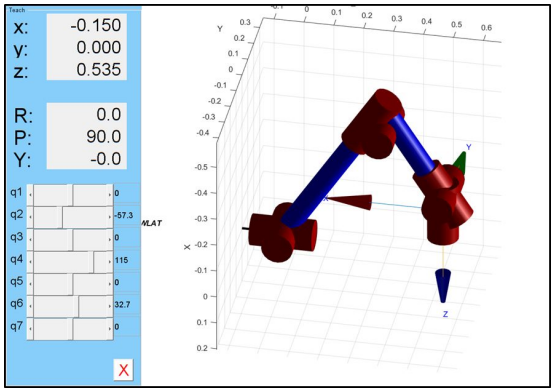
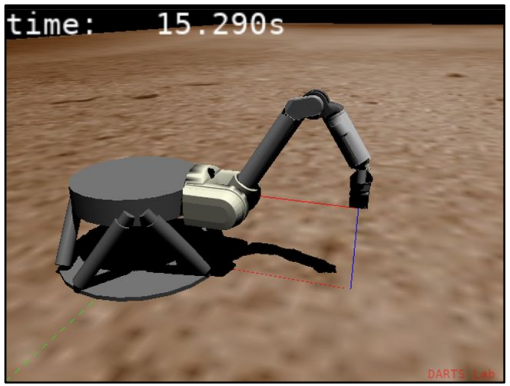
Erik Kramer | Ocean World Lander Autonomy Testbed

Project → A lander and robot arm sampling testbed to evaluate the performance of user autonomy algorithms
Tasks → Non-earth gravity dynamics emulation, motion planning algorithms, development of user features/sequences

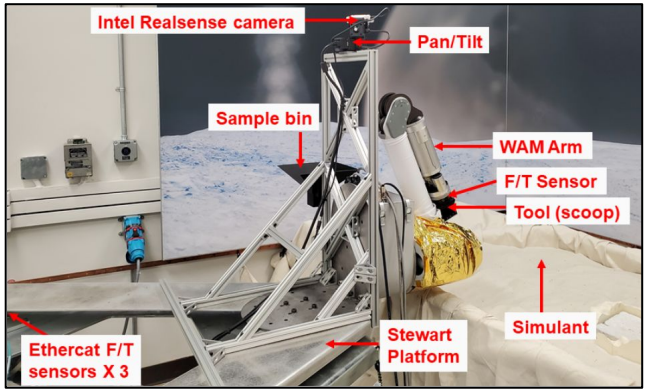
Modeling Kinematics and Dynamics



Sampling Simulations



Hardware Operation



This research was carried out at the Jet Propulsion Laboratory, California Institute of Technology, and was sponsored by the Year-Round Internship program and the National Aeronautics and Space Administration (80NM0018D0004)

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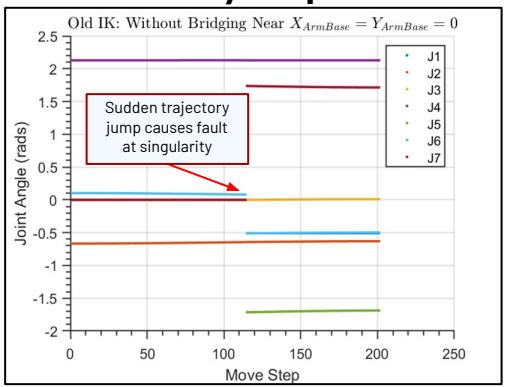
Objectives
- ➔ Develop a mode to emulate non-earth gravity dynamics through torque offloading with software
- ➔ Solve kinematics issues causing Cartesian motion planner to find bad trajectories that result in faults
- ➔ Add user features and sequences as needed by autonomy teams

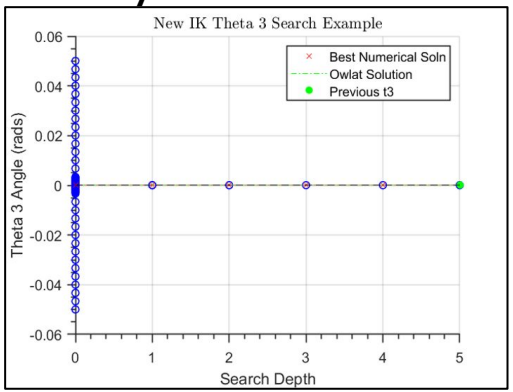
Process
- ➔ Analyzed telemetry with MATLAB to find root cause of robot faults
- ➔ Wrote new and updated old C++ code in a multi-author repository
- ➔ Utilized MATLAB, in house simulator, and hardware testing to verify methods

Results
- ➔ Demonstrated non-earth gravity dynamics through torque control
- ➔ Implemented a new motion planning optimizer that finds smooth trajectories and is 30% faster
- ➔ Added sequences such as radial scooping and features such as ROS action server translators

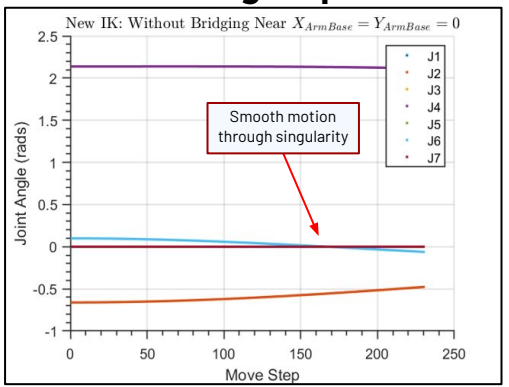
Telemetry Inspection



Analysis Driven Solution



Motion Planning Improvements



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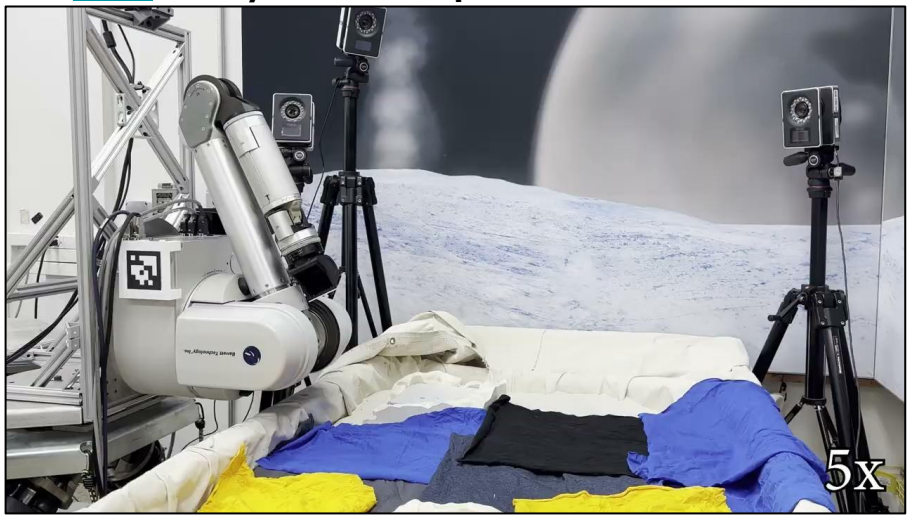
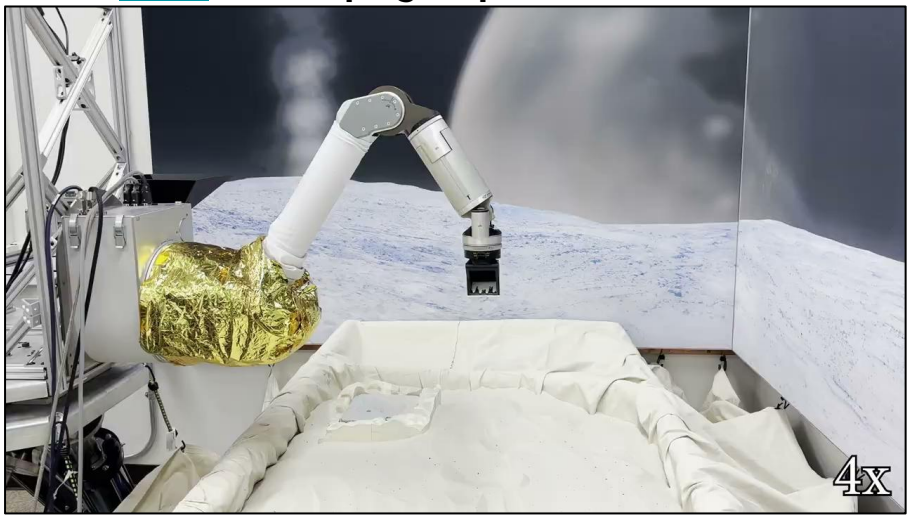
Click for Dynamics Torque Control Video Demo



Click for Scooping Sequence Video Demo



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