Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Ultrasoft Electronics for Hyperelastic Strain, Pressure, and Direct Curvature Sensing[1] CARMEL MAJIDI, REBECCA KRAMER, ROBERT WOOD, Harvard University — Progress in soft robotics, wearable computing, and programmable matter demands a new class of ultrasoft electronics for tactile control, contact detection, and deformation mapping. This next generation of sensors will remain electrically functional under extreme deformation without influencing the natural mechanics of the host system. Ultrasoft strain and pressure sensing has previously been demonstrated with elastomer sheets (eg. PDMS, silicone rubber) embedded with microchannels of conductive liquid (mercury, eGaIn). Building on these efforts, we introduce a novel method for direct curvature sensing that registers the location and intensity of surface curvature. An elastomer sheet is embedded with micropatterned cavities and microchannels of conductive liquid. Bending the elastomer or placing it on a curved surface leads to a change in channel cross-section and a corresponding change in its electrical resistance. In contrast to conventional methods of curvature sensing, this approach does not depend on semi-rigid components or differential strain measurement. Direct curvature sensing completes the portfolio of sensing elements required to completely map hyperelastic deformation for future soft robotics and computing.

[1]NSF MRSEC DMR-0820484

Carmel Majidi
Harvard University

Date submitted: 18 Nov 2010 Electronic form version 1.4