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Funding Source: College of Engineering Undergraduate Research Option

Force feedback control of a hydraulic cylinder

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The objective of this thesis is to demonstrate improvements in the response of a physical hydraulic system when using closed-loop control. A hydraulic system consisting of a power supply, accumulator, and linear actuator is first constructed. To experimentally measure the response, a load sensor is attached to the linear actuator in series and an extension cylinder and mounting plate ensure the test setup remains stationary. Due to the nature and frequency of applied forces, fatigue failure analysis is performed on these two parts for a fluctuating load case to verify the design. The load cell sensor is interfaced with SIMULINK to measure the real time response for a given step input. Transfer functions of varying order are constructed from the analysis of experimental results which can then be used to simulate the hydraulic system response. Once the system is characterized, closed loop control is introduced to feed back an error signal to provide a more desirable response. This improved response is investigated both experimentally and through simulation.