

STATEMENT

by Assoc. Prof. Stefan Savov Biliderov, PhD, Eng.
(academic position, scientific degree, name, surname and surname of the member of the scientific jury)

"GEORGI BENKOVSKI"
BULGARIAN AIR FORCE ACADEMY
(workplace of the member of the scientific jury)

of the thesis of the M.Sc. Eng. Petko Ivanov Stoev
(name, surname and surname of the author of the dissertation work)

on topic: „**MULTIPURPOSE TELE-OPERATED SERVICE ROBOT**”,

submitted for the acquisition of the educational and scientific degree "doctor"

in a doctoral program
„Application of the principles and methods of cybernetics in various fields of science”

field: 5. Technical sciences

professional direction: 5.2 Electrical Engineering, Electronics and Automation

city of Dolna Mitropolia 2024

1. Actuality and significance of the scientific problem being developed

The topic of the dissertation covers a number of multidisciplinary fields of science, such as human-machine interface, robotics, communications, control, mechatronics, etc. It also touches on a number of legal and ethical norms accepted in society or those that are now beginning to make their way. The creation of a universal multi-purpose system based on a service robot is quite a difficult task that requires extensive knowledge in the interdisciplinary areas listed above.

The development and implementation of robotic systems and robots is one of the important conditions for the progress of human civilization, which is dominated by energy saving criteria. Thus, a multi-purpose remote-controlled service robot, as a universal system, will solve a wide range of tasks with the operational ability to perform a variety of services in various spheres of economic, technological and financial life.

Strategic policies and documents for the development of the technology industry give an important place to multi-purpose service robots. The versatility of these robots will play an important role in expanding the future areas of their application. Therefore, the issues of development, expansion of the range and application of multi-purpose service robots will remain relevant for a long time.

2. Evaluation of the scientific results and contributions of the dissertation work

The object of research in the presented PhD thesis is the multi-purpose remote-controlled service robots. Their purpose is to provide and facilitate users in their daily work.

The specific objective of the dissertation is to develop a multi-purpose tele-controlled service robot adaptable to different work environments, such as: hospital facilities; storage facilities; production sites; livestock farms; stores; commercial establishments, etc. To achieve this goal, a number of tasks are set, described in the "Introduction" part of the dissertation.

In addition, the dissertation consists of three more chapters, and in "CHAPTER 1" a number of documents are analyzed, the application of multi-

purpose mobile robots, their characteristics and systems, mechanics and mechanical compatibility, their ability to move, communication, design, ergonomics, etc. Attention is also paid to the specifics of the human-machine interface in multi-purpose remote-controlled service robots.

"CHAPTER 2" addresses the design of the multi-purpose remote-controlled service robot from the perspective of: mechanics; the universality of the robot; the individual expansion modules; executive devices and mechanisms, as well as the necessary sensor system.

"CHAPTER 3" deals with the control of the multi-purpose robot. Such control is also provided through the Internet of Things (IoT) standard MQTT messaging protocol, which is used today in a wide variety of industries such as automotive, manufacturing, telecommunications, oil and gas, etc., as well as computer a WebSocket communication protocol providing simultaneous duplex transmission control protocol (TCP) connections. The controls in the different modes and applications when using the robot are shown.

Control algorithms were synthesized and verified by simulations in a computer environment.

3. Critical notes

In addition to the positive aspects of the work, some disadvantages are also noticeable. Such are:

1. The tasks are repeated twice in the "Introduction" section of the dissertation.
2. The designations on some figures are not explained.
3. There are certain inaccuracies in the rendering of some of the algorithms for the operation of the robot.
4. There are also some spelling mistakes, as well as poor formatting of the text.

I would recommend the colleague to pay more attention to the text part of the dissertation in the future, which will also be useful to him when developing project proposals. The obtained results are very interesting, especially in the validation of the algorithms by connecting several software.

4. Conclusion

Despite the indicated weaknesses in the submitted dissertation, the design and development of a universal multi-purpose robotic platform is a satisfyingly difficult task, requiring high levels of knowledge and motivation on the PhD student.

These weaknesses do not detract from the achieved results and versatility of the proposed robotic platform.

M.Sc. Eng. Petko Stoev is the fifth winner of the "Entrepreneur in Science" award of the Karol Znanie Foundation. The project related to a medical exoskeleton - a robotic arm called "Re4Life" will help people who have suffered a stroke or other injuries that affect the upper limbs.

The presented documents include 16 publications in global databases with scientific information and 5 in non-refereed editions with scientific review.

The list of publications on the topic of the dissertation contains 5 pieces of material submitted to the jury.

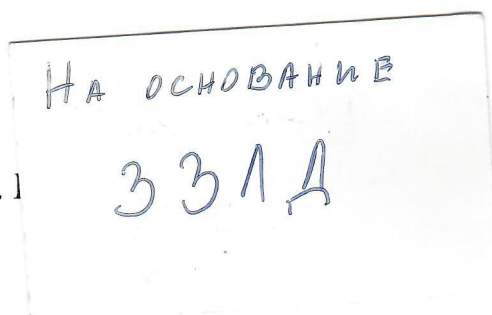
On this basis, I take the liberty of proposing to the esteemed jury to award the Educational and Scientific Degree "Doctor" (a Doctor of Philosophy - PhD) to M.Sc. Eng. Petko Ivanov Stoev.

5. Evaluation of the dissertation work

I give a positive assessment to the dissertation work of M.Sc. Eng. Petko Ivanov Stoev.

Data: 11.03.2024

Member of the jury: Assoc. I



PhD, Eng.