

Reviewer's Report

Doctoral thesis (hereinafter referred to as "thesis"):

Biology-Inspired Control of a Walking Robot

Name of the doctoral student (hereinafter referred to as "student"):

Marek Žák

Name and institution of the reviewer:

prof. Ing. Petr Musilek, Ph.D., University of Alberta, Canada

I. Thesis

Appropriateness and relevance

The subject of the presented thesis is appropriate for the discipline of Computer Science and Engineering, and specifically for the areas of Robotics and Intelligent Systems. The thesis addresses a very relevant topic of control of autonomous mobile robots, taking inspiration in biological systems and bringing new insights on how reflexes observed in insects can be leveraged in man-made systems to make walking robots more dextrous and efficient.

A summary of the contributions of the thesis

The thesis sets a number of appropriate objectives, starting from understanding the movement and control of biological systems, all the way to the design of a new type of hexapod robot and corresponding control algorithms. The main focus has been placed on the speed of walking and ability to move on slopes, emphasizing energy efficiency of robot's operation.

All set objectives have been achieved by the thesis and they directly constitute the main contributions. As such, the thesis has clearly achieved the set goal, as described in the thesis document itself and as also demonstrated through the provided supplementary materials (videos and photographs). The prototype robot (and its predecessor) and control algorithms have been developed by the student and thus constitute his original contributions.

Novelty and significance

The designed robot body and structure present novel, original contributions to the body of knowledge and know-how of mobile robotics. There are a number of specific components of the designed platform and algorithms that present significant contributions to the field of mobile robotics. They can be used and further developed by others, and they also have a strong potential to be applied in practical robotics and in industry.

Evaluation of the formal aspects of the thesis

The thesis document is well structured in seven chapters which provide an appropriate balance of background information and description of theoretical and experimental contributions of the reported work. All illustrations are clear and appropriately captioned. Figures adopted from other sources are correctly cited. The thesis is written using appropriate and clear English language and so are the publications authored by the student.

Quality of publications

The student has published eight articles, most reporting on the core parts of the work described in the presented PhD thesis. Three of the articles have been published in international journals of varying quality and stature. Importantly, the main results of the thesis are communicated in an article published in an indexed journal with good impact. The balance of publications are conference papers in various international venues relevant to the topic of the thesis. Overall, the publication activity of the student is commensurate with the degree sought.

II. Student's overall achievements

Overall R&D activities evaluation

The thesis, publications, and supplementary materials are a clear indication of the strong background, broad knowledge, as well as creative and writing abilities of the student. In addition to the thesis and other communications, the candidate should be commended for designing and constructing several prototype walking robots and for performing a battery of experiments to examine their capabilities and evaluate their performance.

Assessment of other characteristics

From the provided CV, it is clear that the student has participated in a number of other grant projects that are to various degrees related to the topic of his research work. He also has relevant experience from academic research and industry, as well as from teaching university-level computer science and engineering courses. He also supervised and evaluated several theses at the BSc and MSc levels.

III. Conclusion

Through the thesis and other evaluated results, the student has clearly demonstrated his strong creative abilities in the field of Computer Science and Engineering. The presented thesis meets the standard requirements on doctoral theses in this field. In summary, Mr. Zak's thesis and overall performance to date satisfy the generally accepted requirements for the award of the academic degree of PhD.

Edmonton, 05.01.2024

prof. Ing. Petr Musilek, Ph.D.