Space Webs as Infrastructure For Crawling Sensors on Low Gravity Bodies

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Mission Concept

Problem: difficult to land and to move on low-gravity bodies. Single-point-of-contact anchors susceptible to failure

Solution: Use net or rope to grapple onto body; net doubles as infrastructure to enable locomotion of crawler swarm

Example Applications
- Distributed spectroscopy
- Distributed seismology (using impactor)
- Distributed X-ray or alpha tomography
- Rigidization + passive control for distributed aperture imager or phased array antenna
- Terrain mapping

Initial Prototyping

Crawling mechanism prototype: rubber casted magnetic pinch roller crawling on Kevlar rope

Evaluation of AS7263 - a new-to-market chip-sized multispectral sensor ($8, 4mm²) - for discrimination between high iron and low iron meteorite samples

Next Steps: Validation + Adherence Mechanism Prototyping

Validate Initial Spectral Sensor Findings:
- 91% discrimination between high iron and low iron samples for training data using principal component analysis (left; pending further sensor calibration)
- Consider alternative sensing payloads

Adhesion + Rigidization Methods to be Considered:
- Extrusion of a fast-setting adhesive upon contact
- Contact melting to freeze the net in place
- Penetrating micro-anchors
- Bi-stable snapping onto the body upon contact

Net Dynamics in Microgravity:
- Draw from prior space web modeling efforts (right)
- Also study integration of power/com lines into net

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