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Tensegrity Space Systems: Assembly, Automation, Mechanics and Manufacturing

ABSTRACT:



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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 and is the Director of the Land, Air and Space Robotics (LASR) Laboratory at Texas A&M University. He has a diverse background in several aspects of dynamics and control of aerospace vehicles with expertise spanning the whole spectrum of modeling, analysis, computation, and experiments. In the areas of state estimation, astrodynamics, tensegrity systems, vision navigation, and system identification, he has made fundamental contributions documented in over 190 publications. He is a senior member of the IEEE, an associate fellow of the American Institute of Aeronautics and Astronautics (AIAA) and a fellow of the American Astronautical Society (AAS).