Enabling Autonomous Lunar Surface Robotics with Artificial Intelligence

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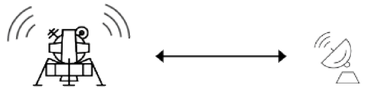
Challenges for Commercial Lunar Missions

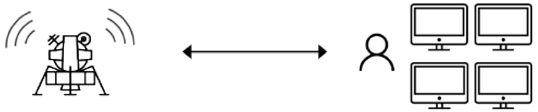
As commercial missions to the Moon become common, the need for self-reliant mission architectures grows. This is critical for the following reasons:

Communications latencies of up to 10 seconds round-trip.



Communications drop-outs due to technical or environmental circumstances.

Communications data transfer constraints due to the constrained data pipeline between the Moon and the Earth.

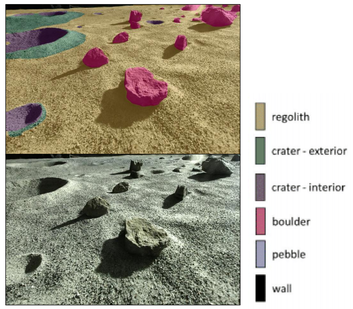


Enabling Autonomous Lunar Surface Robotics

Telecontrol is unfeasible due to communications latencies and drop-outs, so systems must complete tasks autonomously.

To support **safe** and **efficient** task planning and execution, the autonomous system must first understand its environment. To enable autonomous operations, Mission Control is pioneering the use of Deep Learning to extract key information in images from multiple robotic systems.

Artist's concept of lunar base construction. In this scene, multiple robotic systems require autonomous computer vision techniques to understand their environment. [Photo credit: NASA]



An example output of our AI-based lunar terrain classifier, using an image taken at our lunar analogue terrain testbed in Ottawa, Canada.

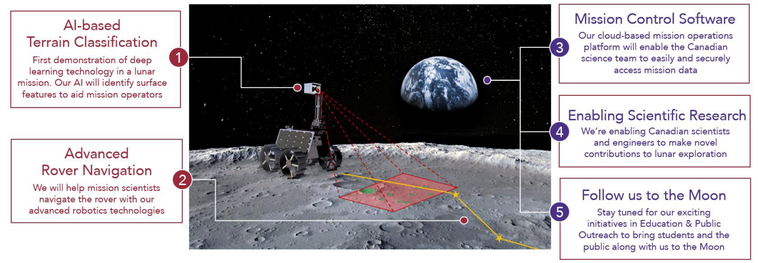
For example, a robotic machine that outfits structures with cabling and other components must be able to identify:

- objects it works with
- geometry of its working space
- whether a task was successful

Upcoming Lunar Surface Demonstration

Mission Control is flying to the Moon!

We will demonstrate the use of Artificial Intelligence to support navigation and science operations for the Rashid micro-rover in the Emirates Lunar Mission led by the Mohammed Bin Rashid Space Centre (MBRSC).



Our AI technology is being embedded on a compact and high-performance COTS flight processor. Using Convolutional Neural Networks trained to detect surface features like rocks and craters seen by the rover, this is expected to be the first demonstration of AI on the surface of the Moon.

This demonstration will highlight how AI can augment the autonomy of spacecraft systems that otherwise rely on Earth-based operations teams, paving the way for autonomous lunar surface infrastructure development.

MISSION CONTROL SPACE SERVICES INC.

Outreach Partners: SEDS-ÉEDS, Rocket Women, SMARTICE

Canadian Science Team: The University of Winnipeg, Carleton University, Concordia University, Western Institute for Earth & Space Exploration

Mission Partners: مركز محمد بن راشد للفضاء Mohammed Bin Rashid Space Centre, Xiphos Technologies, ispace

This project is undertaken with the financial support of the Canadian Space Agency.

Book a Demo

Mission Control's Moon Yard, in Ottawa, Canada, (seen in the background).

This facility is available to anyone who wants a high-visual-fidelity landscape for testing operations strategies and collecting data using our rover test platform. Use our **Mission Control Software** to simply log into a browser and run your analogue mission remotely.