Astroverse, Uncovering Mars's Subterranean Secrets

Storyboard Title, Sequence, & Description

NASA's Jet Propulsion Lab emphasizes the immense potential of exploring planetary caves for human settlements, understanding planet evolution, and extraterrestrial life search. Caves offer a stable environment, protection from radiation and dust storms, minerals, gases, ice, and preserved information about a planet's history.

Our team seeks to train astronauts on critical operations involved in cave exploration, including maneuvering an exploration rover, surveying & mapping the cave, and tackling emergency situations.

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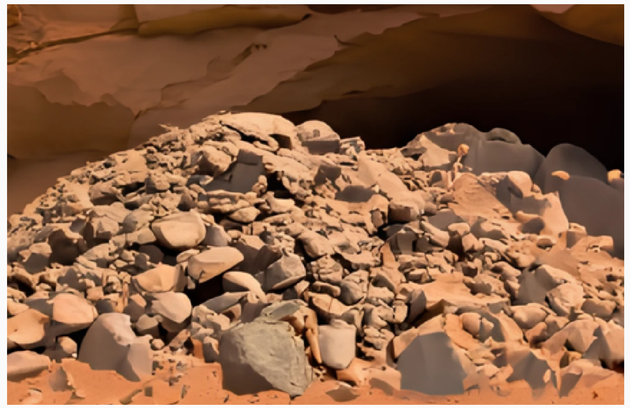

Assets Available in this Storyboard

1. Cave Exploration Rover equipped with a 360° camera, robotic arm, and drill
2. A.R. Headset that enables First-Person Perspective and communication
3. Handheld LiDAR scanner
4. Visualization software that displays LiDAR scans
5. Robot Operating System (ROS) Simulation Framework (allows configuration of parameters)
6. Cave model
7. ArcGIS Pro or other equivalent mapping software
8. Training and debriefing material

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Actions Executable in this Storyboard

1. Wearing an A.R. headset connected to the 360° rover cam.
2. Navigating the rover remotely
3. Generating a 3-D point cloud of the cave by a LiDAR scanner.
4. Operating the rover's manipulator arm and drill.
5. Using ROS Simulation Framework to alter parameters and train in various environments.
6. Randomising weak points in the cave which if not identified may cause collapse.
7. Accessing mapping software and sending generated maps to mission control.

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Frame Descriptions

1 Astronaut remotely operates (with a first-person perspective) a rover to navigate through the cave.

2 Key sub-tasks include navigating over boulders, steep inclines, and tight spaces.

3 Astronaut operates handheld LiDAR scanner to map cave system's shape and identify potential hazards.

4 Using the point-cloud data, here the astronaut creates a map with color-coded labels for rock formation, passages, and potential hazards.

5 In case of a cave collapse, astronaut uses the rover's manipulator arm and drill to clear debris.