OPINION

by Assoc. Prof. Borislav Hristov Milenkov, PhD, Eng.

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on a dissertation submitted for the award of the educational and scientific degree "Doctor" (PhD)
Field of Higher Education: 5 – Technical Sciences
Professional Field: 5.3 "Communication and Computer Engineering", Doctoral Program: "Automation of Areas of the Intangible Sphere (Medicine, Education, Science, Administrative Activities, etc.)".
Author: Eng. Snezha Ventsislavova Shotarova

Dissertation Title: **"Interactive Laboratory for Information Processing with Remote Access"**
Scientific Supervisor: Assoc. Prof. Silvia Velkova Stoyanova-Petrova, PhD, Eng.

1. General presentation of the procedure and the doctoral student

By Order No. RD 22-430 dated 23 February 2026 of the Rector of Paisii Hilendarski University of Plovdiv, I have been appointed as a member of the scientific jury for conducting the defense procedure of a dissertation entitled “Interactive Laboratory for Information Processing with Remote Access”, for the acquisition of the educational and scientific degree “Doctor” (PhD) in the Field of Higher Education: 5 “Technical Sciences”, Professional Field: 5.3 “Communication and Computer Engineering”, Doctoral Program: “Automation of Areas of the Intangible Sphere (Medicine, Education, Science, Administrative Activities, etc.)”. The author of the dissertation is Eng. Snezha Ventsislavova Shotarova – a full-time doctoral student at the Department of Electronics, Communications and Information Technologies (EKIT), with scientific supervisor Assoc. Prof. Silvia Velkova Stoyanova-Petrova, PhD, Eng., from Paisii Hilendarski University of Plovdiv.

The set of materials on paper submitted by M.Eng. Snezha Ventsislavova Shotarova is in accordance with Art. 36 (1) of the Regulations for the Development of the Academic Staff of the University of Plovdiv, and includes the following documents:

– application to the Rector of Paisii Hilendarski University of Plovdiv for opening the procedure for dissertation defense;

– curriculum vitae in European format;

– minutes of the Department Council concerning the reporting of readiness to open the procedure and the preliminary discussion of the dissertation;

– dissertation thesis;

– abstract in Bulgarian and English;

– list of scientific publications related to the dissertation topic;

–copies of scientific publications;

–declaration of originality and authenticity of the submitted documents;

–report on compliance with the minimum requirements.

The doctoral student has submitted 4 (four) publications related to the topic of the dissertation.

The doctoral student currently holds the academic position of "Assistant" in the Department of Electrical Power Engineering and Communications (EC) at the „Paisii Hilendarski“ University of Plovdiv.

2. Relevance of the topic

The pandemic experienced by humanity in the period 2019-2022 has set new tasks for education, especially that providing practical training. Thus, the role of interactive laboratories in modern education has become key. They allow access to specialized tools and resources without the physical presence of learners.

The development of interactive laboratories for remote access, information processing and for transferring real laboratory experiments to remote and interactive platforms provides such an opportunity.

Thus, the topic of this work becomes extremely relevant and will show the way to providing quality education to anyone who wishes, regardless of where in the world they are located.

3. Knowing the problem

In the preparation of the dissertation, the doctoral candidate, MSc Eng. Snezha Shotarova, has used 143 references, all of which are in Latin script (English), addressing research in the relevant thematic area. The last five (5) references are Internet sources, with links dating from 2024 and 2025. The majority of the cited works (over 80%) have been published within the last ten years.

4. Research methodology

The dissertation comprises 187 pages, including 73 figures and 30 tables, structured into an introduction, four chapters, general conclusions, and scientific-applied and applied contributions.

To achieve the objective of the dissertation entitled “Interactive Laboratory for Information Processing with Remote Access”, four (4) tasks have been formulated, which are clearly and appropriately defined.

In Chapter One, based on a conducted literature review, a number of limitations have been identified, on the basis of which the key directions for improvement in the development of a modern interactive laboratory are formulated.

Chapter Two examines the fundamental physical models, formulas, and computational relationships describing the operation of photovoltaic cells, including the relationships between voltage, current, power, irradiance, and temperature. This theoretical knowledge is essential for the correct interpretation of the results obtained in the interactive laboratory environment.

Chapter Three presents the design and implementation of a web-based interactive laboratory, including simulation modules, visualization tools, administrative functionalities, and educational components implemented within an integrated platform for engineering education and analysis.

Chapter Four presents the implementation of an interactive laboratory with remote access, designed for conducting real experiments. The chapter covers the architectural model, the hardware and software implementation, the IoT communication layer, real-time web visualization, and the experimental results.

5. Characterization and evaluation of the dissertation work and contributions

I assess the presented dissertation work as useful for the scientific and educational communities. Four scientific-applied and four applied contributions have been achieved, the most important of which are:

* an integrated architectural model for remote control and monitoring of photovoltaic systems has been developed;

* a model for real-time bidirectional communication between a web interface and a physical photovoltaic system has been proposed;

* an approach for integrating simulation models and real measurement data within a web-based laboratory environment has been developed;

* a functioning laboratory platform with remote access has been implemented.

6. Assessment of the doctoral student's publications and personal contribution

Four (4) publications are attached to the materials submitted for the procedure. Of these, two (2) are in English, while the remaining publications are in Bulgarian.

In all publications, the doctoral candidate is the first author.

One of the publications in English is indexed in Scopus, while the other was presented at an international scientific conference on education and new learning technologies held in Spain.

All publications address different aspects of the dissertation.

Publication No. 3, “Enhancing Engineering Learning through the Use of an Interactive Laboratory”, has been cited twice.

7. Abstract

The abstract is presented in Bulgarian and English. It consists of 32 pages, including contributions and publications related to the dissertation work. The abstract reflects the overall content of the dissertation and highlights its contributions.

8. Recommendations for future use of the dissertation contributions and results

On page 177 of the dissertation, the doctoral student has set herself four options for future research. For me personally, the second of them, "conducting pedagogical experiments to study the effectiveness of the developed laboratory in the educational process...." is of particular interest. As I said in point 1, the opportunity to gain practical experience without physical presence will become increasingly relevant, even without health or other crises.

CONCLUSION

The dissertation work contains scientific-applied and applied results that represent an original contribution to science and meet all the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria (LDASRB), the Regulations for the Implementation of the LDASRB, and the relevant Regulations of Paisii Hilendarski University of Plovdiv.

The dissertation demonstrates that the doctoral candidate, MSc Eng. Snezha Ventsislavova Shotarova, possesses in-depth theoretical knowledge and professional skills in the scientific speciality "Automation of Areas of the Intangible Sphere (Medicine, Education, Science, Administrative Activities, etc.)", and demonstrates the qualities and abilities required for conducting independent scientific research.

Based on the above, I confidently give my POSITIVE EVALUATION of the developed dissertation, the abstract, the achieved results, and the contributions, and I propose that the esteemed scientific jury award the educational and scientific degree "Doctor" (PhD) to MSc Eng. Snezha Ventsislavova Shotarova in the Field of Higher Education: 5. Technical Sciences, Professional Field: 5.3 "Communication and Computer Engineering", Doctoral Program "Automation of Areas of the Intangible Sphere (Medicine, Education, Science, Administrative Activities, etc.)".

March 24, 2026 **Prepared the opinion**: .....

Assoc. Prof. Dr. Eng. Borislav Milenkov