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Set-point Performance Evaluation of Robust Back-Stepping Control Design for a Nonlinear Electro-Hydraulic Servo System

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Abstract : Electrohydraulic servo system have been used in industry in a wide number of applications. Its dynamics are highly nonlinear and also have large extent of model uncertainties and external disturbances. In this thesis, a robust back-stepping control (RBSC) scheme is proposed to overcome the problem of disturbances and system uncertainties effectively and to improve the set-point performance of EHS systems. In order to implement the proposed control scheme, the system uncertainties in EHS systems are considered as total leakage coefficient and effective oil volume. In addition, in order to obtain the virtual controls for stabilizing system, the update rule for the system uncertainty term is induced by the Lyapunov control function (LCF). To verify the performance and robustness of the proposed control system, computer simulation of the proposed control system using Matlab/Simulink Software is executed. From the computer simulation, it was found that the RBSC system produces the desired set-point performance and has robustness to the disturbances and system uncertainties of EHS systems.

Keywords : electro hydraulic servo system, back-stepping control, robust back-stepping control, Lyapunov redesign
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