Strategies for mechanical metamaterial design

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PROPOSITIONS

accompanying the thesis

Strategies for Mechanical Metamaterial Design

I

Purely geometric models effectively describe the physics of mechanical metamaterials.

Chapter 2 of this thesis.

II

Focusing on near-perfect mechanisms instead of exact mechanisms opens a large design space for metamaterials.

Chapter 3 of this thesis.

III

Particle swarm optimization is especially advantageous for handling problems of continuous domains of moderate dimensions.

Chapter 3 of this thesis.

IV

Controlled geometric frustration is an effective route towards mechanical metamaterials programmed with specific shape-shifting response.

Chapter 4 of this thesis.

V

Any given continuous trajectory can be approximately realized by unit cells of unimode metamaterials.

Milton, J. Mech. Phys. Solids **61**, 1543 (2013).

VI

Disordered deformation pathways across different energy scales are prevalent in mechanical metamaterials, albeit largely unexplored.

Pinson et al., Nat. Comm. **8**, 15477 (2017).

VII

Self-adaptive algorithms represent the state-of-the-art in evolutionary computation.

Towards a New Evolutionary Computation, Springer **192**, 75 (2006).

VIII

Combinatorial design strategies, so far used for design of frustration-free metamaterials, also can be used for introducing controlled frustration.

Coulais et al., Nature **535**, 529 (2016).

IX

The future will bring artificial intelligence and responsive metamaterials together.

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