

Position Control of Pneumatic Actuator using Cascade Fuzzy Self-Adaptive PID

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Abstract:

Pneumatic systems are widely used in the industrial automation with its advantages in high power ratio, low cost and cleanliness fluid medium. However, the complex nonlinearities of pneumatics system make this system having difficulty to perform precise motion control especially in providing precise steady state tracking error on rod piston and stable pressure control. To overcome this issue, a cascade control technique named Fuzzy Self-Adaptive PID (CFSAPID) control is proposed. The adaptive tuning by Fuzzy Logic Controller (FLC) is designed as tuner for PID controller. The proposed CFSAPID is simulated and verified on single-piston double acting valve pneumatic system model plant, and compared with single FSAPID controller. Four parameters are focused for analysis including steady state error tracking, piston velocity, pressure on piston chambers and force friction. The effectiveness of proposed CFSAPID has been successfully demonstrated and proved through simulation studies.

Keywords : Pneumatic Actuator; Fuzzy Logic; PID Control; Motion Control

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