

Ultra Precise Positioning Control System for General Purpose Pneumatic Rotary Actuator

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1 Introduction & Methodology

Rotary pneumatic actuators are popular for their simplicity, speed, safety, and power—to—weight ratio. However, they struggle to match the precision of electrical actuators due to nonlinearities in pressure response and friction. This paper proposes a new control system with a compensator to achieve high—precision positioning in rotary pneumatic actuators.

2 Results

The results showed high precision obtained during the steady state. The accuracy obtained in the steady state is 1/10,000 deg (0.1mdeg). It also showed quick response and excellent tracking during the transient response due to implementation of feedforward control.

3 Conclusion

Study designed and implemented compensator-based control that achieved high precision of 1/10,000 deg using general purpose rotary actuator.

Actual without compensato Reference — Reference Actual with all ON — Actual without feedforward Actual with all ON Actual without compensato 를 135.000 -10.0 90.000 45.000 135.007 135.006 $\pm 1/10,000 \deg$ 135.004 135.003 음 135.002 Measured with FF Measured with FF Measured without FF 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23

The proposed compensator works for precise positioning in the steady state and feedforward improves tracking performance for reference trajectory in dynamic response region.

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