

# Reduced-Order Simulation of Flexible Meta-Materials

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We propose a reduced-order simulation and optimization technique for a type of digital materials which we denote as geometric meta-materials. They are planar cellular structures, which can be fabricated in 2d and folded in 3d space and thus well shaped into sophisticated 3d surfaces. They obtain their elasticity attributes mainly from the geometry of their cellular elements and their connections. While the physical properties of the base material (i.e., the physical substance) of course influence the behavior as well, our goal is to factor them out. However, the simulation of such complex structures still comes with a high computational cost. We propose an approach to reduce this computational cost by abstracting the meso-structures and encoding the properties of their elastic deformation behavior into a different set of material parameters. We can thus obtain an approximation of the deformed pattern by simulating a simplified version of the pattern using the computed material parameters.