

Evaluation of doctoral thesis entitled

Trajectory Tracking of Differential Drive Mobile Robot by Model Predictive Control

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The thesis is focused on very actual technical problem related to mathematical modeling, discrete control, robotics, mechatronics and information science. Various models of mobile robot kinematics, dynamics and control are involved in the theoretical sections. Both linear and nonlinear predictive control strategies are developed to obtain trajectory tracking kinematic controller, velocity tracking dynamics controller and trajectory tracking kino-dynamics controller. All models are based on physical and geometrical background, forming the adequate system of ordinary differential equations, its optional linearization if necessary and correct application of control design principles. All these subjects are correctly implemented and the results of off-line and on-line simulation are also included.

I have two questions which should be asked during the defense:

The mobile robot is designed, traced and controlled on 2D plane. What details has to be focused on when the movement will be controlled over real surface in 3D space. Which of mentioned in thesis principles would be saved, extended, modified, eliminated and/or added.

The robot tracing is based on relative simple but reliable and fast principles of image processing. What should be the principles, algorithms and roles of modern signal and image processing methods which should improve your tracing system in the future versions.

The thesis has very actual subject and its aims are well defined and satisfied. The methods of processing are either traditional or modern but adequate to thesis aims and correct. The doctoral thesis consist of new results namely: original mechanical, optical and electronic construction of mobile robot and supporting tracking devices, original software drivers and interfaces for real time tracking, movement and its control, novel kinematic and dynamic models and MPC strategies. The thesis has significantly influenced the robotic applications with external tracking. The author's publications in journals and conference proceedings are very systematic and actual.

Therefore, I suggest the doctoral thesis for the defense and after the successful termination I recommend to assign the title Doctor of Philosophy (Ph.D.).

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Jaromir Kukal, Ph.D.

assoc. prof.

