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The Board of Doctoral Study
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Report on the PhD Thesis "Robot localization"

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Robotics as a technology includes both design and construction of robots, but also computer systems for their control, sensory feedback, and data processing. In narrower context, the robotics has an interaction with today's quickly developing area named Entertainment Computing, having even a technical committee TC14 in IFIP from 2006 as well as a journal from 2009. This thesis summarizes works covering the author's study and research of *robot localization*. It concerns a theory, software engineering practices, and robot constructions, as robots constitute an experimental environment in this case, in contrary to other application computing, where algorithms are tested and evaluated on real or artificial data sets.

In Introduction the author specifies the main topic of his research, i.e. a robot localization, and the structure of the Thesis. Chapter 1 explains shortly various types of localization methods which are used in robotics and focuses in detail on some of them used in the work, particularly Monte Carlo Localization (MCL) and satellite localisation, particularly GPS. Chapter 2 can be conceived as the core of thesis. The author offers there a short introduction to target applications and to robots themselves. The applications are specific according to a number of international robotic contests where the robots developed by the authors and his team were presented. The rules and requirements of the contests are explained in detail.

In the Chapter the author describes robots Logion 2008 and MART 2009, using MCL for localization. An interesting part of MART 2009 is its vision system based on two algorithms: Maximally Stable Extremal Regions and Maximally Stable Colour Regions for detection of objects. Section 2.5 is devoted to GPS localisation testing. GPS localization is appropriate for outdoor areas. The author studied the possibility of connecting GPS as one of data sources in MCL algorithm for outdoor and developed MLC implementation for a special case – the localization on a graph. This system was successfully tested on data gathered during the Robotour 2011. The pervious Section 2.4 describes the MOB-2 robot platform which is used for author's pedagogical activities in robotics at Faculty of Mathematics and Physics.

The results presented in the thesis have been published in papers of representative international conferences, like e.g. EUROBOT, IASTED DBA, and Entertainment computing - ICEC. The conference proceedings have been published by well-known Springer and ACTA Press publishers. They have been validated in practice as well. Consequently, I recommend that the candidate be awarded the Doctor degree.

Prof. Jaroslav Pokorný

supervisor