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Adaptive Backstepping Position Control of Pneumatic Anthropomorphic Robotic Hand (Conference Paper)

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Abstract

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This paper presents a nonlinear adaptive backstepping algorithm for position control of an anthropomorphic robotic hand. The contraction force of the pneumatic artificial muscle (PAM) actuators has been modeled based on an empirical approach and the overall finger is represented as a nonlinear second order system, taking into account the system uncertainty caused by hysteresis phenomenon in PAM actuators. Adaptive backstepping controller has been developed by formulating the estimator of the system uncertainty. A cascade control system is developed by combining a conventional PID control, as an inner loop controller, with the adaptive backstepping position control as the outer loop of the controller. Finally, a simulation test is conducted to evaluate the performance of the proposed controller.

Author keywords

Adaptive Backstepping Anthropomorphic hand Pneumatic Muscle Actuator Position control

Indexed keywords

Engineering controlled terms: Actuators Adaptive control systems Algorithms Backstepping Cascade control systems Controllers Intelligent control Muscle Pneumatic actuators Pneumatic equipment Pneumatics Robotic arms Robotics Smart sensors Three term control systems

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