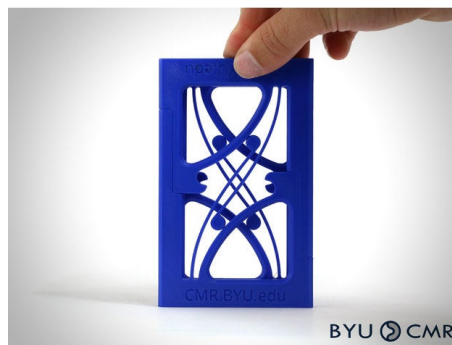


Master Thesis

Investigation of compliant constant-force mechanisms

Compliant mechanisms are flexible systems that achieve the transmission of forces and displacements through elastic deformation. The absence of "classical" joints and the possibility of manufacturing them as monolithic structures reduces the material consumption, the assembly costs, and the maintenance costs of these systems and is therefore of great interest in many fields. On the other hand, compliant mechanisms provide their own challenges including their nonlinear behavior.

Goal of this thesis is the systematic investigation of compliant constant-force mechanisms. While coil springs generally provide greater force with increasing extension, constant-force mechanisms provide the same force for the entire deformation process up to a defined displacement. Such mechanisms can for example be used for machine tools, sports equipment, or electrical contacts. The objective of this thesis is to investigate different concepts for compliant constant-force mechanisms. Nonlinear finite element simulations are used to gain an understanding of how these mechanisms work. The results are evaluated and differences between individual mechanisms and their behaviors are highlighted.



Compliant constant-force compressions mechanism

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The specific tasks are:

- Literature research on compliant constant-force mechanisms and their applications.
- Analytical consideration of compliant mechanisms.
- Analysis of compliant mechanisms using nonlinear finite element simulations (ANSYS, ...).
- Summary and evaluation of the results.

Recommended fields of interest

Compliant mechanisms, complex finite element simulations, structural mechanics

Literature

Tolman, Kyler A.; Merriam, Ezekiel G.; Howell, Larry L. Compliant constant-force linear-motion mechanism. *Mechanism and machine theory*, 2016, 106. Jg., S. 68-79.

Howell, Larry L. Compliant mechanisms. In: *21st century kinematics*. Springer, London, 2013. S. 189-216.