

Rock and Ice Climbing Robots for Volcanology

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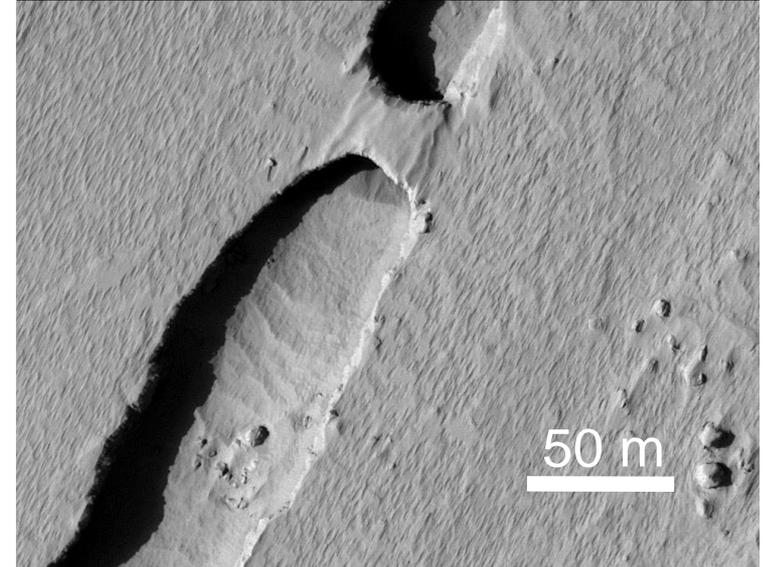
Jet Propulsion Laboratory
California Institute of Technology

Volcanic environments = extreme terrain

Vent access



Lava tube exploration



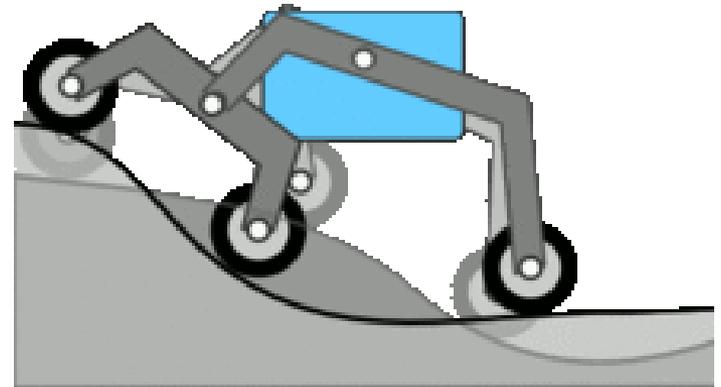
Glacier travel



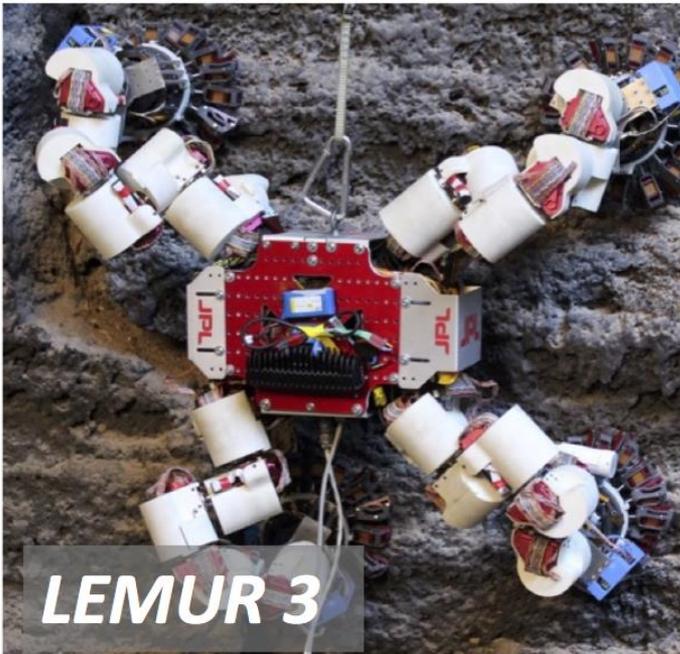
Fumarolic ice caves



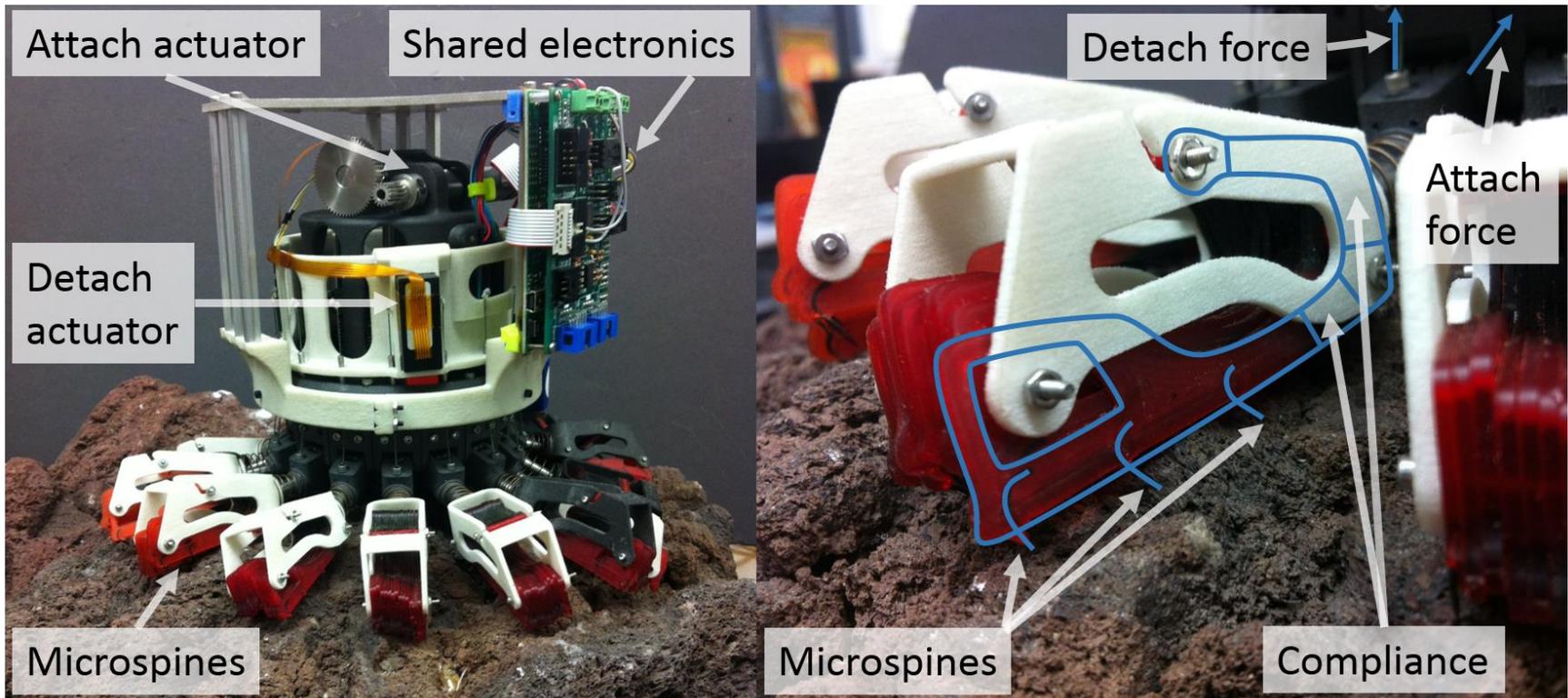
Rocker-bogie doesn't cut it



JPL Limbed Robots



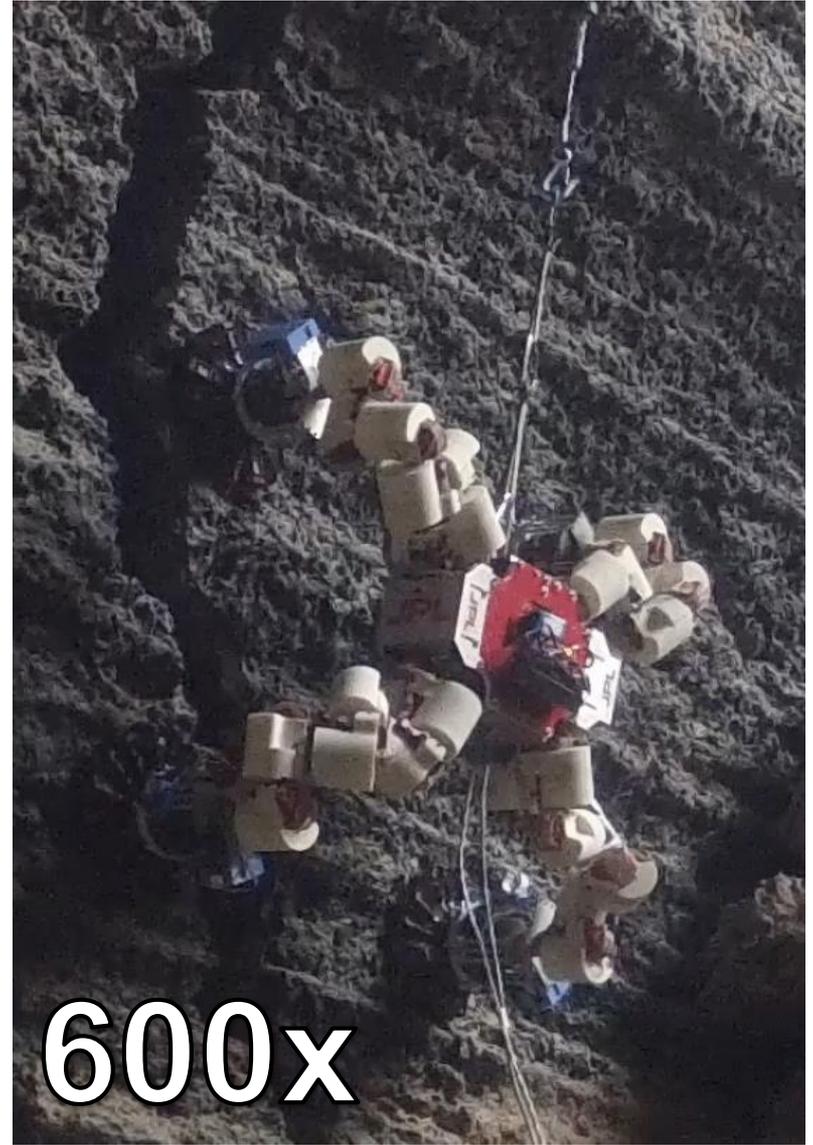
Microspine Grippers



Lava Tube Mobility with Microspine Grippers



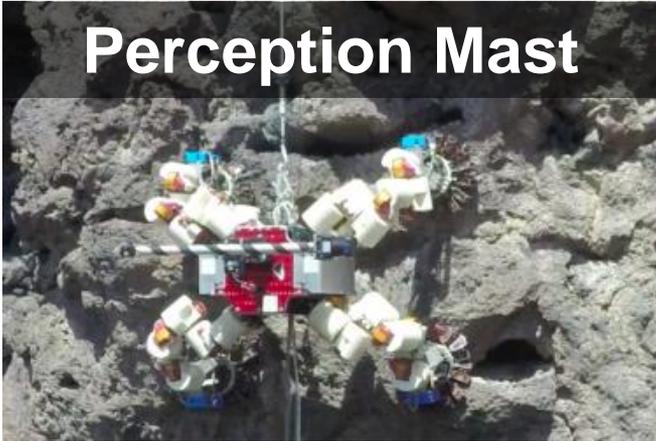
Big Skylight Cave, New Mexico



600x

Perception systems

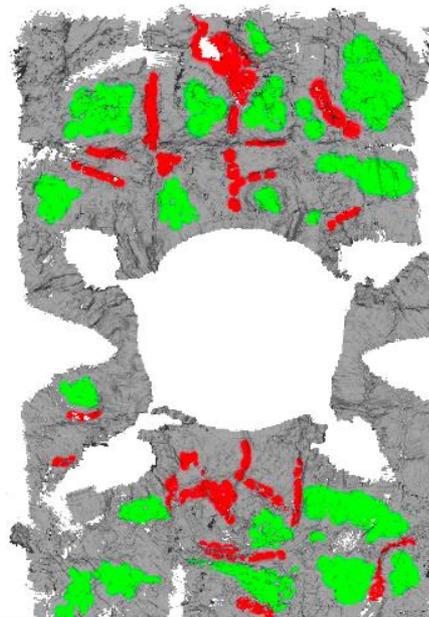
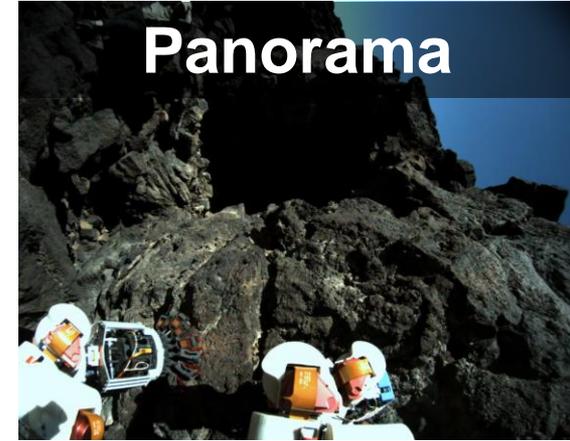
Perception Mast



LIDAR Cloud



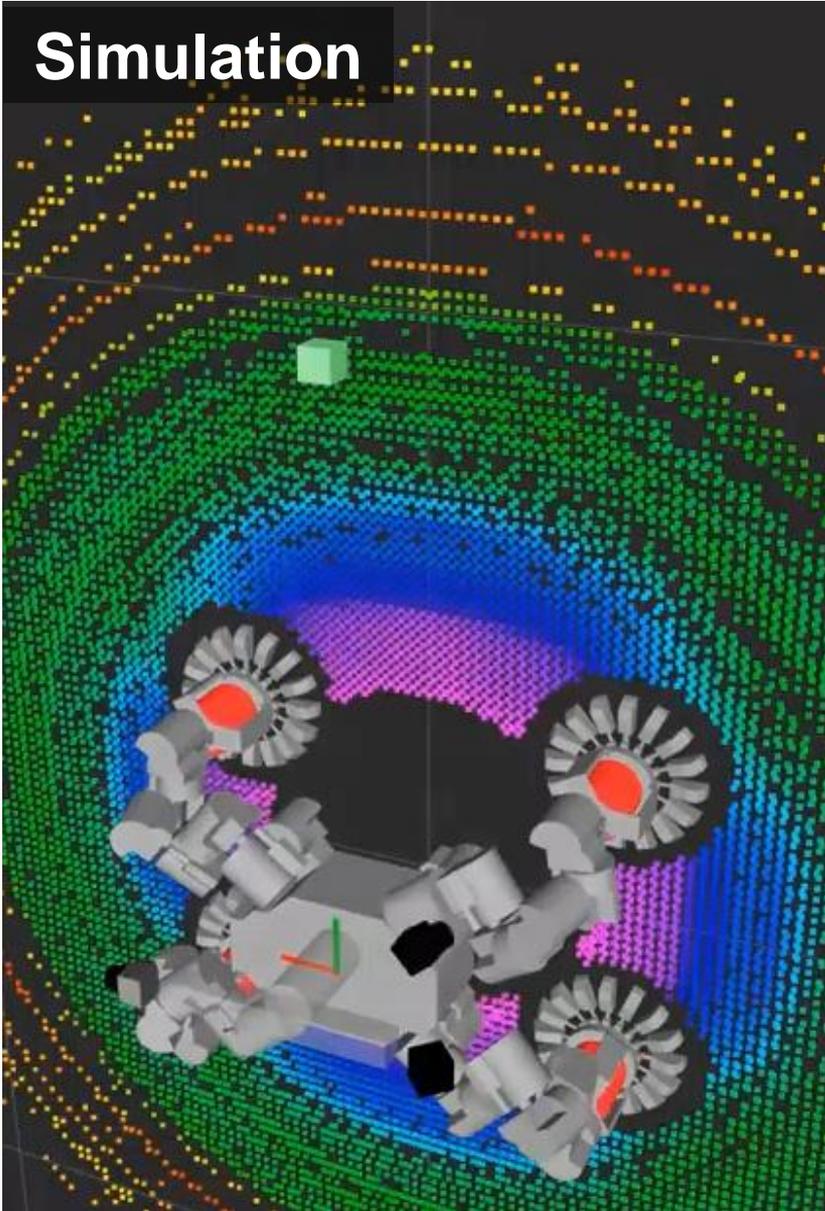
Panorama



Graspability Classifier using Expert Annotation

Autonomy

Simulation



Pisgah Crater, California

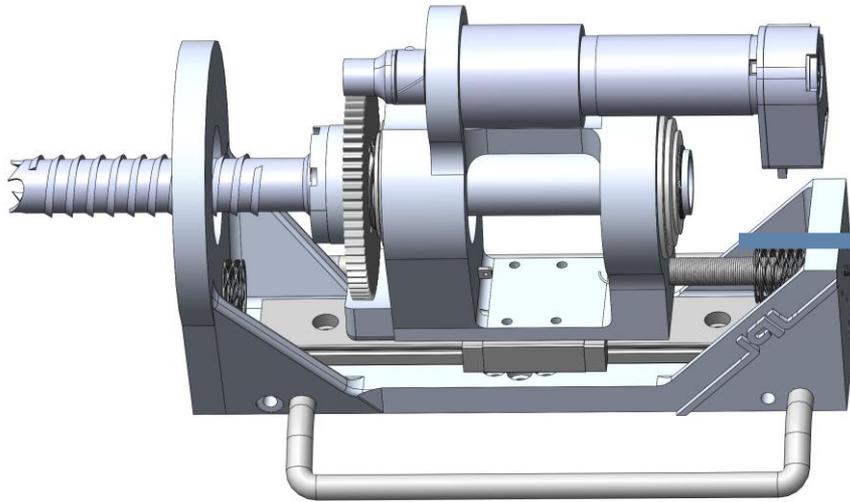


Ice Climbing

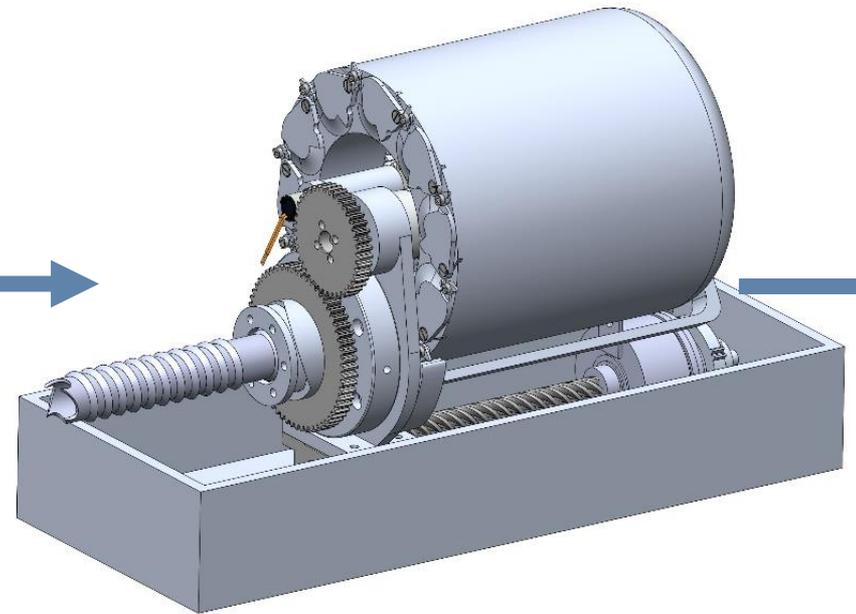


Design Path

Major Design Phases



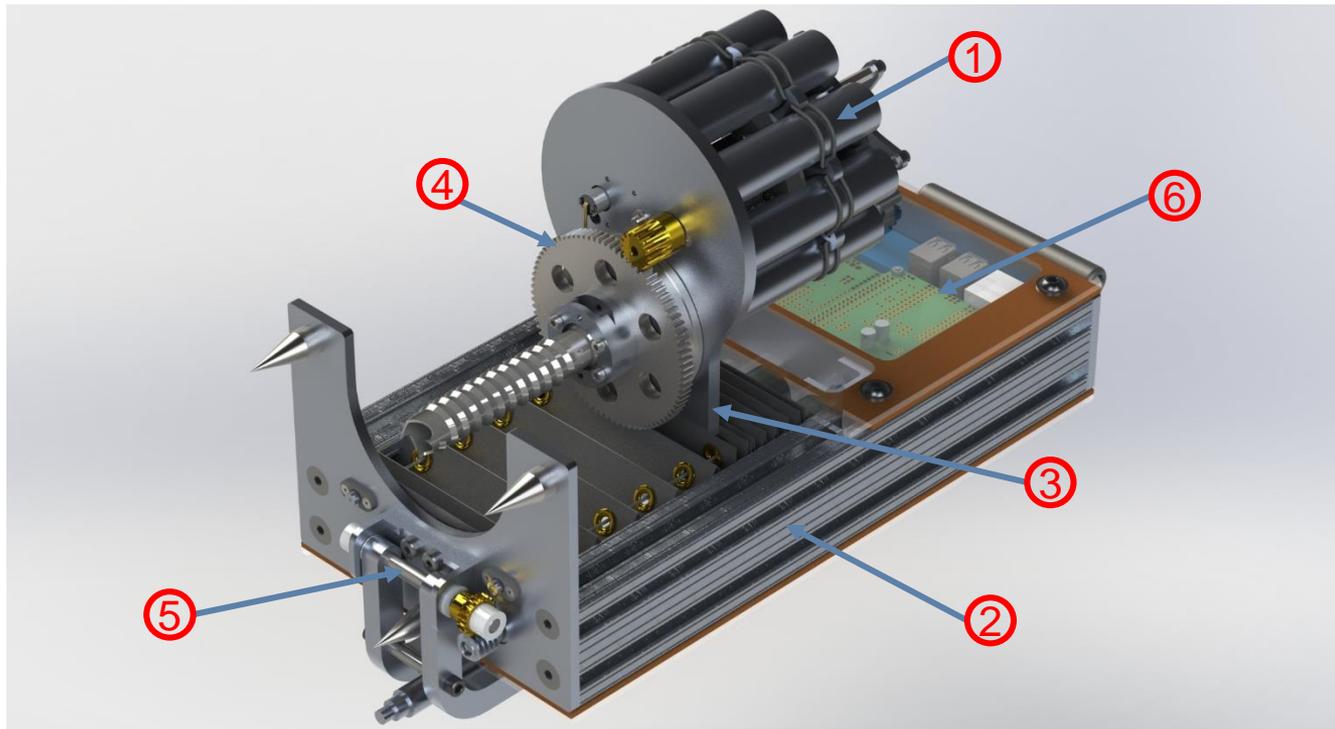
December 11



June 4

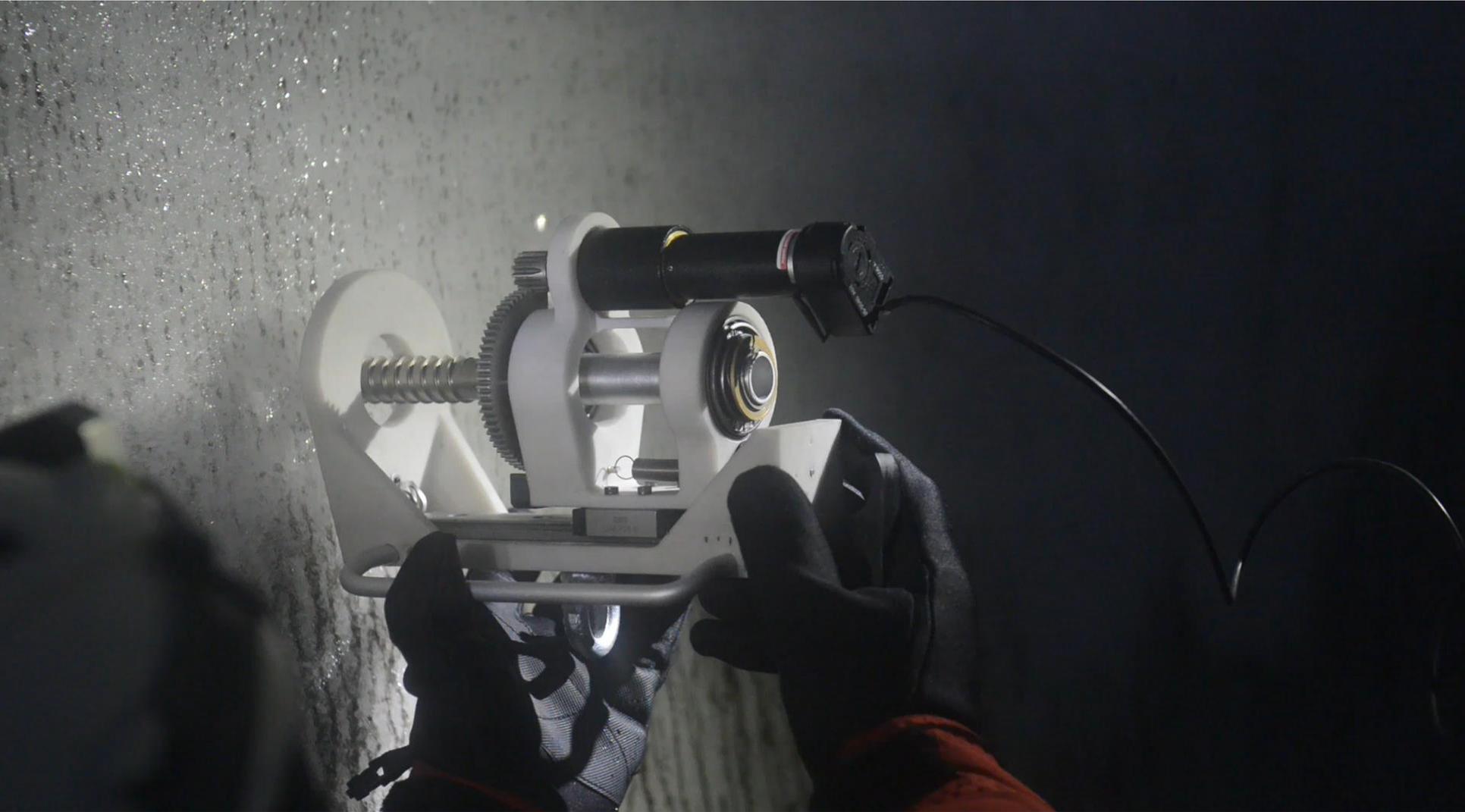
Design Overview

- ISEEv2.1 (Rainier Edition)



1. Capsule Carousel
2. Powertrain and Housing
3. Force Sensing Nut
4. Ice Screw Drive System
5. Stowing Unclogger
6. Electronics and Battery

Field test: Erebus 2016



Field test: Erebus 2016



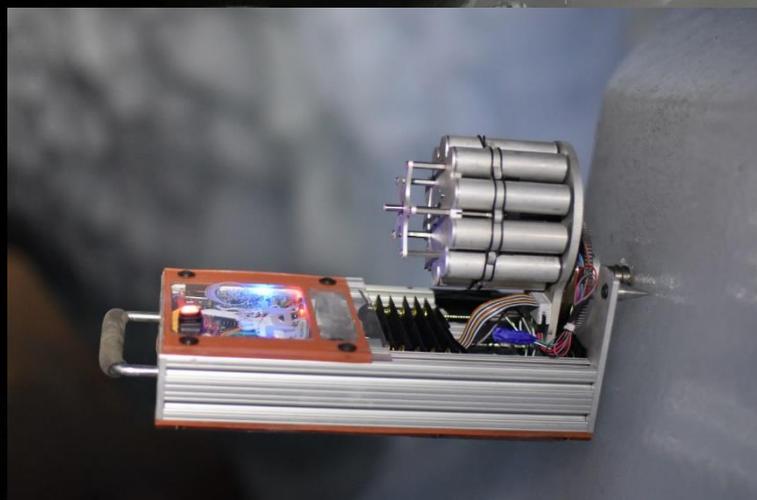
Field test: Erebus 2016



Field test: Erebus 2016



Field test: Rainier 2017



Field test: Rainier 2017



2017-06-01

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