

Stability and Performance Improvement of a Two-Degree-of-Freedom Robot under Interaction Using the Impedance Control

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Abstract : In this paper, the stability and the performance of a two-degree-of-freedom robot under an interaction with a unknown environment has been investigated. The time when the robot returns to its initial position after an interaction and the primary resistance of the robot against the impact must be reduced. Thus, the applied torque on the motor will be reduced. The impedance control is an appropriate method for robot control in these conditions. The stability of the robot at interaction moment was transformed to be a robust stability problem. The dynamic of the unknown environment was modeled as a weight function and the stability of the robot under an interaction with the environment has been investigated using the robust control concept. To improve the performance of the system, a force controller has been designed which the normalized impedance after interaction has been reduced. The resistance of the robot has been considered as a normalized cost function and its value was 0.593. The results has showed reduction of resistance of the robot against impact and the reduction of convergence time by lower than one second.

Keywords : impedance control, control system, robots, interaction

Conference Title : ICGHOST 2020 : International Conference on Ghost Conference

Conference Location : ghost city, Other

Conference Dates : December 12-13, 2020