

Feedback Control of Ionic Polymer Actuators

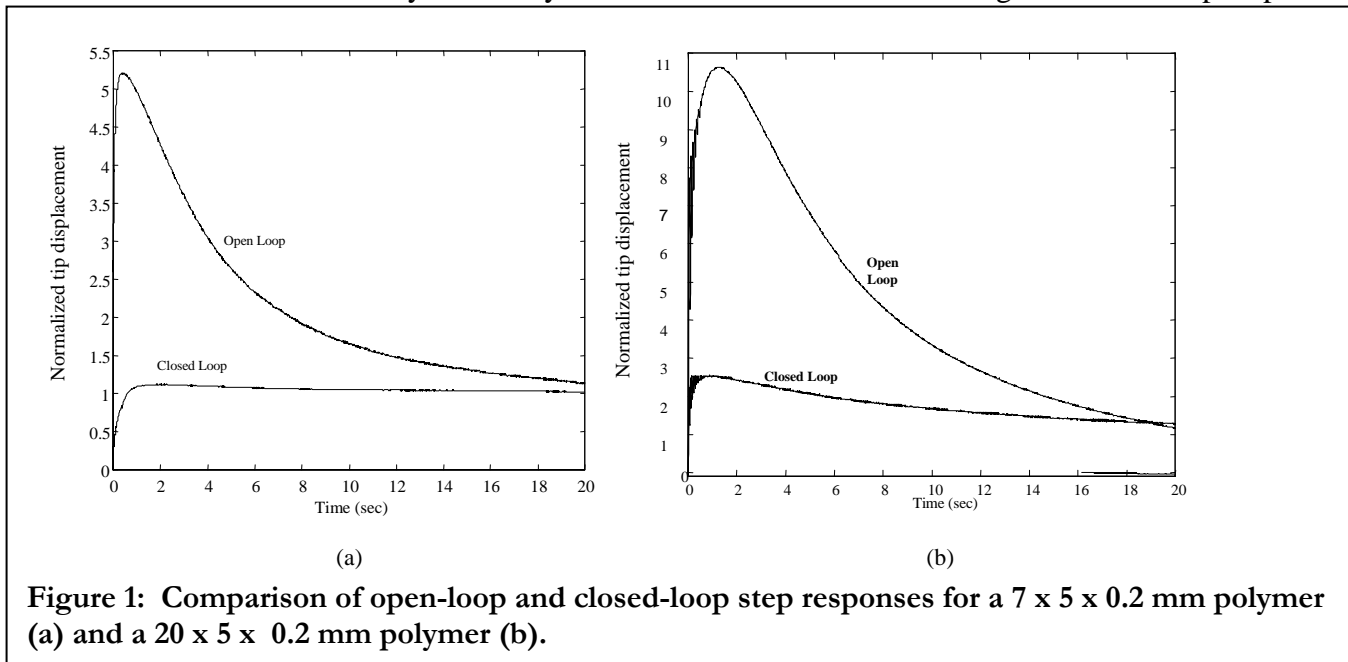
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Closed-loop feedback control has been demonstrated for a class of cantilever ionic polymer actuators. Polymer samples obtained from Dr. M. Shahinpoor at The University of New Mexico were used to study the ability of

illustrate that the displacement exhibits a rise time on the order of 50-100 msec and a 5-15 second relaxation time. As shown in Figure 1, feedback control substantially decreases the overshoot and settling time of the step response.



feedback control to increase the response time of the actuators.

The tests were performed on a series of 10 mm wide, 0.2 mm thick samples with lengths that ranged from 5 mm to 25 mm. Tip displacement was measured with a laser vibrometer and feedback control was implemented on a digital signal processor. A power amplifier was used to excite the ionic polymer actuators. Open-loop responses to a step change in the voltage

The settling time of the shorter polymer was decreased by a factor of 10. Slower response times were exhibited by the longer polymer due to the existence of a resonance mode within the control bandwidth [Mallavarapu and Leo (2001)]. This work was sponsored by the U.S. Air Force and the National Science Foundation.

Mallavarapu, K., Leo, D.J., 2001, "Feedback control of ionic polymer actuators," to appear, *Journal of Intelligent Material Systems and Structures*.