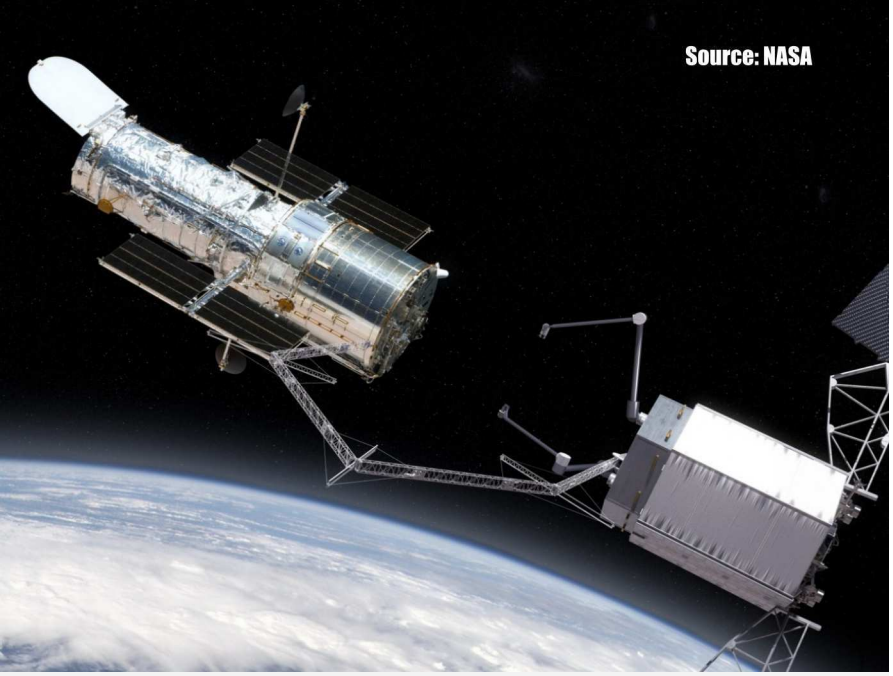

National Aeronautics and Space Administration

Robotics, Automation and Control

Tension Actuated in Space MANipulator (TALISMAN)

Structural Architecture For Long Reach Manipulators

NASA Langley Research Center has developed an improved version of its TALISMAN structural architecture for long reach manipulators. TALISMAN uses a series of tension members for stiffening, resulting in improved structural performance, as well as providing a means to actuate the joints, with improved mechanical advantage for the motors.

BENEFITS

- Enhanced Versatility
- Order of Magnitude Reduction in Mass
- Order of Magnitude Reduction in Packaging Volume
- Order of Magnitude Reduction in Power Requirements

APPLICATIONS

- Nuclear Fuel Manipulation
- Tank Cleaning and Confined Space Applications
- Automotive Manufacturing
- Other Assembly Line Manufacturing
- Floating Barrier Articulation
- Environmental Remediation
- Jig and Tooling for Aircraft Manufacturing
- Oil & Gas Industry for Offshore Remote Manipulation
- Undersea Manipulation

technology solution

THE TECHNOLOGY

The current iteration makes two significant improvements. The first is the ability to actively change the geometry of the TALISMAN components during operation. This change can take many forms including adjusting the amount that a fixed length spreader protrudes from one side of the arm to the other, telescoping the spreader in or out above or below the joint, deploying and/or retracting additional spreader arms, changing the geometry of the links between joints and changing the intersection of the tension elements with the links or spreaders. The capability to actively change components is important because it allows the device geometry, mechanical stiffness or actuator authority to be adjusted during operation.

The second is an arrangement of capstans that enable each tension segment to be actively controlled while using one or two tension elements per joint, without having springs in the load path.
The Third is a novel arrangement of cables that reduces the torque requirements (and thus the power requirements) of the motors by an order of magnitude while simultaneously adding an effective gear reduction by using a unique arrangement of differential capstans and pulleys.

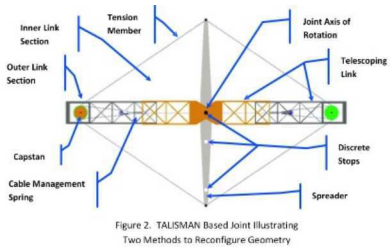

Figure 2. TALISMAN Based Joint Illustrating Two Methods to Reconfigure Geometry

TALISMAN based joint illustrating two methods to reconfigure geometry. Source: NASA

PUBLICATIONS

Patent No: 9,168,659

More Information

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