

Implicit Force Control of a Position Controlled Robot - A Comparison with Explicit Algorithms

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Abstract : This paper investigates simple implicit force control algorithms realizable with industrial robots. A lot of approaches already published are difficult to implement in commercial robot controllers, because the access to the robot joint torques is necessary or the complete dynamic model of the manipulator is used. In the past we already deal with explicit force control of a position controlled robot. Well known schemes of implicit force control are stiffness control, damping control and impedance control. Using such algorithms the contact force cannot be set directly. It is further the result of controller impedance, environment impedance and the commanded robot motion/position. The relationships of these properties are worked out in this paper in detail for the chosen implicit approaches. They have been adapted to be implementable on a position controlled robot. The behaviors of stiffness control and damping control are verified by practical experiments. For this purpose a suitable test bed was configured. Using the full mechanical impedance within the controller structure will not be practical in the case when the robot is in physical contact with the environment. This fact will be verified by simulation.

Keywords : robot force control, stiffness control, damping control, impedance control, stability

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