

Presentation Title: Digital Engineering a Lunar Rover

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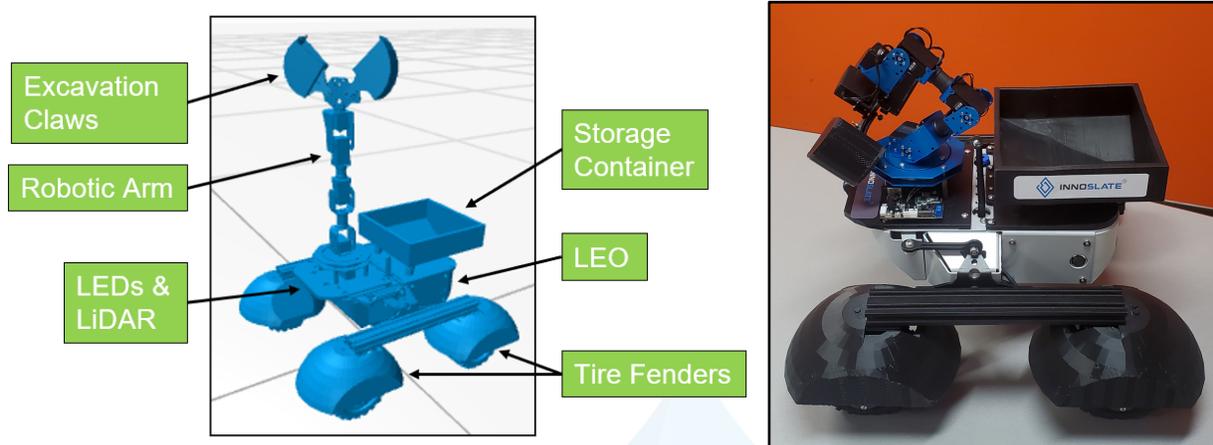
Description:

As part of NASA's Break the Ice Challenge Phase I, a lunar rover system architecture was designed to excavate icy regolith and extract water for creating a sustainable source of water on the surface of the Moon.

This project utilized the end-to-end digital engineering and MBSE tool, Innoslate, to research and design, build, and test a lunar rover prototype. Requirements in Innoslate's Documents View were written to define the rover system's functionality, as well as, to specify the extreme lunar environmental conditions and specific performance parameters that must be adhered to. Action diagrams were created to model and simulate the lunar mission to determine how long the proposed lunar rover system will take to collect 10,000 kg of water on the lunar surface. Finally, Innoslate's Test Center was beneficial in recording tests conducted in the lab and in the field to verify and validate the lunar rover prototype. Further analyses were also conducted using Innoslate's various integrations with other tools such as STK, MATLAB, and Ansys. Having a well-integrated systems and design engineering environment reduced prototype development time and cost significantly throughout the project.

This digital engineering project produced a fully functioning lunar rover prototype with sub-systems that drive and navigate the rover on the lunar surface, excavate icy regolith, store and protect collected materials such as water and regolith, and power the rover for at least 365 days.

The figure below is SPECTER, a Space Prospecting Excavator Convoy Transporting & Evaluating Regolith.



A performance analysis concluded SPECTER, scaled up to the size of an Apollo mission rover, is able to excavate 250,000 kg of 4% concentration regolith to be converted into 10,000 kg of water in 10.67 months with a total energy consumption of 4,800,556 mAh.