structure, unlike existing ones, in which voids cavities and cracks [B8]. The influence of different modes of laser ablation on the extracted teeth was determined [B10], [G8], [G11]. Migration into food simulants has been investigated and the carbon nanoparticle release determined by laser diffraction analysis [B9].
- Methods for testing dental specimens [G8], [G11], contactless temperature testing of transformers [G7], electromagnetic micro-drive motion testing and motion control systems [G19], [G21] are proposed.
- Experimentally is determined the velocity of the movement of the moving part of electromagnet for Braille Display by using a high-speed camera [G20]. The results are compared to previous experiments and results, obtained from experimental studies from a sensor for acceleration and modelling with finite element software.
- Results are presented for manufacturing parts by means of a controlled impact for the purpose of obtaining a non-rebound impact [G21]. The results are important for increasing the durability of the elements studied and for obtaining complex elements (forgings) with a reduced number of transitions.

Contributions in discrete production and automation of processes

- A theoretical analysis has been made, the need for packaging has been considered, a marketing study has been made, on the basis of which a technical and economic assignment for an automatic packaging line of synchronous type with certain productivity [G19], [G25] is formed. The possibilities for automation of packaging processes are analysed and conclusions are made for increasing the productivity and quality of automatic machines and lines [G25], [G26].
- Methods have been developed for 3D digitization and 3D modelling of cultural and historical heritage sites for using from disadvantaged people (blind or visually impaired). These methods can be attributed to hybrid solutions using tactile plates that consist of tangible segments generated by non-trivial image processing methods annotated with Braille symbols [B7].

Contributions for automation of assembly operations

- Requirements (including medical requirements) for the functional purpose, performance and reliability of the automatic assembly line for assembling mattress frames were analysed to improve their quality production [G28].
- Studies have been done to design, optimize and develop a linear actuator based on magnet and human-computer interface [B6]. A Braille screen with two main advantages - a simplified design and a low cost for the use of visual arts by visually impaired people are shown. An approach for segmental dynamic presentation of paintings using Pablo Picasso's Guernica painting is proposed.
- New technologies and models for access to visually impaired people to graphic information through the Braille Display and Braille Terminals [G3], [G6], [G9], [G29] have been proposed. Analysed software for digitization and modelling of cultural and historical heritage sites [G5].
- The developed methods for 3D digitization and 3D modelling of objects of cultural and historical heritage have been applied and implemented by 3D printing in two places in Italy. Seven tactile tiles have been developed with scenes from the Battle of Pavia 1525 exhibited at the EXPO 2015 in Milan [G3], [G29]. A tactile tile for blind people, developed using the methods in [B1] and [B7], is placed in the Brera Gallery, Milan, next to the original masterpiece "Jesus Christ and the Samaritan at the Well" by Anibal Karachi (1555).

N. Stoimenov is recognized as a scientist with significant results in the fields:

- Automation of discrete production with applications in packaging lines;
- Innovative technologies in the process of grinding with applications in cement production, mining industry, in heated power plants working on solid fuel, metallurgy, etc.;
- Control systems;
- Material analysis;
- Creation of innovative approaches and technologies for digitization of cultural and historical heritage.

He has received 6 awards, honours, and diplomas for scientific and applied achievements, a young inventor and more.

4. Citations

The noticed citations are 16 from 6 publications.

5. Implementation of the minimal requirements and other activities

Chief assistant N. Stoimenov fulfils and exceeds by almost all indicators the minimum national requirements for the academic position „Associate Professor”. Requirements/Implementation on the different indicators are: Indicator A - 50/50; B - 100/143; G – 220/227.5; D – 60/72; E – 20/52.

Chief assistant N. Stoimenov is head of the project „Investigation and optimization of grinding processes for grinding by using innovative shapes of grinding bodies and environments“, 2016-2017, funded by a program to support young scientists at BAS 2016. He is a member of the team at the project: „3D Digitalization of Objects from National Cultural-Historical Heritage“, 2017-2020, funded by National Science Fund.

In the Patent Office of the Republic of Bulgaria is published a patent application with registration number 112368 / 25.08.2016 for the invention "Thermometer" in which N. Stoimenov is a co-author.

Remark – technical inaccuracy in the design of the documents is noticed - there is no correspondence in the contribution reference with the numbered publications in section G.

Conclusion All requirements of the Academic Staff Development Act, the Regulations for its implementation and the Regulations on the specific conditions for acquiring academic degrees and for occupying academic posts in the IICT are fulfilled. On the basis of the presented materials, scientific and scientific-applied contributions, as well as the complex evaluation of the other indicators of the competition, I give my **positive opinion** and **strongly recommend** to the Honourable Scientific Jury to propose to the Scientific Council of IICT-BAS to award Chief Assistant PhD **N. Stoimenov** for the academic position “**Associate Professor**” for the needs of department “Embedded Intelligent Technologies” at IICT-BAS, professional field 5.2 “Electrical Engineering, Electronics and Automation”, scientific specialty “Automated Systems for Information Processing and Control”.

14.01.2020

Member of Scientific Jury:



Professor/DSc. K. Stoilova