Lunar Rover Wheel Testing

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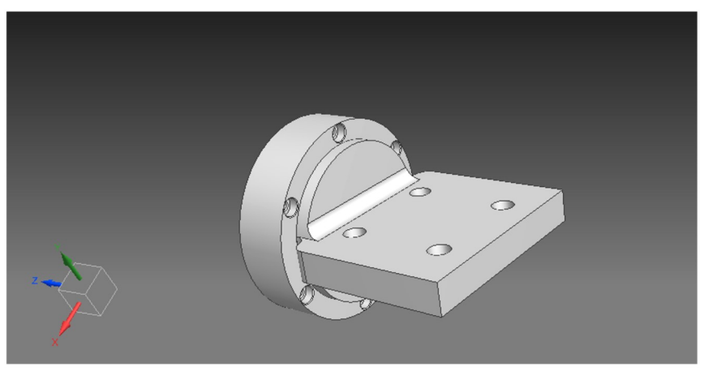
Abstract:

The project scope was to design a testing apparatus capable of testing a wheel that will be used on lunar terrain .Collecting data such as soil (lunar regolith) pressure, rolling resistance, and soil displacement, will help determine the most reliable wheel for this environment.

Introduction:

- Designed a circular wheel test rig to analyze the effects of lunar regolith on a wheel.
- **Project Definition:** Allocated time on the design to limit failures, Utilized 8020 series aluminum and 3D printed parts to increase build efficiency.
- **Deliverable:** A circular wheel test rig.
- **Conceptual Design:** Generated test prints and several structures to evaluate different types of failures.
- **Product Development:** Manufactured a functional circular wheel test rig for testing..

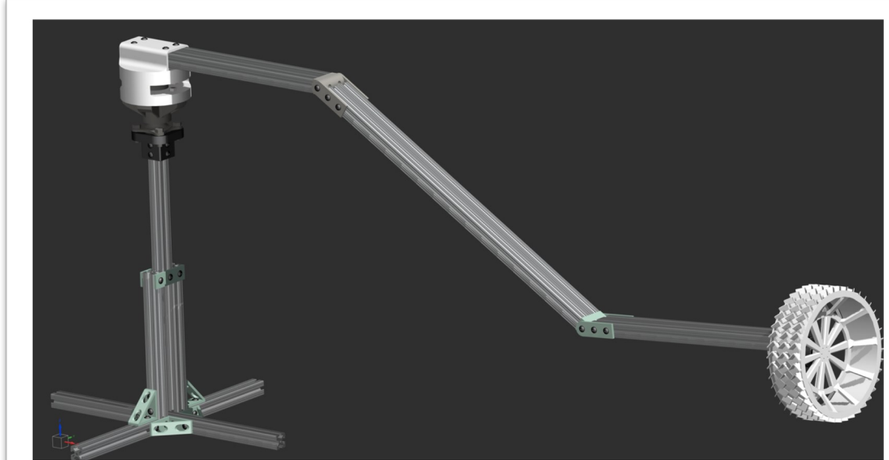


Methods:

- Using Siemens NX 1926, we generated parts for the assembly of the testing apparatus.
- Built an assembly in NX.
- 3-D printed all the custom parts needed for the testing apparatus.
- Built the testing apparatus.
- Measuring data from these tests will be important for the progress of the Biobot project.
- The Biobot project is a project by the University of Maryland Space Systems Lab to design an autonomous lunar rover to provide life support for manned lunar expeditions and reduce the overall weight of the suit system.

Testing Procedures:

- Use calipers to measure soil compression of the lunar regolith (sand) made by the wheel, measure the weight of the wheel with a scale, and measure the drawbar pull with a fish scale.
- The location of the test will be at Space Systems Lab's moon yard. (See Results & Conclusions for picture)



Results & Conclusions:

- Testing in progress and will be completed in the following weeks.

Lessons Learned:

- Learned that the load applied to the bottom structure of the rig is essential to designing the hub connector to ensure that the structure does not create a bending moment.
- Learned that proper hole alignment is critical to the design of the test rig components.
- Learned how external and internal forces applied to the system affected rotational motion.
- Learned that increasing the infill on the 3-D printed parts does not guarantee increased structural strength.