

UND Lunabotics

Presentation Overview

- Who We Are
- Project Challenge
- Mechanical
- SEECS
- Outreach
- Surprises and Lessons Learned
- Conclusions



Who We Are

- Multi-disciplinary team with EE, CS, and ME involvement
- Senior design project for SEECs and ME
- Underclass involvement
- Team is dedicated to Competing in the NASA Lunabotics Competition

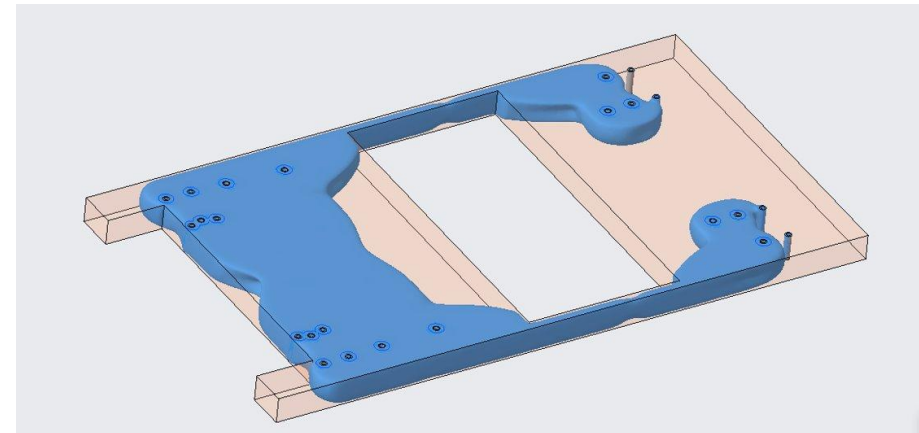
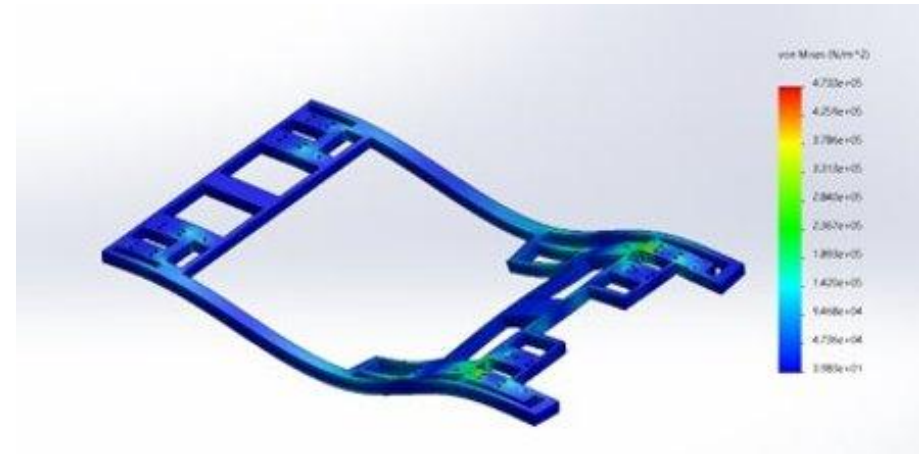


Project Challenge

- Competition to design and build a robot to mine in a simulated lunar environment
- Promote STEM and the Artemis Program through Outreach
- Competition Scoring
 - + Regolith mined
 - + Dust mitigation/resistance
 - + Autonomous operation
 - - Robot weight
 - - Bandwidth usage
 - - Camera stream

Mechanical

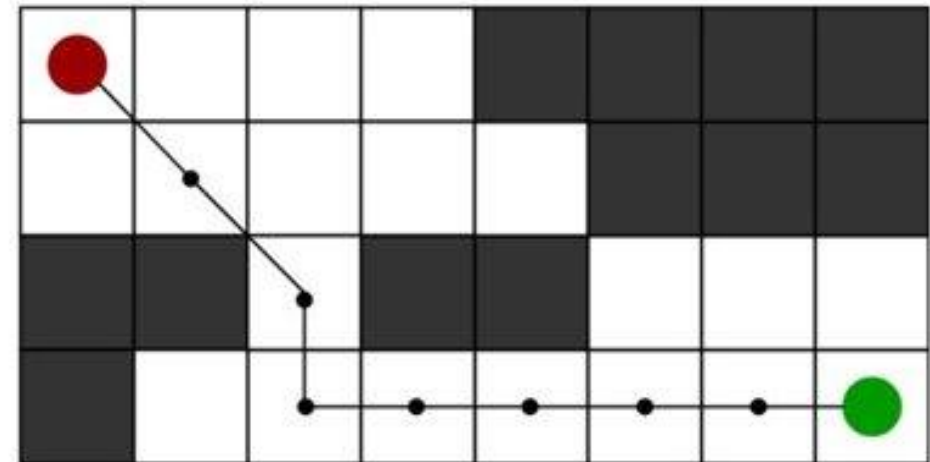
- Design a robot that can mine as much regolith as possible
 - Using a proven bucket-ladder design
- Minimize the weight of all mechanisms
 - Combination of FEA and Topological Optimization
- Ensure all mechanisms can be automated by the SEECS team
 - Combination of encoders, sensors, and limit switches



SEECs Work -



- First year with full autonomy
 - Using NVIDIA Jetson and ZED II stereo camera
 - Generate point
 - Navigate using A* algorithm
 - Localization using Fiducials with OpenCV
- Communication Systems
 - CAN communication protocol - Drivetrain
 - UART communication – Load Cells, Infrared Sensors, Current sensors



Surprises and Lessons Learned

1

Order components months in advance

- Supply chain issues have been all over the board

2

Make continuous phone calls

- Phones beat Emails

3

Always talk to the secretaries

- Secretaries get things done

Outreach

- First Lego League
 - Competition Judges
 - General Volunteers
- Red River Valley Career Fair
 - Discussed engineering with High Schoolers
- Engineers at the Library
 - Lead engineering activities with pre-k children
- Engineering Saturday Fall/Spring
 - Groups of prospective students were shown the lab and robot along with answering questions
- Campus Tours
 - The robotics lab is a frequent stop for prospective students answering questions and shown robot
- First Robotics Competition
 - John and the robot

Conclusions

- NASA Lunabotics competition
- UND Senior Design students
 - + Regolith mined
 - + Dust mitigation/resistance
 - + Autonomous operation
 - - Robot weight
 - - Bandwidth usage
 - - Camera stream
- Outreach
 - FIRST Robotics
 - UND Engineering Days
 - Engineering Days
- Lessons learned
 - Order Early
 - Make Phone calls
 - Talk to secretaries