

Prototyping a Robotic Manipulator and Controller

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Abstract

Building a robot and its environment (control, software, hardware, simulation, etc) is a complex task that requires the efforts of an experienced engineering team. Once a robot model has been chosen and a design has been agreed upon, it becomes difficult to make design changes without affecting the manufactured parts, actuators and sensors. Therefore, developing an environment that enables flexible design and reconfigurable links, joints, actuators, and sensors would be an essential step for efficient prototyping. Such an environment should have the right “mix” of software and hardware components for designing the physical parts and controllers and for the algorithmic control and specifications of the kinematics, inverse kinematics, dynamics, trajectory planning, analog control and computer (digital) control of the manipulator. Specifying object-based communications and catalog mechanisms between the software (control, simulation, and monitoring) modules, PPL hardware controllers, physical parts’ CAD designs, and actuator and sensor components is a necessary step in the prototyping activities. We discuss and present a framework and intermediate results in the process of prototyping an experimental reconfigurable 3-link robot in this report.

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