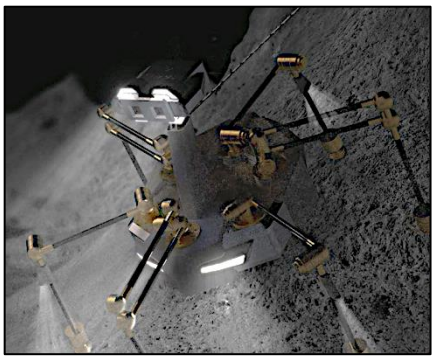
2022 BIG Idea Challenge Finalists



Arizona State University

"CHARLOTTE - Crater Hydrogen And Regolith Laboratory for Observation on Technical Terrain Environments"

Faculty Advisors: Dr. James Bell, Dr. James Rice, Prof. Tyler Smith

Team Video: https://youtu.be/00CsmGkdMtg

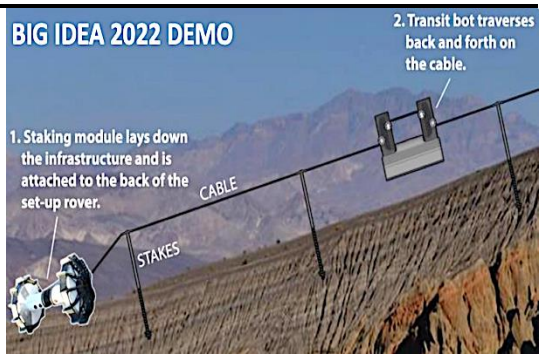
CHARLOTTE is a 6-legged rover designed to carry advanced scientific payloads up and down steep rocky terrain ranging in slopes from 30-75°incline using a rappel system. The rovers unique leg configuration allow the rover to maintain stable footing with three legs on the ground at all times. In addition, it is designed to carry the Mastcam-Z (Mars Perseverance) to acquire high resolution images and Mini-NS (LunaH-Map) for detecting the presence of water ice.

California Institute of Technology

"Lunar Architecture for Tree Traversal In-service-of Cabled Exploration (LATTICE)"

Faculty Advisors: Dr. Soon-Jo Chung, Dr. Issa Nesnas, Dr. Charles Elachi, Dr. Jason Kastner, Dr. Steve Wall, Dr. Michael Mello

Team Video: https://youtu.be/FAz3xY-eOvA



LATTICE: the Lunar Architecture for Tree Traversal In service of Cabled Exploration, will facilitate the exploration of lunar craters. Being a lightweight, rapidly deploying, long-lived robotic infrastructure, LATTICE will enable rovers and other entities to conduct operations in and around steep crater walls, opening the doors to untapped scientific and commercial opportunities.

Florida State University (FAMU-FSU College of Engineering)

"Extreme Terrain Quadruped (ET-Quad)"

Faculty Advisors: Dr. Jonathan Clark, Dr. Christian Hubicki, Dr. Camilo Ordonez, Dr. Shayne McConomy, Dr. Juan Ordonez

Team Video: https://youtu.be/ZOklf4lSlVE

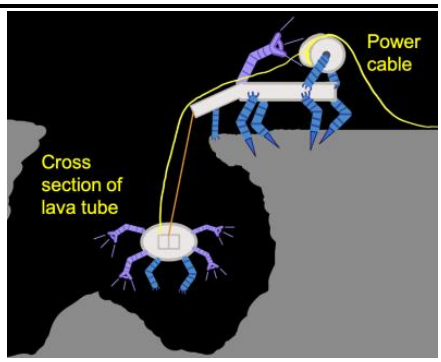
ET-Quad is a small-scale quadrupedal robot with multi-functional legs that allow it to traverse rough terrain, to wade or swim through deep, soft-packed regolith, and to climb up sheer rocky surfaces. The proposed robot is designed based on recent technological advances in building these multi-modal robots. These include innovations in modeling, leg design, and control.

Massachusetts Institute of Technology with Boston Dynamics, MassRobotics, and Robots5

"Walking Oligomeric Robotic Mobility System (WORMS)"

Faculty Advisors: Dr. Jeffrey Hoffman, Dr. David Trumper, Dr. Olivier de Weck

Team Video: https://youtu.be/5B2cSCKrPTE



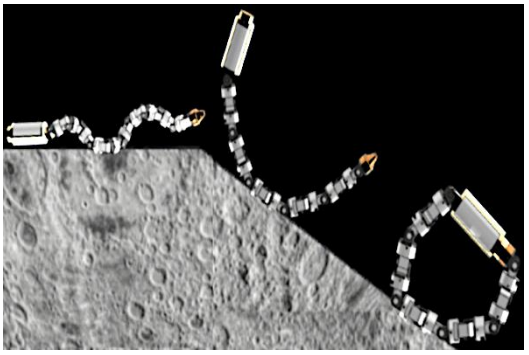
Our project is Walking Oligomeric Robotic Mobility System (WORMS), referring to an architecture where a robotic mobility capability emerges from the swarm-like integration of a small ('oligomeric') set of nearly-identical, articulating 'worms'. Mimicking arms, legs, and backbones, WORMS can be configured into diverse walking robots with a payload capacity from kilograms to tons. For our operational scenario, we deploy a charging and radio relay station in a PSR and provide maps of the region.

Northeastern University

"COBRA: Crater Observing Bio-inspired Rolling Articulator"

Faculty Advisor: Dr. Alireza Ramezani

Team Video: https://youtu.be/sNxFugMt8b4



COBRA is a snake-inspired multimodal rover that combines tumbling and slithering locomotion. Its mission is to explore Shackleton Crater and provide ground truth measurements of water ice concentration throughout the crater. The rover utilizes slithering locomotion to traverse porous regolith and tumbling to efficiently travel large distances on the steep crater slope by leveraging lunar gravity. COBRA is robust on uneven terrain and consists of lightweight, customizable modules.

University of Connecticut

"Morphing Tank-to-Leg Modality for Exploratory Lunar Vehicles"

Faculty Advisors: Dr. Fiona Leek, Dr. Ramesh Malla

Team Video: https://youtu.be/4zF1PQumCn8

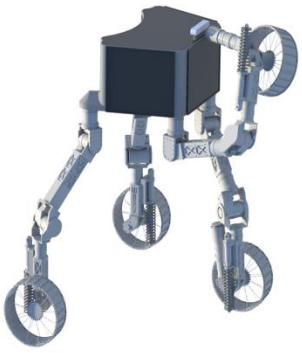
The proposed modality is a robust tank-to-leg hybrid which can withstand various environments encountered on the Moon, such as extreme operating temperatures, icy regolith, and inclines greater than 30 degrees. Our solution benefits from walking and tread driven motion while minimizing mechanical complexity. This is achieved by integrating lightweight tank treads into the legs of a quadruped design.

University of Maryland

"TRAVELS: Terrapin Rover Allows Versatile Exploration of the Lunar Surface"

Faculty Advisor: Dr. David Akin

Team Video: https://youtu.be/ecy2cGpxCgk



TRAVELS is quadrimodal mobility system: one which can roll, walk, leap, and rappel down steep slopes as necessary. TRAVELS will use the wheel-on-leg system to seamlessly switch between different movement options to adapt to the lunar environment it is presented with.