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Rapid Hydrogel Microactuator Using Elastic Instability HOWON LEE, CHUNGUANG XIA, NICHOLAS FANG, University of Illinois at Urbana-Champaign — Rapid Hydrogel Microactuator Using Elastic Instability Inspired by rapid movement of sensitive plants such as Venus flytrap [1], we present an innovative way to enhance actuation speed of hydrogel micro devices by exploiting elastic instability. In this work, hydrogel micro devices in doubly curved shape are designed and fabricated using projection micro-stereolithography[2], with embedded microfluidic channels on the surface. Local swelling of hydrogel around channels causes bending which subsequently induces stretching of the soft structure. Such coupling gives rise to elastic instability, the onset of which triggers rapid conversion of stored elastic energy into kinetic energy in fast motion. We further designed a set of devices with different dimensions, which leads to different coupling of elastic energy in bending and stretching [1]. Our experimental results verified the critical coupling parameter that triggers snap-buckling motion. Ongoing experiments are investigating the actuation speed as a function of coupling parameter. This novel approach promises new potential applications for hydrogel based devices in various fields of study including microfluidics, soft robotics, artificial muscle, and drug delivery. Reference [1] Forterre, Y., et al, Nature, 433, 421-425 (2005) [2] Sun, C., et al, Sensors and Actuators A, 121:1, 113-120 (2005)

Howon Lee
University of Illinois at Urbana-Champaign

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