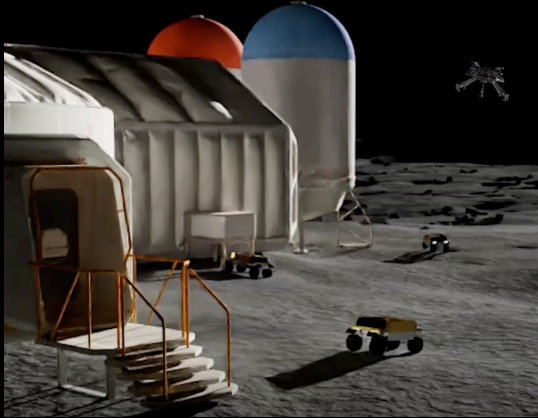


softserve

# SOFTSERVE'S MULTI-ROBOT FLEET SIMULATION



**SIMULATE | COORDINATE | EVALUATE | PERFECT**

SoftServe's **Multi-Robot Fleet Simulation** is designed to virtually test and optimize the autonomous coordination of multiple robots for lunar resource extraction. Using NVIDIA technology, SoftServe's solution replicates lunar conditions, enabling efficient and scalable mission planning and software refinement.

The solution enables companies to port custom robots into the simulation to test and refine their software, hardware, mission logics, and interactions. This solution enables rapid development of lunar-ready robotics software with minimal cost and high reliability.

## CHALLENGES



### Testing Limitations

Lunar robotics requires robust, adaptive programming despite limited access to real-world testing.



### Autonomous Collaboration

Managing a fleet of varied robots without real-time human oversight requires extensive programming.



### Redundancy Planning

Ensuring seamless operation by dynamically adapting to any equipment challenges within the robotic fleet.



### Mission Scalability

Scaling operations for larger lunar missions and other planetary bodies with adaptable robotic systems.

## SOLUTION

The **Multi-Robot Fleet Simulation** enables companies to test the programming and orchestration of autonomous lunar operations involving a diverse array of robotic systems. This project employs a **simulation-first approach**, enabling precise mission planning and risk reduction through co-simulation and high-fidelity simulations.

By leveraging a Moon-like co-simulation environment, the platform can test various complex scenarios in a realistic setting. **Advanced terrain modeling** and **terramechanics** are utilized to replicate navigation and excavation on challenging lunar surfaces. That enables companies to test and perfect the programming of individual robots and entire fleets.

## BENEFITS



### Risk Reductions

Deploys extensive, precise, and realistic simulations, ensuring robust mission planning, and risk reduction.



### Faster Development Cycles

ROS 2 middleware allows users to develop algorithms that can be deployed on real robots.



### Adaptability and Scalability

Supports more extensive testing of lunar operations and with adaptable and reliable robotic systems scaled to mission scope.

# TECH STACK

- **Physical AI:** AI-driven physics modeling and optimization for precise simulation, control, and decision-making in challenging environments like space and robotics.
- **Multi-Robot SLAM:** Real-time mapping and navigation for autonomous robots.
- **Vibration System:** Optimizes digging techniques and energy efficiency for L-REX excavators.
- **Co-simulation with Modelica:** High-fidelity simulations integrating multiple physical interaction environments.
- **NVIDIA Isaac Sim™ and Omniverse™:** Realistic simulations with advanced visualization and physics-based capabilities.
- **ROS 2 middleware:** Enables communication and coordination between multiple heterogeneous autonomous robots.

# COMPONENTS



**SoftServe's Moon-Like environment:** Enables testing of various and complex edge cases in a realistic lunar environment.



**Navigation System:** Capable of maneuvering through deep craters and complex cave systems, accessing previously unreachable resources.



**Terramechanics modeling:** Provides validated models for simulating soil interactions and optimizing excavation techniques.



**Vision system:** Simulated modules for visualizing and identifying to test autonomous resource mapping and extraction.



**Multi-robot fleet orchestration:** Scalable system for testing the interactions of diverse robotic fleets, ensuring seamless collaboration.

# BUSINESS VALUE

## COST REDUCTION

Reduce mission planning and operating costs with simulation technologies for lunar robotics.

## ACCELERATED TIME-TO-MARKET

Speed up robotics software development with pre-built accelerators.

## MISSION SAFETY

Increase mission safety due to the ability to simulate edge cases

## TERRESTRIAL INDUSTRIAL APPLICATIONS

Expedite software development for uses such as mining with simulation-first principles.

# PARTNERS



# WHY SOFTSERVE

## STABILITY

### 31 YEARS

Award-winning service, across multiple industries

## EXPERTISE

### 30%

of the team are Sc.D. & Ph.D. holders in robotics & advanced automation

## EXPERIENCE

### 20+ YEARS

Our team's total experience in space projects

## TRUST

### 14 YEARS

Longest space mission with our experts involved

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