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System Identification and LMI Based Robust PID Control of a Two-Link Flexible Manipulator

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Abstract

This paper presents investigations into the development of a linear matrix inequalities (LMI) based robust PID control of a nonlinear Two-Link Flexible Manipulator (TLFM) incorporating payload. A set of linear models of a TLFM is obtained by using system identification method in which the linear model represents the operating ranges of the dynamic system. Thus, the LMI constraints permit to robustly guarantee a certain perturbation rejection level and a region of pole location. To study the effectiveness of the controller, initially a PID control is developed for TLFM with varying payloads. The performances of the controllers are assessed in terms of the input tracking controller capability of the system as compared to the response with PID control. Moreover, the robustness of the LMI based robust PID control schemes is discussed. Finally, a comparative assessment of the control strategies is presented.

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