

OPINION

by **Corr. Member Lyubka Doukovska, DSc**

from the Institute of Information and Communication Technologies,

at the Bulgarian Academy of Sciences,

on the Thesis for awarding educational and scientific degree PhD,

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

the Professional Area: **5.2. Electrical engineering, Electronic and Automation,**

the Scientific PhD Specialty: „**Application of the principles and methods of cybernetics**

in different fields of science“

Author of the PhD Thesis: **Petko Ivanov Stoev**

PhD Thesis Title: **Multipurpose teleoperated service robot**

In accordance with Order No. 32 from 31.01.2024 of the Director of the Institute of Information and Communication Technologies, I have been appointed as a member of the Scientific Jury regarding the PhD thesis of **Petko Ivanov Stoev** for awarding the educational and scientific degree “Doctor of Philosophy” (PhD). The scientific advisor of the PhD thesis is Prof. Nayden Shivarov.

As a member of the Scientific Jury I have received:

1. Order No. 32 from 31.01.2024 of the Director of the Institute of Information and Communication Technologies.
2. PhD thesis for the educational and scientific degree PhD.
3. Abstract of the PhD thesis for the educational and scientific degree PhD.
4. Copies of the publications included in the PhD thesis.
5. Accompanying documents according to the procedure for the defense of the PhD thesis.

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 PhD thesis consists of 143 pages. Its structure includes introduction, three chapters, conclusion, literature, request for originality and publications on the dissertation topic.

The aim of the PhD thesis is development of a multipurpose teleoperated service robot to improve working conditions and support the work activities of people in various work environments, namely hospitals, warehouses, manufacturing sites, livestock farms and commercial sites.

To accomplish this, the following tasks have been set:

1. Getting to know the main characteristics and specific features of teleoperated service robots.
2. Designing the main components of the mechanical design of the robot:
 - Universal mobile platform;
 - Module with lifting platform;
 - Rotary table module;
 - Cleaning module;
 - Scissor lift module;
 - Niryo anthropomorphic robot module.
3. Choice of drive, actuators and sensor system of the robot.
4. Development of industrial design of the robot.
5. Development of remote control of the tele-controlled multifunctional mobile robotic platform.
6. Control the robot modes of the multi-purpose robot:

- Setting the execution sequence of the individual operating modes of the multipurpose robot;
- Development of software and hardware of the individual modules.

I find that the aim and the problems formulated reflect the topicality and significance of the presented PhD thesis, as well as the possibility to apply the results obtained in the engineering practice.

The presented list of publications on the dissertation work includes five publications in proceedings of national and international conferences. The data thus presented give me reason to conclude that the research has been provided with the necessary publicity.

I accept that the contributions so formulated could be considered to have scientific and common application. This separation would allow detailing the results obtained in accordance with the specificity of their significance. Such defined contributions can be defined as enriching the existing scientific field with new knowledge. I do not accept the formulation of the first contribution as scientific-applied.

The PhD abstract has a volume of 42 pages. It faithfully reflects the essence and content of the PhD thesis, including the purpose, subject, object and tasks of PhD thesis 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. The content of the dissertation does not meet the requirements of Art. 27 (2) of the *Development of Academic Staff Act in the Republic of Bulgaria*. The PhD thesis should contain a conclusion - summary of the obtained results and end with a bibliography.
2. The presence of stylistic errors in the text is noticeable.
3. The list of the references doesn't comply with the requirements for bibliography.
4. A list of citations for a PhD thesis presents a single noticed citation of a publication, indicating it, not the citing source.
5. There are no directions for future work, based on the results of the PhD thesis.
6. The PhD student should direct his efforts to increase his contributions to reputable international publications.

Conclusion

I accept that the requirements of the Law for the *Development of Academic Staff Act in the Republic of Bulgaria* and the specific requirements in the Act's Institutional Regulations for its implementation, the Rules for the conditions and the order for acquiring academic degrees and for the occupation of academic positions in Bulgarian Academy of Sciences and the Rules for the specific conditions for acquisition of academic degrees and occupation of academic positions at the Institute of Information and Communication Technologies - BAS are fulfilled. After my introduction to the PhD thesis and its publications, an analysis of their significance and the contributions they make, I give my positive assessment and I recommend to the Honorable Jury to award the educational and scientific degree PhD to **Petko Ivanov Stoev** in the Scientific Field **5. Technical Sciences**, the Professional Area **5.2. Electrical engineering, Electronic and Automation**, the Scientific PhD Specialty **“Application of the principles and methods of cybernetics in different fields of science”**.

28.02.2024

Sofia

Signature: .

/Corr. Meml

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