M.Sc. Thesis Proposal

Deformation decay in Metamaterials

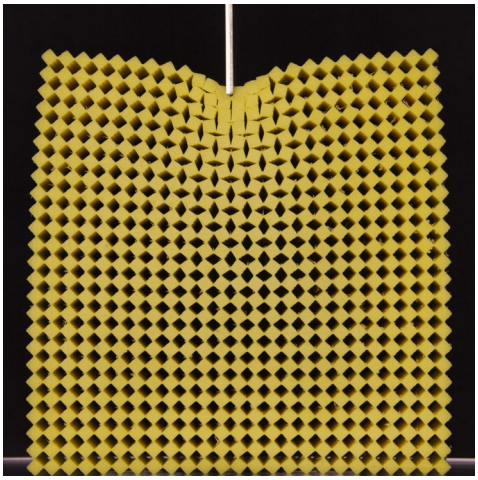

Image of a locally indented mechanical metamaterial[1]

Background

Mechanical metamaterials are a new type of materials that obtain their mechanical properties from structure rather than from their chemical composition. In a recent paper, Coulais et al.[1] showed how the structure of a mechanical metamaterial also affects how a local deformation propagates through the material.
We propose to use the controllable decay of deformation in these materials to build mechanisms that convert multiple inputs to smaller and more precise outputs. By changing the structure of these engineered materials, the ratio between deformations at the inputs and outputs of the materials can be prescribed. This could be used to convert a coarse motion from an actuator into a smaller, more accurate motion for use in precision mechanical applications.

Challenge

In this project, you will study how different metamaterial structures affect the deformation decay in a material and design a systematic method to change the rate of deformation decay within a material by changing its structure. Using this method, you will design and construct a compliant structure that converts deformations at multiple points of the structure into smaller output deformations at different output positions.

Please contact for more details

Supervisor 1: Freek Broeren (f.g.j.broeren@tudelft.nl)
Supervisor 2: Volkert van der Wijk

1Coulais, Corentin, Dimitrios Sounas, and Andrea Alù. 2017. “Static non-reciprocity in mechanical metamaterials.” *Nature*, February. Nature Research. doi:10.1038/nature21044.