

REVIEW

of the thesis for awarding the educational and scientific degree:

“Doctor of Philosophy”,

under the Scientific Field: **5. Technical Sciences,**

the Professional Area: **5.3. Communication and Computer Techniques,**

the Scientific PhD Specialty: **“Computer Systems, Complexes and Networks”**

PhD Thesis Title: **Intelligent Methods of Research and Implementation of
Hardware Solutions**

PhD Thesis author: **Dipl. Eng. Krasimir Georgiev Markov**

Reviewer: **Acad. Vassil Stoyanov Sgurev, DSc**

I have been appointed as a member of the Scientific Jury regarding the procedure for the acquisition of the educational and scientific degree “Doctor of Philosophy” (PhD) of the aforementioned PhD Thesis by order №328-1 from 06.12.2023 of the Director of the Institute of Information and Communication Technologies at the Bulgarian Academy of Sciences, and based on the Development of the Academic Staff Act in the Republic of Bulgaria and based on §30 (2) of the Act’s Institutional Regulation. At its meeting on 15.12.2023, the Scientific Jury selected me to be a reviewer of the PhD Thesis.

As a member of the Scientific Jury, I received on paper and electronically the PhD Thesis, the PhD Thesis abstract, the publications of the PhD student for the PhD thesis, and the accompanying administrative documentation.

In order to form the final evaluation of the PhD thesis, the requirements of the Development of Academic Staff Act in the Republic of Bulgaria are implemented the specific requirements in the Act’s Institutional Regulation shall be taken into consideration, where the respective norms are:

1. Pursuant to Art. 6 (3) of the Development of Academic Staff Act in the Republic of Bulgaria, PhD thesis should contain scientific or scientific-applied results, which represent an original contribution in science. **The PhD thesis must indicate that the candidate has in-depth theoretical knowledge of the relevant specialty and ability for independent research.**

2. According to Art. 27 (2) of the specific requirements in the Act's Institutional Regulation, PhD thesis should be presented in a form and volume corresponding to the specific requirements of the primary unit. **The PhD thesis should contain: a cover page; content; introduction; exhibition; conclusion - a summary of the results obtained with a declaration of originality; bibliography.**

The survey of the above documents demonstrates that they completely conform to the requirements of the Development of the Academic Staff Act in the Republic of Bulgaria, the Regulation for its enforcement, the Regulation for the conditions and the rules of acquisition of scientific degrees and holding academic positions in the Institute of Information and Communication Technologies at the Bulgarian Academy of Sciences.

All requirements of §3 of the Regulation for the specific conditions for the acquisition of scientific degrees and holding academic positions in the Institute of Information and Communication Technologies at the Bulgarian Academy of Sciences are fulfilled concerning the minimal credits in the Professional Area 5.3 Communications and Computer Engineering for awarding the educational and scientific degree "Doctor of Philosophy". In the group of indicators A, the PhD student has the required number of 50 points and in the group of indicators G, the required points are 30 while the PhD student has 120 points.

The dissertation research examines key aspects of the application of intelligent methods in the design of components and devices involved in the implementation of distributed systems for wireless collection, transmission and management of information flows. The focus is on architectural decisions, communication protocols, sensors and software platforms that are essential for the functionality and reliability of communication systems.

Distributed systems for wireless collection and management of information flows are based on a combination of different technologies, including radio frequency identification (RFID) and artificial intelligence (AI). Despite the technical challenges, these systems provide the ability to collect and analyse information in real time, leading to efficiency improvements, resource optimisation and the opportunity to innovate.

The aim of the dissertation is to investigate and implement hardware solutions using modern methods from the field of intelligent systems. In order to achieve this goal, six tasks are formulated.

The PhD thesis consists of 133 pages. It is structured in an introduction, three chapters, a conclusion - a summary of the results obtained, guidelines for future research, publications on the topic of the dissertation, accompanied by a declaration of originality of the results obtained, three appendices and a bibliography.

Each chapter is a distinct part of the work that treats the results obtained. The connection between the chapters is provided by the logic of the exposition and allows to gain an overall view of the research.

The sources cited are sufficiently varied and for the most part are written by foreign authors. The presence of Bulgarian authors in the literature used also makes a good impression.

Six publications are included in the submitted list of publications on the PhD thesis. Five of the publications are independent and one is co-authored. All presented publications are related to the PhD thesis theme.

The achieved results have been disseminated among the scientific community, being published in the journals – “Problems of Engineering Cybernetics and Robotics” and “Engineering Sciences”, as well as in the proceedings of the international conference - 10th IEEE International Conference on Intelligent Systems (IS'20).

The obtained scientific, scientific and implementation, and implementation results are closely interrelated and it is not appropriate to strictly distinguish them. The amount and the thoroughness of these results completely cover the requirements for the acquisition of the educational and scientific degree “Doctor of Philosophy”.

The PhD abstract has a volume of 37 pages. It faithfully reflects the essence and content of the PhD thesis, including the purpose, subject, object and tasks of the dissertation research and the ways of their realization.

In order to form the final evaluation of the PhD thesis, the requirements of the *Development of Academic Staff Act in the Republic of Bulgaria* and its Implementation Rules are to be taken into account, according to which I have the following remarks and recommendations:

1. Style errors are noted in the text of the PhD thesis.
2. The formulation of the PhD thesis contributions does not allow emphasizing the individual contribution of the PhD student.
3. The PhD student should direct his efforts to increase his contributions to reputable international publications.

The above remarks are rather recommendations for future work. They do not in the least question the research results obtained by the PhD student.

During the preliminary discussions, I had the opportunity to make other remarks and recommendations as well and they were considered by the PhD student in the final version of the PhD thesis.

In conclusion, bearing in mind the declared contributions in the reviewed PhD thesis, as well as the fact that all requirements of the relevant regulatory documents for the educational and scientific degree "Doctor of Philosophy" are observed, I firmly recommend to the Scientific Jury to award **Dipl. Eng. Krasimir Georgiev Markov** the educational and scientific degree "Doctor of Philosophy" (PhD) in the Scientific Field **5. Technical Sciences**, the Professional Area **5.3. Communication and Computer Techniques**, the Scientific PhD Specialty "**Computer Systems, Complexes and Networks**".

24.01.2024

Sofia

Reviewer

