

H-Infinity and RST Position Controllers of Rotary Traveling Wave Ultrasonic Motor

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Abstract : Traveling Wave Ultrasonic Motor (TWUM) is a compact, precise, and silent actuator generating high torque at low speed without gears. Moreover, the TWUM has a high holding torque without supply, which makes this motor as an attractive solution for holding position of robotic arms. However, their nonlinear dynamics, and the presence of load-dependent dead zones often limit their use. Those issues can be overcome in closed loop with effective and precise controllers. In this paper, robust H-infinity (H^∞) and discrete time RST position controllers are presented. The H^∞ controller is designed in continuous time with additional weighting filters to ensure the robustness in the case of uncertain motor model and external disturbances. Robust RST controller based on the pole placement method is also designed and compared to the H^∞ . Simulink model of TWUM is used to validate the stability and the robustness of the two proposed controllers.

Keywords : piezoelectric motors, position control, H^∞ , RST, stability criteria, robustness

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