2013 Version of the Graduate Course, Robot modeling and control
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Home Assignment, Part I

The first assignment in the graduate course robot is to model an ABB IRB1600-8/1.45 robot. The kinematic data can be taken from the product specification, available on the home page http://www.control.isy.liu.se/student/graduate/robot/assignment.html.

The exercise contains the following parts:

- Kinematic model. Your implementation should support both direct as well as inverse kinematics. The inverse kinematics can be solved by an iterative numerical solution.
- Compute the inertia matrix for each link. Assume the robot to consist of hollow uniform rectangular beams made out of metal (steel, aluminum, iron, …).
- Derive a dynamic model using Lagrange's equation or the Newton-Euler technique.
- Import the model into a simulation tool to make it possible to develop control strategies in home assignment, part II. The model can be implemented by using the explicit equations in for example an S-function block in Matlab or by using blocks, such as the multi body library in Modelica.
- Write a report that describes how you have modeled the robot and include examples from using the direct kinematic model as well as the inverse kinematic model.

Some additional comments on the exercise:

- The dynamic model can be restricted to 3-DOF while the kinematics shall be derived for the full 6-DOF manipulator
- Include gear-box in the model (gear ratio [-100 100 100 -60 -60 40]:1), motor inertia can be assumed to be 50 – 100 % link inertia when transformed to the arm-side, i.e., after the gear-box.
- Maximum available motor torque can be assumed to be [6 10 5 0.6 0.6 0.5] Nm.

Dead-line for this home assignment is given on the home page http://www.control.isy.liu.se/student/graduate/robot/assignment.html.