

OPINION

by **Prof. Eng. Atanaska Dimitrova Bosakova-Ardenska, PhD**, University of Food Technologies - Plovdiv
on the doctoral thesis for acquiring the educational and scientific degree "**Doctor**"
in: field of higher education 5. Technical Sciences
professional area 5.3. Communication and Computer Engineering
doctoral program Automation of Areas in the Intangible Sphere (medicine, education, science, administrative activities, etc.)

Author: Veselin Zdravkov Mengov

Topic: *REMOTE ACCESS SYSTEM TO EDUCATIONAL RESOURCES IN THE FIELD OF TELECOMMUNICATION AND INFORMATION SYSTEMS*

Supervisor: Assoc. Prof. Eng. Sotir Ivanov Sotirov, PhD

1. General presentation of the procedure and the doctoral student

Based on the order of the Rector of the Paisii Hilendarski University of Plovdiv (PU) ПД-21-2152 from 23.11.2023, I have been appointed as a member of the scientific jury to ensure the procedure for defending the doctoral thesis on the topic "Remote Access System to Educational Resources in the Field of Telecommunication and Information Systems" for the acquisition of the educational and scientific degree "Doctor" in the field of higher education 5. Technical Sciences, professional direction 5.3. Communication and Computer Engineering, doctoral program "Automation of Areas in the Intangible Sphere (medicine, education, science, administrative activities, etc.)". The author of the dissertation is Veselin Zdravkov Mengov – a full-time doctoral student at the Department of ECI (Electronics, Communications, and Information Technologies) with a supervisor Assoc. Prof. Eng. Sotir Ivanov Sotirov, PhD, from PU "Paisii Hilendarski".

The set of materials presented by the doctoral student complies with Article 36 (1) of the Regulations for the Development of the Academic Staff of PU and includes the following documents:

- Application to the Rector of PU to initiate the procedure for defending the doctoral thesis from 20.11.2023;
- CV in European format;
- Record of the departmental council related to the readiness for initiating the procedure and the preliminary discussion of the doctoral thesis;
- Doctoral thesis;
- Summary;
- List of scientific publications on the topic of the dissertation;
- Copies of scientific publications;

- List of noticed citations;
- Declaration of the originality and authenticity of the attached documents;
- Reference for meeting the minimum national requirements specified in the Regulations for the Development of the Academic Staff of PU for obtaining the educational-scientific degree "Doctor" in the professional direction 5.3 Communication and Computer Engineering.

The doctoral student Veselin Mengov obtained a Bachelor's degree in Computer Science and a Master's degree in Software Technologies from Paisii Hilendarski University in 2015. From 2007 to 2022, he worked as an IT expert at the Agricultural University, Plovdiv. Since 2022, Veselin Mengov has been working as an assistant professor in the ECI department at Paisii Hilendarski University. The doctoral student is proficient in Russian and English.

2. Relevance of the Topic

The dissertation presents a web-based implementation of a remote access system to educational resources during practical sessions (remote laboratory) in the field of communication and information technologies. The system is designed based on a thorough analysis of the advantages and disadvantages of existing similar systems and is implemented using a web-based interface. The developed system has been used for exercises in signal modeling. The possibility of organizing remote access to real laboratory equipment contributes to the quality conduct of practical sessions, both in emergencies and in the training of students in part-time or distance learning. In this regard, the development presented in the dissertation is undoubtedly relevant and aligns with contemporary trends in the application of computer-based technologies for remote access to educational resources and laboratory equipment.

3. Understanding the Problem

In the dissertation, a total of 99 literary sources were used, of which nearly 52% are from the last ten years. However, the lack of alphabetical ordering of literary sources and the presence of web addresses that were accessible in 2022 but are no longer accessible (not updated) are notable. In Chapter One (Study and Analysis of Remote Access Systems to Educational Resources), existing systems representing remote or virtual laboratories for conducting experiments in engineering sciences are discussed. A comparison is made based on the technologies used for system implementation, their applications, and specific features concerning requirements for client computer systems and upgrade capabilities. As a result of a detailed examination of the discussed systems, the doctoral student has formulated requirements on which the functionality of a "remote laboratory" type system can be evaluated.

4. Research Methodology

As a result of the literature review, the doctoral student formulated the goal of the dissertation: "To develop a system for remote laboratory exercises in engineering disciplines based on real equipment." To achieve this goal, six tasks were formulated related to the design and development of hardware and software to facilitate the operation of laboratory setups demonstrating amplitude and pulse-code modulation of signals; development of a web-based system for remote access to laboratory setups and measuring equipment with the possibility of integrating the developed system into the educational process by providing means for recording and documenting experiment results; assessing the effectiveness of the developed system in the learning process. Surveys were conducted among students majoring in "Telecommunication and Information Systems" and "Telecommunications with Management" who used the system during the 2020-2021 period. The academic performance of students using the system was compared to other groups of students who did not use it. Various data collection techniques and subsequent quantitative and qualitative analysis adequately present the results of the tasks performed.

5. Characterization and Evaluation of the Dissertation and its Contributions

The presented dissertation consists of a total of 147 pages and includes an introduction, six chapters, conclusion, a list of publications related to the dissertation, a declaration of originality, a list of literary sources, and appendices. In some chapters of the dissertation, information is included that would be more appropriate as part of the appendices. For example, in Chapter 4 "Study of Amplitude Modulation through a Remote Laboratory" and Chapter 5 "Study of Pulse-Code Modulation through a Remote Laboratory," guides for working with the remote laboratory during exercises on amplitude and pulse-code modulation of signals are presented. Additionally, in Chapter 3 "Design and Development of the Remote Laboratory," an overview and reference information for the software products LabVIEW and Matlab and the programming language Python are presented, which essentially should be part of the literature review (Chapter 1).

A significant advantage of the development presented in the dissertation is its applicability in the educational process, particularly in the field of implementing remote methods for conducting practical sessions in engineering education. The doctoral student has formulated a total of six contributions, divided into two categories - "Scientific-Applicative" and "Applicative." The formulation of one of the scientific-applicative contributions is considered unclear, as the presentation of software architecture based on the established practice of the client-server model should not essentially claim such a contribution. The choice of specific technologies (programming language, software platforms, libraries, etc.) in implementing the designed system should be considered more as a contribution with an applied character. The made remarks are editorial in nature and do not relate to the essence of the results presented in the dissertation.

6. Evaluation of Publications and the Doctoral Student's Personal Contribution

The doctoral student has presented a total of six publications related to the dissertation, earning a total of 73.3 points with a minimum requirement of 30. In one of the presented publications, the doctoral student is single author, while in the others, there are two co-authors. One of the publications is a report from the international scientific conference XXIX International Scientific Conference Electronics (ET), the proceedings of which are published in the IEEE Xplore Digital Library and indexed in Scopus. The doctoral student is the first author in all publications related to the dissertation, undoubtedly demonstrating the significance of his personal contribution.

7. Author`s Summary

As part of the materials for the current procedure, an Author`s Summary has been presented in Bulgarian and English, comprising thirty-three pages (32 pages plus a title page), which essentially represent the most significant part of the materials presented in the dissertation.

8. Recommendations for Future Use of Dissertation Contributions and Results

The presented system for remote access to laboratory equipment in the dissertation can be adapted for conducting other exercises in the field of communication and computer engineering. As a direction for future development of the system, I would recommend exploring the possibilities for collaborative remote conduct of practical sessions by small groups of students, ensuring interaction among them. To popularize the obtained results, it would be beneficial for the doctoral student to focus on publishing articles in journals with high impact factors.

CONCLUSION

The dissertation contains contributions of scientific-applied and applied nature, meeting the requirements of the Regulations for the Development of the Academic Staff in Republic of Bulgaria, the Regulations for Application of the Regulations of the Academic Staff Development, and the corresponding Regulations of Paisii Hilendarski University. The presented dissertation demonstrates that the doctoral student Veselin Zdravkov Mengov possesses theoretical knowledge and professional skills in the scientific specialty "Automation of areas in the intangible sphere (medicine, education, science, administrative activities, etc.)", showcasing qualities and abilities for independent scientific research.

Based on the above, I provide my **positive assessment** of the conducted research, as presented in the reviewed dissertation, summary, achieved results and contributions, and I ***recommend to the esteemed scientific jury to confer the educational and scientific degree of "Doctor" upon Veselin Zdravkov Mengov*** in the field of higher education: 5. Technical Sciences,

professional direction 5.3. Communication and Computer Engineering, doctoral program "Automation of areas in the intangible sphere (medicine, education, science, administrative activities, etc.)".

29.01.2024

Author of the opinion:
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