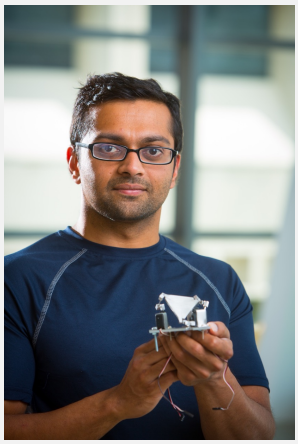
PennState College of Engineering

Systems, Controls, and Robotics Seminar Series

Tensegrity Space Structures: Assembly, Automation, Mechanics and Manufacturing



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Seminar: Thursday Nov. 3, 10:00 AM, 112 Kern

ABSTRACT

Tensegrity systems are mass efficient structural elements that use axially loaded components to achieve a three-dimensional shape. The talk focusses on recent advances in automated manufacturing and assembly of integrated mass-efficient deployable tensegrity structures. Mechanics and topologies associated with novel tensegrity bending structures, prisms and plates are presented. The manufacturing automation activities for on orbit assembly and manufacturing of the deployment of polymorphous satellite systems engendered by the innovative structures and tensegrity building blocks are detailed. Advances in space robotics, flexible electronics, sensing and actuation technologies will be used to demonstrate the mass-efficient structural system operations, including autonomous assembly and in-space manufacturing of multifunctional structural modules. A set of technical demonstrations showcase an autonomous operation of the modular multifunctional structural systems that form the building blocks of a large space structures. A second set of experiments that show a robotic manufacturing system that builds the tensegrity modules from a combination of raw and prefabricated materials. Novel approaches for projectile 3D printing of free-flying space robotic platforms will provide glimpses of space robotics in the future.

BIOGRAPHY

Manoranjan Majji is an associate professor of Aerospace Engineering at Texas A&M University and is the director of the Land, Air and Space Robotics laboratory. He has a diverse background in several aspects of dynamics and control of aerospace vehicles with expertise spanning the whole spectrum of analysis, modeling, computations and experiments. In the areas of astrodynamics, nonlinear estimation and system identification, he has made fundamental contributions documented in over 150 publications (including 43 journal articles). He is the recipient of the National Geospatial Intelligence Agency's new investigator award. He has also been recognized by the Milton Plesur Award for undergraduate teaching excellence. He has earned the best reviewer title for the Journal of Guidance, Control and Dynamics four times, and is a senior member of the AIAA. In addition to being a scholar, Dr. Majji has a great deal of engineering experience developing software systems and embedded systems from OEM products. Working with Systems and Processes Engineering Corporation (SPEC) at Austin, he authored several data processing algorithms for LADAR systems. He holds a patent on holonomic omni-directional robot. His research has been funded by various agencies, including, NGA, NASA, AFOSR, ONR, DARPA, and AFRL.