GALCIT Colloquium

Structures Subject to Movable and Configurational Constraints, with Application to Soft Robotics and Locomotion

Dr. Francesco Dal Corso
Assistant Professor of Solid and Structural Mechanics
University of Trento, Italy

Examples of structures subject to movable and configurational constraints will be shown to display peculiar features such as snap-back instabilities, self-restabilization, and motion through release of elastic energy.
A soft robot arm, loaded at one end with an hanging load, has the other end constrained by a slowly rotating clamp. Depending on the load amount, the behaviour of this system switches from an 'elastica compass' to an 'elastica catapult'. A blade constrained by a sliding sleeve ending with a linear spring may be a self-restabilizing structure. In this case, at increasing load, the deflection initially increases and then progressively decreases until the rod is totally inserted into the sliding sleeve.
A rod is subject to transversal forces (twist or bending) and frictionless constraints generate a longitudinal propulsive force realizing (torsional or flexural) locomotion. This motion occurs by tranforming elastic energy in kinetic energy. All these structural systems can be modelled as nonlinear elastic structures and solved analytically. Physical models have been designed, realized and tested, confirming the theoretical predictions.
The results represent innovative concepts ready to be used in advanced applications, as for example in soft-robotics locomotion.

3:00 PM, 27th January 2017
Lees-Kubota Lecture Hall
133 Guggenheim
Lecture followed by refreshments at 4 PM.

Graduate Aerospace Laboratories at the California Institute of Technology

For information please contact: Mallory Neet at mneet@caltech.edu or (626)395-8026