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Shape evolution in blueprinted liquid crystal polymer films: topological defects and artificial iris[1] ANDREW KONYA, ROBIN SELINGER, Kent State Univ - Kent — Blueprinted nematic polymer networks are programmable solids with a non-uniform director field imposed at crosslinking. The pattern encodes a shape evolution trajectory triggered by heat or any stimulus that changes the magnitude of nematic order, inducing folding, curling, etc., a form of auto-origami [1]. We present 3D finite element simulation studies of blueprinted films with high order topological defects of positive or negative charge to study resulting actuation, and compare to experiments by White et al [2]. Inspired by recent experiments by Zentel et al [3], we also model an artificial iris as a disk with a +1 defect and a circular hole. We consider a blueprinted director pattern that is purely radial, purely azimuthal, or at an intermediate angle, and model resulting actuation. Depending on the geometry, the iris may undergo expansion, contraction, and/or rotation. Interestingly, we find one geometry that actuates via pure rotation. We discuss potential applications in optics and robotics. Implementation of our 3-d finite element algorithm for NVIDIA CUDA-enabled GPU provides high speed performance. [1] de Haan et al DOI:10.1002/adfm.201302568 [2] ME McConney et al, DOI:10.1002/adma.201301891 [3] S Schuhladen et al, DOI:10.1002/adma.201402878

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