TECHNISCHE UNIVERSITÄT MÜNCHEN
LEHRSTUHL FÜR STEUERUNGS- UND REGELUNGSTECHNIK
ORDINARIUS: UNIV.-PROF. DR.-ING./UNIV. TOKIO MARTIN BUSS

24.05.2016

M A S T E R ' S T H E S I S
for
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Modeling and Control of a Wheeled Humanoid Robot

Problem description:

In urban and industrial environments, a mobile humanoid can conveniently operate in numerous applications where automation or cooperation with humans is desired. Moreover, these human-like robots have the potential to undertake tasks that are deemed too dangerous or straining for humans. In recent years, robotics researchers and designers developed numerous techniques for planning and controlling mobile humanoid robots. For safe human-humanoid cooperation to take place, a certain degree of sensitivity and reactiveness is required from the robot. This requirement, in addition to the necessary contact and interaction between the robot and its environment, has lead the research in the area of whole-body control. This thesis aims to contribute to the field of whole-body control of mobile humanoid robots. First, the student shall review and build a strong background in the state of the art of the following areas: multi-task hierarchical control, torque-controlled robots, modeling and control of mobile humanoid robots. Then, the kinematics and dynamics of the humanoid shall be modeled. Taking into account the required modes of teaching and operation, a fitting control system that handles the execution of multiple tasks of various priorities shall be designed. The multi-priority controller shall be implemented and evaluated in various simulation scenarios to test its performance and effectiveness.

Tasks:

- Literature review
- Modeling of the kinematics and dynamics of the humanoid robot.
- Formulation and implementation of a multi-priority controller for handling manipulation tasks, as well as additional constraints.
- Evaluation of the control scheme.

Bibliography:

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Start:	1.07.2016
Intermediate Report:	31.10.2016
Delivery:	31.12.2016

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