Laboratory for Product Development and Lightweight Design
TUM School of Engineering and Design
Technical University of Munich

Compliant mechanisms for nodes of a morphing truss

From Concept to CAD to Prototype

Robot Systems Group
Laboratory for Product Development and Lightweight Design

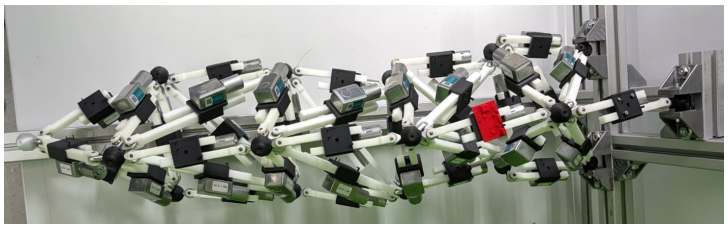

Figure 1 Morphing Truss Hardware

Project Description: Morphing truss structures can actively change their geometry through adjustable members, enabling lightweight and adaptive engineering systems. The performance of such structures strongly depends on the design of their nodes, which must allow smooth rotational motion while maintaining structural stiffness and minimizing weight. The objective of this student research project is to redesign the nodes of an existing morphing truss by utilizing compliant mechanisms. Unlike conventional joints that rely on bearings or hinges, compliant mechanisms achieve motion through elastic deformation of their material, reducing part count, friction, wear, and assembly complexity. The student will investigate suitable compliant joint concepts, develop CAD designs, and evaluate their mechanical performance through simulation and prototyping. Particular focus will be placed on balancing flexibility required for structural morphing with the stiffness and strength needed to withstand operational loads. The project combines principles of mechanical design, compliant mechanisms, structural analysis, and lightweight engineering.

Desired Skills: The project is suitable for students with a background in mechanical engineering, mechatronics, aerospace engineering, or a related field. Applicants should have a solid understanding of engineering mechanics and structural design, as well as experience with CAD modeling. Knowledge of finite element analysis (FEA) and mechanical simulation tools is beneficial for evaluating the performance of compliant mechanisms under load. An interest in lightweight structures, compliant mechanisms, and innovative design approaches is highly desirable. Experience with rapid prototyping, additive manufacturing, or experimental validation is considered an advantage, as the project may include the fabrication and testing of prototype joint designs.

Application Process: Interested candidates should submit their application via email, including a detailed CV and a current transcript of records. Please send your applications to the Email mentioned below.
We look forward to reviewing your background and discussing how you can contribute to this innovative project.

LPL

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