Real-time implementation of an enhanced nonlinear PID controller based on harmony search for one-stage servomechanism system

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Abstract

This paper presents a real-time implementation of an enhanced nonlinear PID (NPID)
controller to follow a preselected position profile of one stage servomechanism drive
system. This purpose should be realized regardless the different operating points and external disorders (friction and backlash). In this study, the MATLAB Simulink used for
purpose of controller design while the result from simulation will be executed in real time
using LABVIEW software. There is not enough information about the servomechanism
experimental setup so, the system identification techniques will be used via collecting
experimental input/output data. The optimum parameters for the controllers have been
obtained via harmony search optimization technique according to an effective cost function. Also, the performance of enhanced NPID controller has been investigated by
comparing it with linear PID controller. The experimental and simulation results show
that the proposed NPID controller has minimum rise time and settling time through constant position reference test. Also, the NPID control is faster than the linear PID control by 40% in case of variable position reference test.

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