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Master Project: Accurate Simulation of a Collaborative Robot Arm with Cartesian Impedance Control



Reinforcement Learning methods allow to master complex tasks like rotating a cube in a robotic hand trained in simulation only². But in order to be able to use simulation as a both safer, but also parallelized environment, it needs to accurately represent the actions of the real robot.

This project aims at accurately simulating a state-of-the-art 7 degrees of freedom robot arm in the open source simulation framework *Gazebo*. Currently only simple trajectories can be simulated and disturbances are not adequately accounted for.

Your Tasks

At first you search and discuss related work on control for robot simulation. Based on that, a suitable control strategy is developed that mimics the behavior of the real robot arm which runs a Cartesian impedance controller. The emphasis is on contactrich tasks like a peg-in-hole problem, but also collisions with the environment. The project will be developed and evaluated with real robot arms.

Requirements

Start Date

- Profound knowledge in control
- Knowledge in C++ and/or Python
- Interest in robotics and ROS
- Independent, diligent and structured way of working
- Immediately or later

Keywords

- Control
- Robotics, Simulation

SARS-CoV-2

Due to the newly discovered coronavirus, the university performs remote education. While an application for an exception could make it possible to work on premise, this project can also be conducted remotely. For both design and evaluation, sensor values can be recorded and supervision can happen with video calls.

¹ http://gazebosim.org/tutorials/?tut=ros_control

 $^{^2 \} Learning \ Dexterity \ \texttt{https://openai.com/blog/learning-dexterity/}$