An Auto-Tuning Method for the Scaling Factors of Fuzzy Logic Controllers with Application to SISO Mechanical System

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Abstract:

A PD-like self-tuning fuzzy controller based on tuning of scaling factors (STFC) by gradient descent method is presented. The tuning scheme allows the tuning of the scaling factors to be on-line. Tuning scaling factors is more effective and simpler than tuning all the parameters of standard fuzzy logic controller (FLC). The aim is to obtain good performance parameters, such as the rise time, the overshoot, the steady-state error. Experimental results of an inverted pendulum system with STFC controller show a better performance in the transient and steady state phases than other classical controllers like PD, PID, auto-tuned PID controller (PID-AT), and linear quadratic regulator (LQR).

Keywords:

Fuzzy logic controller (FLC), scaling factors, gradient decent method, performance indices.

Published In: