Abstract Submitted
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Transformable topological mechanical metamaterials[1] D. ZEB ROCKLIN, SHANGNAN ZHOU, KAI SUN, XIAOMING MAO, University of Michigan, Department of Physics — We present a class of mechanical metamaterials characterized by a *uniform soft deformation*—a large, zero-energy homogeneous elastic deformation mode of the structure—that may be used to induce topological transitions and dramatically change mechanical and acoustic properties of the structure. We show that the *existence* of such a mode determines certain exotic mechanical and acoustic properties of the structure and its *activation* can reversibly alter and tune these properties. This serves as the basis for a design principle for mechanical metamaterials with tunable properties. When the structure's uniform mode is primarily dilational (shearing) its surface (bulk) possesses phonon modes with vanishing speed of sound. Maxwell lattices comprise a subclass of such material which, owing to their critical coordination number (four, in 2D), necessarily possess such a uniform zero mode, often termed a Guest mode, and which may be *topologically polarized*, such that zero modes are moved from one edge to another. We show that activating the deformation can alter the shear/dilational character of the mode and topologically polarize the structure, thereby altering the bulk and surface properties at no significant energy cost. arXiv:1510.06389 [cond-mat.soft]

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