



Fig. 2. Selection of twelve soft actuator designs simulated using shell (color) and tetrahedral (transparent) finite element meshes. Insets show the un-actuated designs. Color contours show L2 norm of local difference in position as predicted by the two simulations, normalized by the undeformed length of the actuator. In these simulations we remove all degrees of freedom from a group of nodes at one end of the actuator and apply a quasistatic pressure load to all internal faces. Mesh and material model data are given in Table II. These actuators exhibit bending, twisting, and extension modes of deformation, and shell meshes capture the deformation shapes well. As expected, shell meshes are less compliant at equivalent pressure due to numerical locking, however the trajectories of the deformation are remarkably similar. Generation of shell and volume meshes, as well as simulation execution and post-processing, is fully automated. The color map used in these plots originates from ColorBrewer [33]. All designs are represented by implicit geometry functions available for download: <https://www.matterassembly.org/soft-actuator-synthesis>.