Research Team

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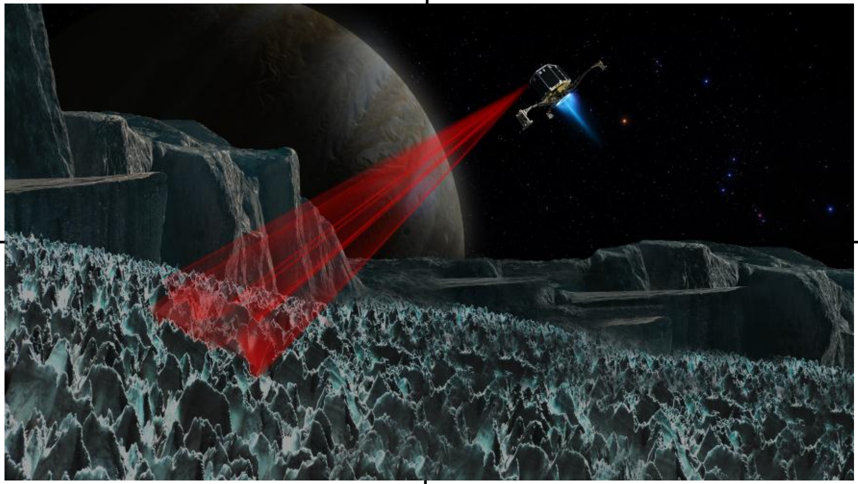
Research Objectives

- Develop information-theoretic exploration that maximizes extent and quality of site model while minimizing energy expenditure and human oversight.
  - Starting TRL: 1, Ending TRL: 3
- Develop a light, small, low-power sensor for ice and highly 3D terrain that is robust to glare, darkness, translucence, and stray light scattering.
  - Starting TRL: 1, Ending TRL: 3
- Develop modeling and dense mapping techniques for substantially 3D, icy surfaces.
  - Starting TRL: 1, Ending TRL: 3



Approach

- Develop sensor that can detect and model ice, rock, and regolith
- Innovate model for highly 3D spire and blade features in terrain that violates standard quasi-planar exploration assumptions
- Innovate an autonomous exploration methodology with a motion planner that maximizes information gain per unit time for autonomous exploration.
- Integrate the resulting sense, plan, act strategy on both flying and rolling robots.
- Validate the developments at sites in Pennsylvania that exhibit similar characteristics as the anticipated craggy, icy environments

Potential Impact

•Enables future autonomous missions on icy moons, permadark craters, and polar regions with brilliant, grazing light.

•Develops space-relevant sensing applicable to icy, dusty and shiny surfaces both illuminated and in the dark and highly reflective surfaces that are common on orbiting assets like ISS.

•Dual use in activities such as unrehearsed modeling of complex 3D terrestrial infrastructure like bridges, pipelines, & transmission towers.

•Development of robotic tools for avalanche, crevasse, and mountain rescue.