

OPINION

by **Dr. Eng. Borislav Hristov Milenkov - Associate Professor at the University of Food Technologies**

dissertation for the award of the educational and scientific degree "**PhD**"

by: field of higher education: 5;

Professional field: 5.3. *Communication and computer engineering*;

Doctoral programme: '*Automation of areas of the intangible sphere (medicine, education, science, administration, etc.)*'.

Author: *Mag. Sezgin Fakhri Ismail*

Topic: *parametric and structural optimization of telecommunication models*

Scientific supervisor. *Prof. Dr. Slavi Yassenov Lyubomirov*

1. General presentation of the procedure and the PhD student

By Order No. RD-21-668/24.03.2023 of the Rector of Plovdiv University "Paisii Hilendarski" (PU) I have been appointed as a member of the scientific jury for the procedure for the defense of my dissertation thesis entitled "PARAMETRIC AND STRUCTURAL OPTIMIZATION OF TELECOMMUNICATION MODELS" for the acquisition of the educational and scientific degree "Doctor" in the field of higher education. Technical sciences, professional field 5.3. Communication and computer engineering, doctoral programme "Automation of areas of the intangible sphere (medicine, education, science, administrative activity, etc.". The author of the dissertation work is Mag. Sezgin Fakhri Ismail - PhD student in full-time training at the Department of Electrical Engineering, Communication and Information Technology. with scientific supervisor Assoc. Eng. Prof. Dr. Slavi Yassenov Lyubomirov from Paisii Hilendarski University

The set of paper materials submitted by Mag. Sezgin Fakhri Ismail is in accordance with Article 36 (1) of the PU Academic Staff Development Regulations, and includes the following documents:

- request to the Rector of PU for the disclosure of the procedure for dissertation defence;
- autobiography in European format;
- Minutes of the departmental council related to reporting the readiness for the opening of the procedure and the preliminary discussion of the dissertation;
- dissertation;
- author's abstract;
- list of scientific publications on the topic of the dissertation;
- copies of scientific publications;
- declaration of originality and authenticity of the attached documents;

The PhD candidate has attached 5 (five) publications on the topic of the PhD.

The PhD student was born in 1974. He graduated from Paisii Hilendarski University with a qualification "teacher of mathematics and informatics". Currently he is working as a teacher of "Informatics and Information Technologies" in "N. Ъ. Vaptsarov" - town of. She is

also a teacher at the school of V. Vapartsov Vaporata. I do not know Mag. Sezgin Fakhri Ismail personally.

2. Relevance of the topic

The topic of the thesis is topical because it stems from the increasing complexity of projects and the scale of telecommunication systems, which make us pay attention to the level and quality of work at all stages of the project and not least the level of performance of the design process itself. Emphasis is placed on the use of Artificial Intelligence methods and techniques in assessing the condition of components in telecommunication systems. The peculiarities of the main parametric and structural optimization procedures affecting telecommunication models are specified. The use of Artificial Intelligence (AI) methods in system identification is justified. The individual functional blocks are described and the hardware platform of the implemented module is given.

3. Knowledge of the problem

To justify the development of the dissertation the dissertant Mag. Sezgin Fakhri Ismail has used 132 literature and information sources, of which 7 are in Cyrillic and the rest in Latin (95%), concerning research in the field of his subject. It is noteworthy that most of the cited works were published in the last 10 years.

4. Research methodology

The dissertation is 161 pages, with two appendices - 22 pages. It is organized in four chapters, an introduction, a conclusion (general conclusions), a description of contributions, a list of the doctoral student's publications and a bibliography (literature used).

In order to achieve the aim of the dissertation "Parametric and structural optimization of telecommunication models", six tasks are set. They are well formulated and selected, which contributes to their solution in the dissertation.

In chapter one of the dissertation, a literature review on the specific issues is conducted. The advantages and disadvantages of existing methods and algorithms are presented.

Chapter two focuses on sensitivity analysis to determine the input parameters that affect the uncertainty in the model output.

The creation of test models of basic telecommunication devices in the Matlab environment is discussed and presented in Chapter Three.

Chapter four focuses on experimental research.

5. Characteristics and evaluation of the dissertation and contributions

I evaluate the presented dissertation as useful for the scientific community. Scientific and applied contributions have been achieved. The most important of them are:

- Numerical experiment and Monte-Carlo simulation methods are applied to investigate the capabilities of GA and PSO algorithms for automated determination of the parameters and structure of specific classes of modules and devices in telecommunication systems.
- Procedures implementing the Genetic Algorithm (GA) and the Particle Swarm Optimization (PSO) method have been developed and the importance of factors affecting the qualities of the considered algorithms has been investigated and a comparative analysis has been conducted.
- A software tool in Matlab environment has been developed and investigated to test a model of the cooling system of communication equipment in structure identification, using integer-coded GAs and ORFs and performing a planned Monte Carlo experiment. A significance analysis of the factors was carried out, and special functions implementing the procedures of integer-coded GAs and ORF-algorithms were written for this purpose. The values of the structural indices (na, nb and nk) of the ARX - polynomial model (idpoly) of the cooling system were determined.
- Testing was performed in the identification of the structure of a model of the cooling system of communication equipment using GA and ORF. Data taken from Feedback's PT326 laboratory experimental model is used as input.

6. Assessment of publications and personal contribution of the PhD student

Five (5) articles are attached to the proceeding materials. Of these, 3 (three) are in English co-authored with the supervisor and two in Bulgarian.

The articles in Bulgarian have been published in the scientific works of the "Union of Scientists in Bulgaria" and the PhD student is an independent author of one of them.

Articles in English are refereed in Web of Science.

All the articles, address different aspects of the dissertation.

There is no citation information for any of the articles.

7. Abstract

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

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

I recommend that in the future the PhD student joins larger research teams.

CONCLUSION

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

The dissertation work shows that the PhD student Sezgin Fakhri Ismail possesses in-depth theoretical knowledge and professional skills in the scientific specialty of "Automation of areas of the intangible sphere (medicine, education, science, administrative activities, etc.)", demonstrating qualities and skills to independently conduct scientific research.

Because of the above, I confidently give my positive evaluation of the developed dissertation, abstract, results and contributions, and I propose the honorable scientific jury to award the degree of Doctor of Education and Science to Mag. Sezgin Fakhri Ismail in the scientific field 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.)".

30 May 2023 г.

Prepared by:S.....

Assoc. Prof. Dr. Eng. Borislav Milenkov