



AUTO-ADAPTIVE CONTROL OF A ONE-JOINT ARM DIRECT DRIVEN BY ANTAGONISTIC SHAPE MEMORY ALLOY

D Josephine Selvarani Ruth, S Sunjai Nakshatharan and K Dhanalakshmi

Department of Instrumentation and Control Engineering

National Institute of Technology, Tiruchirappalli, India

E-mail: djsruth@gmail.com, sunjainakshatharan@gmail.com, dhanlak@nitt.edu

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Abstract— This paper pursues a promising approach to obtain strain feedback based angular motion control of a manipulator for any robotic application. The proposed single degree of freedom manipulator uses antagonistic shape memory alloy (SMA) actuated wires. Antagonistic SMA actuated structures employ opposing pairs of one-way SMA actuators to create systems capable of a fully reversible response. A self-tuning PID type fuzzy (auto adaptive) based control scheme is designed and implemented experimentally. The controller is designed based on the model estimated by using system identification technique. Experimental and simulation results show that antagonistic SMA actuator in combination with the controller can track any input trajectory signal with high accuracy motion control and is suitable for various control applications.

Index terms: Shape memory alloy, antagonistic configuration, angular motion control, one-joint arm manipulator, self-tuning fuzzy PID