THE LAND SEAL CREATIVE LOCOMOTION ROVER PROJECT

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GOALS

1.) Design a wheel-free autonomous locomotion system for rough terrain inspired by the "Walking Dragline Excavator."

2.) Integrate an eccentric drivetrain, synchronized legs, and motorized turntable

3.) Demonstrate potential for future space exploration applications.

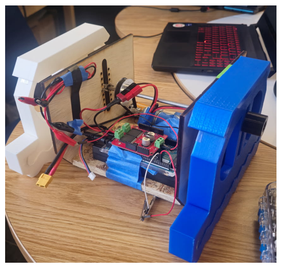
TESTiNG + RESULTS

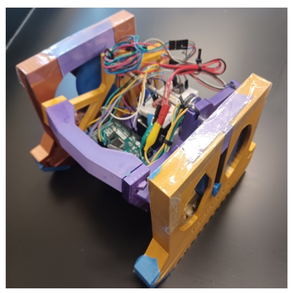
Land Seal V1 – Concept Test

- Motion Achieved
- The idea worked, but it had trouble staying balanced, it couldn't handle flat and uneven ground

Land Seal V2 – Structural Prototype

- Testing
  - Linear motion testing on solid ground and grass
    - Successful
- Main Takeaway:
  - Testing revealed the need for further experimentation on sandy terrain





Land Seal V3 – Final Prototype

- Testing:
  - Linear motion testing in sandy terrain
    - The lower front section of the leg catches onto obstacles, shifting the rover's direction
- Main Takeaway:
  - Testing revealed the need for a leg re-design and suspension for sandy terrain

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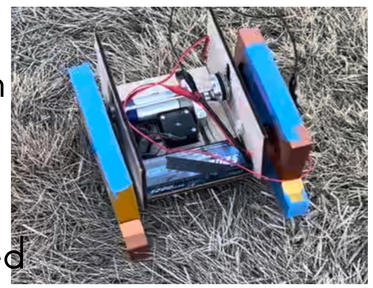

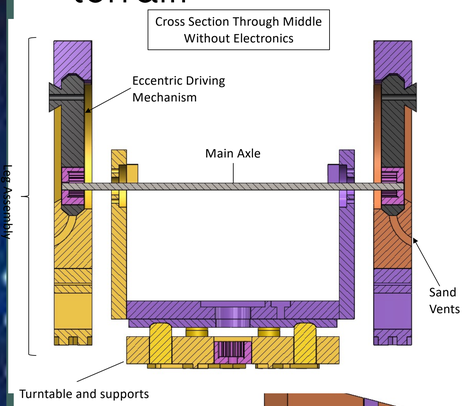

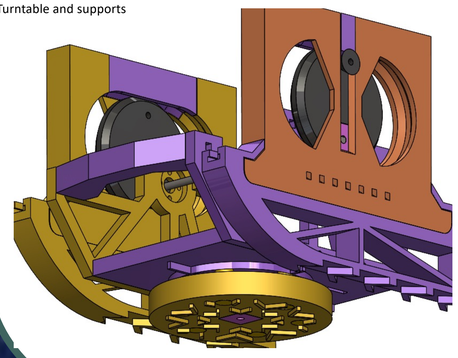

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FiNAL DESiGN

Main Concern:

- The turntable and ultrasonic sensor were mechanically integrated but non-functional.
  - Had to rely on manual alignment and hope that the rover would maintain the correct heading

Achievements During the Competition:

- Demonstrated stable, straight-line movement on Course 1
- Capably climbed over small rocks and slight inclines within Course 2 and 3

Final Improvements:

- Addition of a suspension system using eye hooks and rubber bands.
- A curved "swoop" was added to the bottom front of the leg
  - To create a steeper angle, reducing the chance of catching on obstacles, shifting direction, or getting stuck
- Graphite spray was applied to the components within the leg, reducing the chance of any disruptions to the rover's motion

Challenges:

- Faced larger obstacles, often getting stuck or veering off course.
- Misinterpreted ultrasonic sensor data caused the rover to move in reverse consistently.

CONCLUSiON

In summary, the land seal shows that non-linear eccentric motion is feasible.
It is a viable option for rocky, uneven terrain. Based on iterations of the Land Seal Creative Locomotion Rover, it's concluded that non-linear eccentric motion works well for this robotic platform. The development process through various Land Seal versions illustrates evident progress in stability, obstacle navigation, and sensor integration. The final version, Land Seal Ver.3, with its 3D-printed chassis, integrated motorized turntable, and ultrasonic navigation sensor, demonstrates significant improvements. While eccentric motion presents unique challenges, it is a better alternative for navigating complex environments.