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HIGH GAIN FEEDBACK CONTROLLER FOR A ROBOTIC ARM

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Abstract In this work we consider the designing of a positioning robust controller for a 5 DOF robotic arm, based on High Gain Feedback method, to counter the effect of different payloads, the robot and the controller are modeled and simulated using MATLAB, and it is used to verify the results.

Introduction When working with robotic manipulator, many difficulties arise due to the complex nature of manipulators, the nonlinear relations, the coupling problem, the difficulty of accurate modeling of the manipulator and the effects of disturbances acting on it.

Typical controllers (PID controllers) used with manipulators suffer to compensate for the uncertain disturbances, like different payloads and unmodeled disturbances like friction, and parametric uncertainties as the manipulator itself changes as it ages.

To counter the previously mentioned difficulties, engineers and researchers have been developing and working on many control methods and approaches to achieve an adequate level of control, mainly adaptive and robust control schemes, many control approaches have been developed, adaptive control aims to minimize the errors by implementing some on-line parameters estimation, whereas robust controller is a fixed controller, designed to satisfy performance specifications over a given range of uncertainties.

Main part The proposed robust controller is designed based on High Gain Feedback method, the robotic arm is treated as 5 SISO systems, each link and its connected motor forms an independent system, the aim is to compensate for the uncertainties of changing payload at the end-effector, and any unmodeled friction or inertias of the robot, while ensuring that the designed High Gain Controller does not make the system unstable.

Conclusion: The test of this control strategy will be carried out in MATLAB, using MATLAB Simulink, where a model of the robot will be built, and the controller will be implemented, the test will focus on characteristics of the step response of the system, as when it moves from its initial position to another position, and the degree of accuracy at which the system is able to follow a predefined trajectory.

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