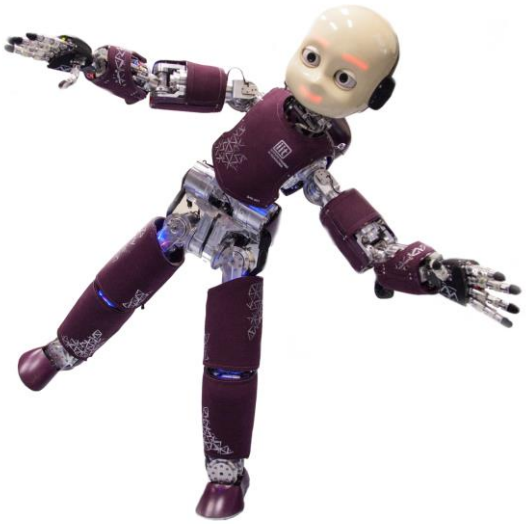
Masterarbeit
Informatik/Mathematik/Physik
"HeiCub walking with soft soles"

Hintergrund:



The HeiCub humanoid robot is a reduced version of the iCub humanoid robot, a child-size robot designed and built by iCub Facility department of the Fondazione Istituto Italiano di Tecnologia (IIT) in Genoa, Italy. It is a research platform that is spread among many institutes all over the world.
The robot is an open-source platform and all the mechanical design as well as software libraries are openly available on the web.
The robot was initially built to perform cognitive studies and consists in a full body humanoid robot with a head with embedded cameras, arms with dexterous hands and legs. In the recent version of the robot strong legs have been built in order to give walking capabilities to the robot. The version that is in Heidelberg at the research group ORB has only legs and torso, as it is meant to be used to carry out walking experiments within the European project KoroiBot (http://www.koroibot.eu/).
The HeiCub is currently able to perform walking in different scenarios with offline computed trajectories and also with an online control framework based on pattern generation. However, a bottleneck in state of the art humanoids, including iCub, is the assumption of completely rigid contact between the robot and the floor.

Projekt:

In this project we would like to cope with the problem of walking with soft soles. Typically, humanoid robots have rigid soles that do not allow any deformation, as it is usually assumed that the contact between the robot and the floor is perfectly rigid and inelastic. However, the iCub comes with soft soles that incorporate skin sensors that would allow to determine important features such as the center of pressure of the robot. Due to their compliance, these soles have never been used, as the walking control frameworks used until now all suppose perfectly flat rigid contact.
We would like therefore to study and implement a new control framework to cope with the compliance of the soles. At IIT, where the robot was built, a module to estimate the state of the foot has been implemented. This could be the starting point of the project, in which the state estimator of the foot is studied and tested, and then incorporated into the whole-body control framework of the iCub to cope with the soles during walking tasks and/or other standing tasks.
To get a better idea about how the robot walking motion looks like: https://www.youtube.com/watch?v=iQ75jQV1DGI

Voraussetzungen:

Good knowledge of: mechanic systems, C/C++, mathematics. Knowledge about robotic hardware is appreciated but not required.
Thesis is expected to be written in English.

Kontakt:

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