Propositions

accompanying the dissertation

Harnessing mechanical instabilities for functional structures using nonlinear building blocks

by

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1. A structure that snaps does not necessarily fail, collapse, or lose integrity; it may become stiffer and able to bear higher loads. *Chapter 2*
2. Shaping the profiles of equilibrium curves enables new energy transfer directions, actuation mechanisms, and deformation patterns. *Chapters 2 & 4*
3. Every building block is a curve, but not every curve is a building block. *Chapters 2, 3 & 4*
4. The number of turns accumulated by a force-displacement curve indicates the minimum number of degrees of freedom required to model the underlying physical system. *Chapters 3 & 5, & Ref. [100]*
5. Static simulation is more insightful than dynamic simulation: the former builds a map of all possible deformation pathways, whereas the latter traces only a single trajectory within it. *Chapters 3 & 4*
6. Nonlinear structures can behave as media stiffer than their constitutive material. *Chapter 4*
7. Ignoring immediate application constraints when designing a physical system can bring more innovative solutions – though these solutions may address problems that have yet to arise or may never arise in practice. *Chapters 2 & 4*
8. Mechanics is like chess. Even though the governing rules are simple, well-defined, and known for centuries, we still explore higher-level patterns and lack the intuition for a complete understanding.
9. Purely mechanical solutions are inherently more durable and sustainable than multi-physical approaches.
10. Caring about aesthetics is necessary for scientific research.