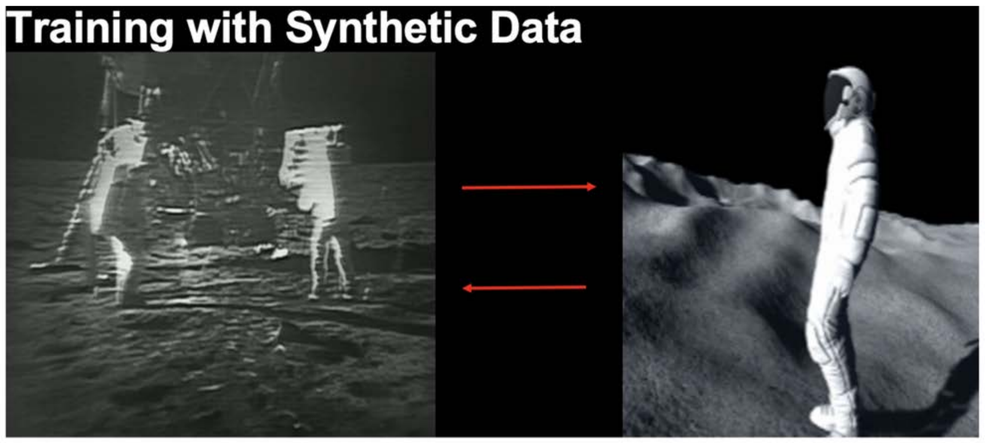
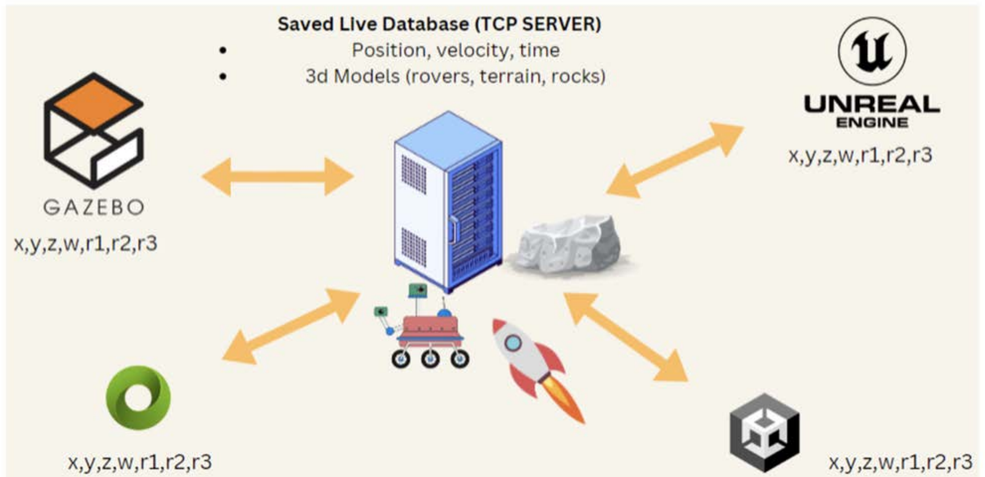
AUTONOMY RESEARCH CENTER FOR STEAHM

Trustable Autonomy

Metaverse for Moon Exploration





Synopsis

- Virtual Test Environment: A high-fidelity simulation is used to test rover behavior and performance
- Autonomous, Cooperative Exploration: Moonwalker rovers are designed for goal-directed lunar exploration with minimal human input
- Collaboration: Cross-platform and organization collaboration

Research Objective

- Test in Virtual Simulations: Use advanced simulation environments to evaluate and improve rover performance in realistic lunar conditions
- Enhance Safety and Efficiency: Implement motivation-driven behavior in rovers to optimize mission success while maintaining safety
- Encourage Collaboration: Lower barrier for lunar collaboration and simulation

Research Approach

- Physics Sim: Omniverse Isaac Sim, Unity 3D, Chronos Project
- Identify Lunar Actions: V-JEPA and synthetic training data from Unity 3D
- 3D Models: Generated from lunar LRO data or created within 3DS Max

Research Results and Products

- Collaborative Server: Cross-platform connection succeeded with latency of below 40 ms
- V-JEPA Actions: Trained model to understand lunar actions (walking, fixing, carrying, etc.) within 85% accuracy

Commercialization and/or Societal Impact Opportunities

Application: Cross-platform and organization collaboration

Key Values: Open source, scientific progress and collaboration

Potential Customers: Space industry, automotive industry, scientists

Team Names & Collaborators

ARCS Students:

Jared Carrillo, Elliott Sadler, Neville Elieh Janvisloo, Subhobrata Chakraborty, Rayyan Mridha, Luke Cortez, Leon Gold

Faculty:

Dr. Bingbing Li, Manufacturing Systems Engineering; Dr. Thomas Chan, Psychology

JPL Collaborators:

Dr. Thomas Lu, Dr. Edward Chow

Citations

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