Auxetic Structures: Shock Absorption and Zero-Stiffness

MAE 263F

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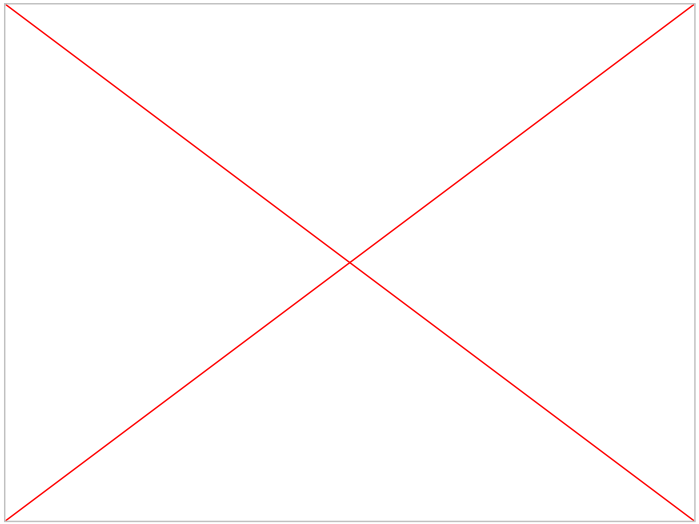
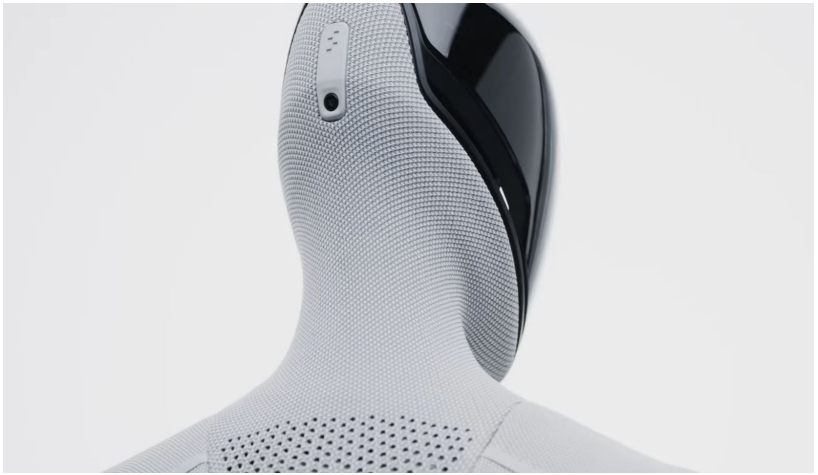
Motivation

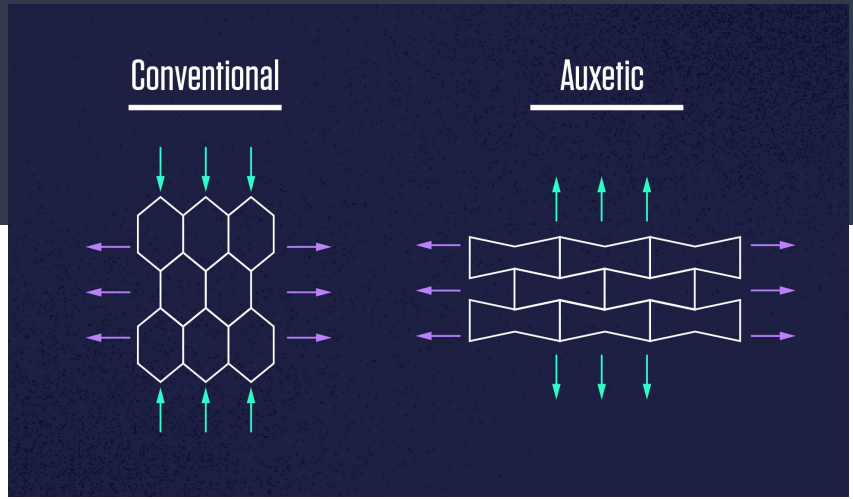
- Need for “robotic skin” to ensure environmental and human safety
- Testing of “quasi zero-stiffness” robotic skin

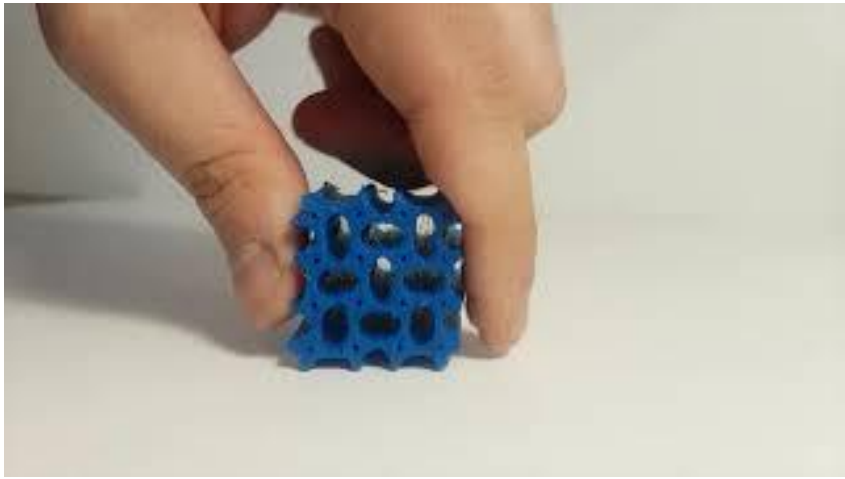




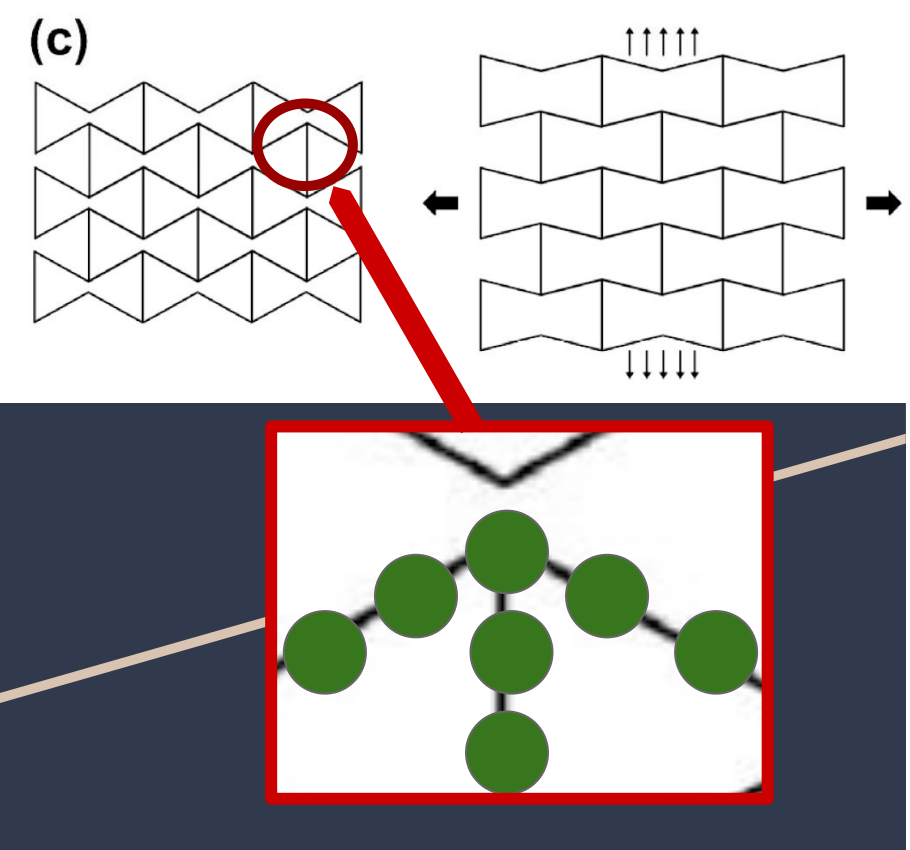
Goal

- Testing different Auxetic lattices under uniform load to measure the Poisson ratio of the different lattices
- Measurements to observe are compression/displacement, and energy absorption, stiffness(elasticity)
- Tested using a lattice of elastic beams with the properties of TPU
- Plan to expand to 3-dimensional structure lattice

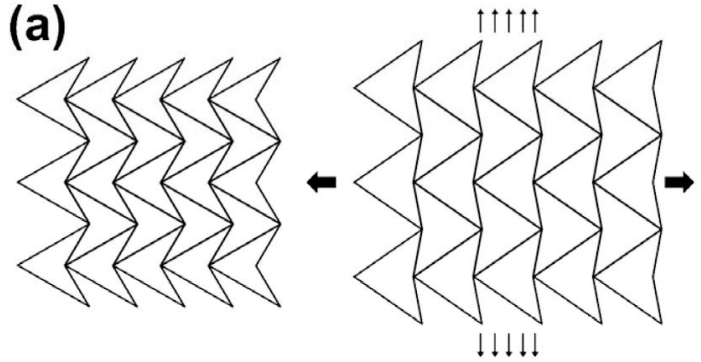


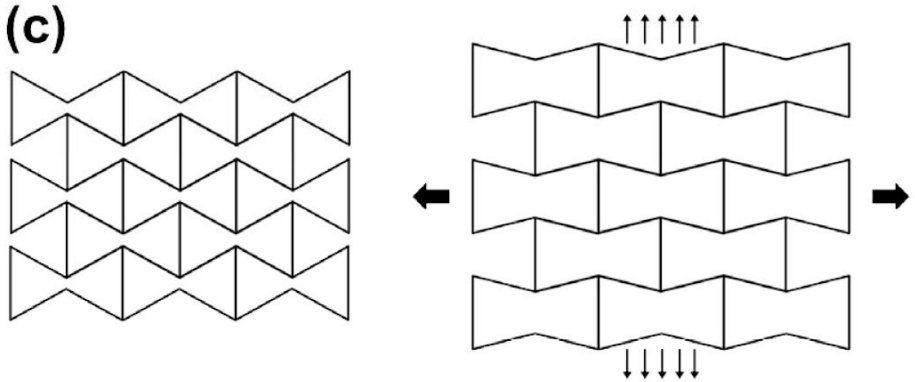


The Simulation



- Design of a beam-spring network using the the tested lattices
- Applying uniform loads/forces on the edges of the lattice to see deformation and testing passion's ratio
- Releasing forces to see the "zero-stiffness" quality of the lattice - returning to its original shape


(a)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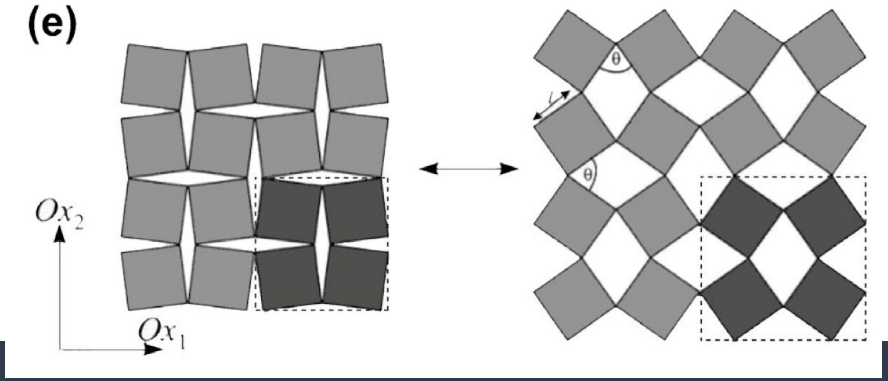
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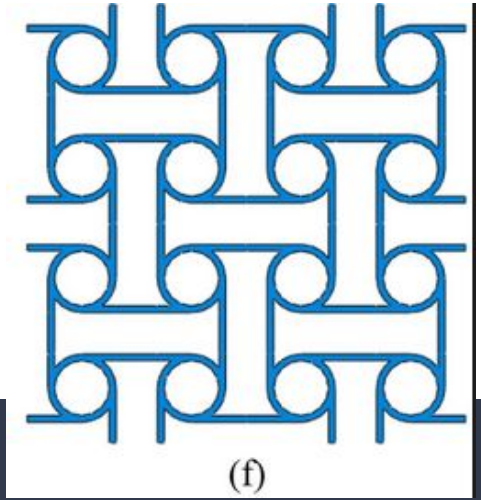
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