ROBOT FLEXIBLE-LINK AND FUZZY CONTROL DESIGN BY MATHEMATICAL MODELING

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Abstract- In this paper, to investigate a new mathematical model for the "shoulder-elbow-like" single flexible-link robot arm with dampings. Detailed analysis and derivation are given to support the mathematical modeling of this particular flexible mechanism. A new design of a fuzzy-logic-based (PI + D) 2 control scheme is developed for both vibration suppression and set-point tracking. Computer simulation results for the modeling are performed to observe the significant vibration modes, and simulation results for the control scheme demonstrate that the controllers perform very well for the tracking based on this flexible-link model. A newly developed method for stability analysis using the "two-straight-lines" criterion is also presented.

Keywords- PDE model, Flexible beam, Timoshenko theory, Fuzzy control, PID controller,