

The Southwest Mechanics Lecture Series

at

Texas A&M University

DESIGN AND DEMONSTRATION OF HIGH AUTHORITY SHAPE MORPHING STRUCTURES

BY

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Time: 4:00 p.m.
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Abstract

A high authority shape morphing plate capable of realizing large displacements while sustaining large loads is described and demonstrated. The design incorporates an active back-plane comprising a Kagome truss, capable of changing the shape of a solid face, connected to the back-plane by means of a truss core. The two shape deformations to be demonstrated consist of hinging and twisting. The design is performed by a combination of analytic estimation and numerical simulation, guided by previous assessments of the attributes of the Kagome configuration. The structure is shown to be capable of sustaining large passive loads at low weight. With presently available actuators, the authority is found to be actuator-limited. Alternative actuators demonstrate the full potential of the system.

An optimization ascertains the largest displacements achievable within the force capability of the actuators. The consistency between measured and calculated responses has allowed the numerical method to be used to set objectives for alternative materials, as well as structural and actuator enhancements. nano-mechanics of cross-scale phenomena associated with nano-adhesion, nano-friction, encapsulated nano-patterning and nano-imprinting.

