A FUZZY INTEGRATED APPROACH TO IMPEDANCE CONTROL OF ROBOT MANIPULATORS

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Abstract

This paper presents an integrated fuzzy approach to recover the performance in impedance control, reducing the errors in position and force, considering uncertainties in the parameters of the manipulator dynamic model and contact surface or environment model. This integrated strategy considers a fuzzy adaptive compensator in the outer control loop that adjusts the manipulator tip position to compensate for uncertainties present in the environment. In the inner loop, a fuzzy sliding mode-based impedance controller compensates for uncertainties in the model of the manipulator, based on an inverse dynamics control law. The system error, defines the sliding surfaces of the fuzzy sliding controller as the difference between the desired and actual impedances. In order to evaluate the force/position tracking performance and to validate the proposed control structure, simulations results are presented with a three-degree-of freedom (3-DOF) PUMA robot manipulator.

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