University of Portland

University of Portland Robotics Club

NASA Robotic Mining Competition 2018-19

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Outline

Introduction
- RMC
- Collaboration
- Goals

Design
- Mobility System
- Excavation System
- Deposition System
- Electrical Systems

Video Demo

STEM Outreach

Acknowledgements

NASA's Robotic Mining Competition

The competition itself:

- 50 university/college teams from around the country work to *"Design it", "Build it", & "Dig it"*

Four ways to score points:

1. Slide Presentation and Demonstration
2. STEM Outreach Project and Report
3. Systems Engineering Paper
4. Mining Competition

Collaboration

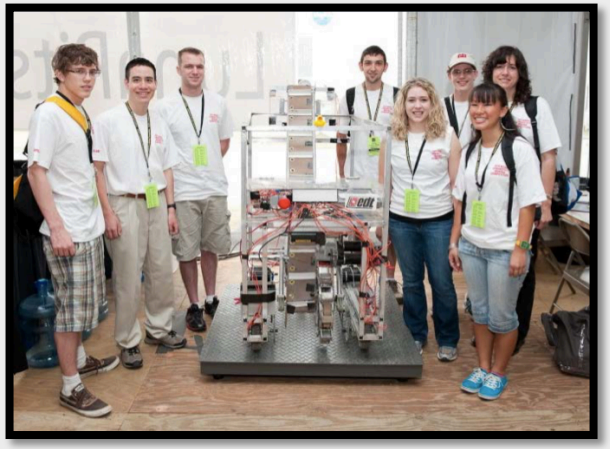
Performance Goals

Performance Goals:

	Pre-Systems Engineering Goals
Mass	< 70 kg
Size	1.5m x 0.75m x 0.75m
Maximum Excavation Depth	45 cm (max pit depth)
Autonomous Operation	500 pts (fully autonomous)
Suspension Travel	30 cm
Excavation Speed	2250 cm^3/min
Travel Time to Mining Area	< 1 minute

University of Portland's Rover Evolution

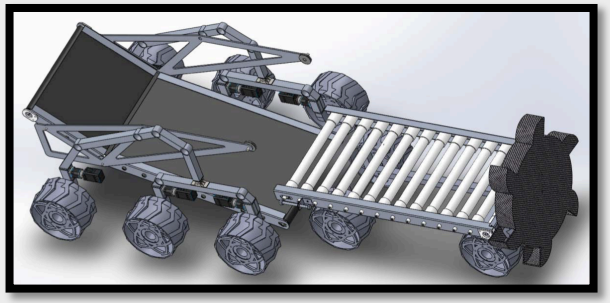
2010 - 2011



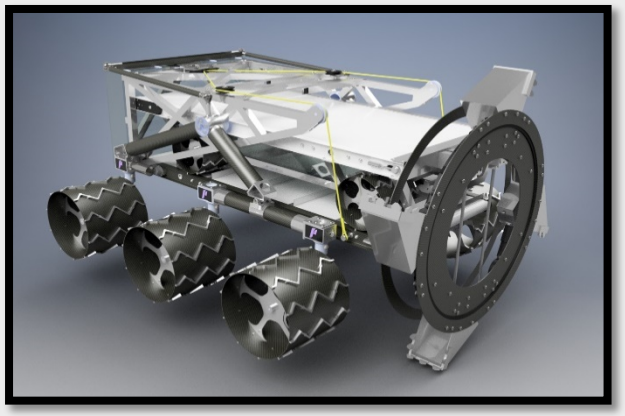
2011 - 2012

2012 - 2013

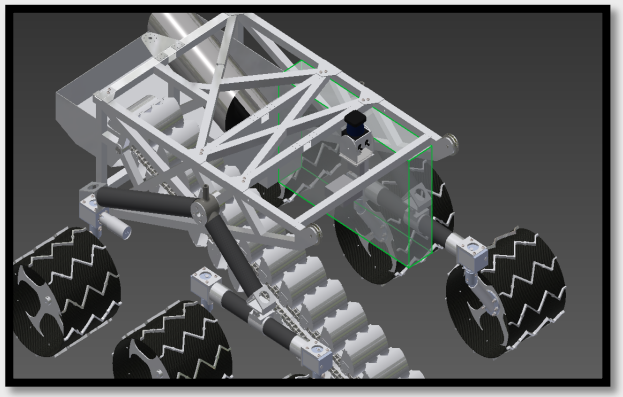
2013 - 2014

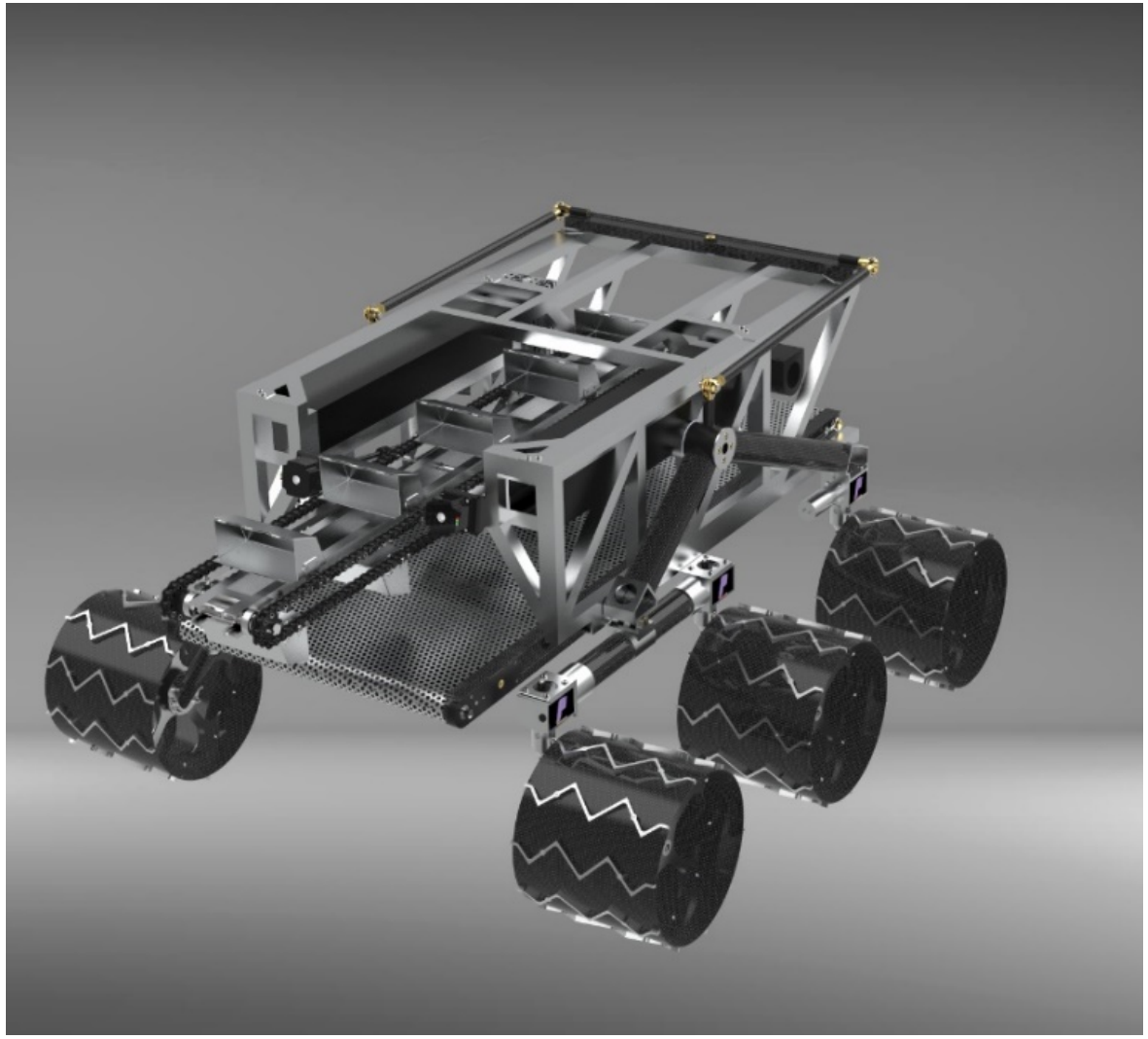


2014 - 2015



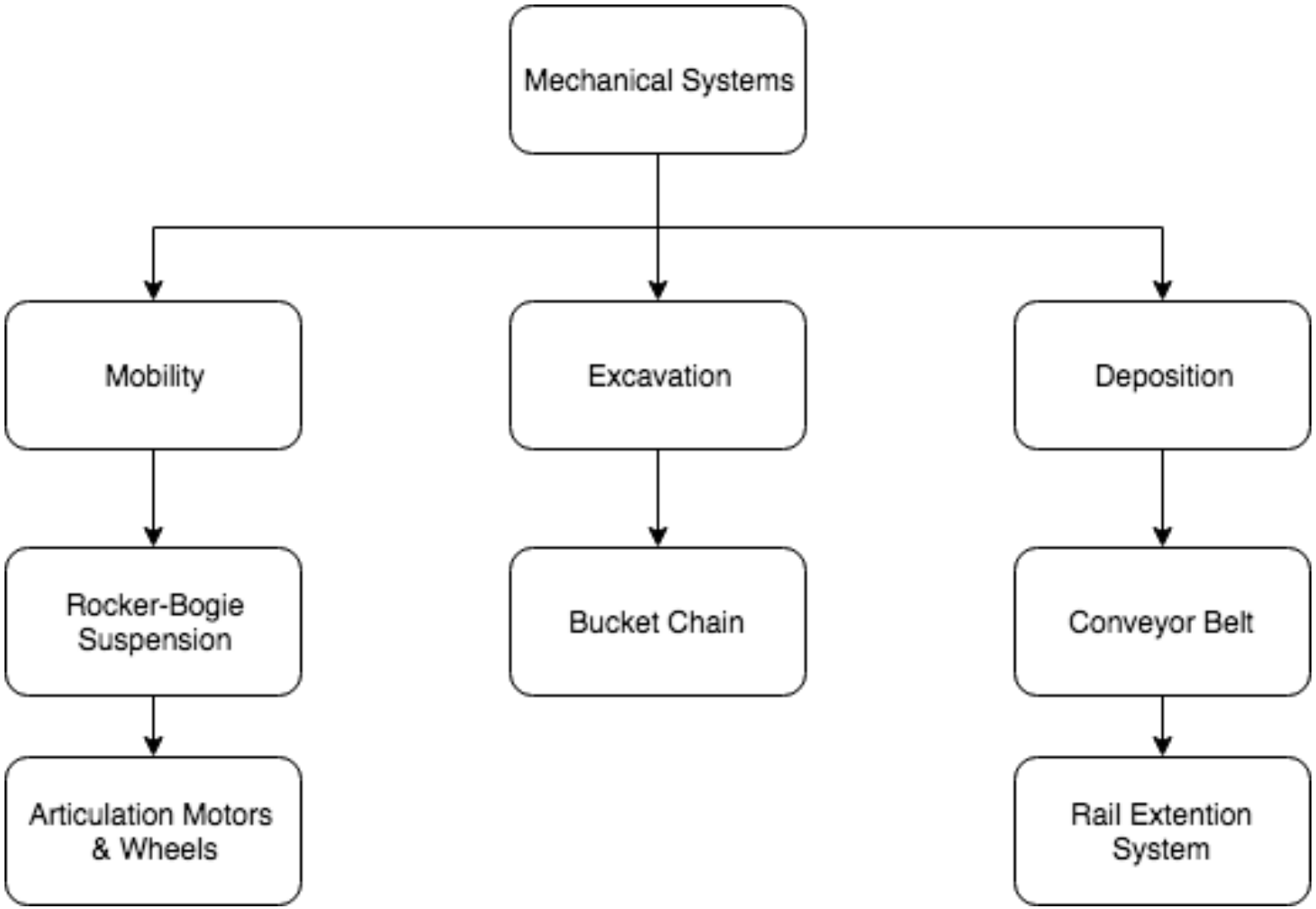
2017 - 2018





2018-2019

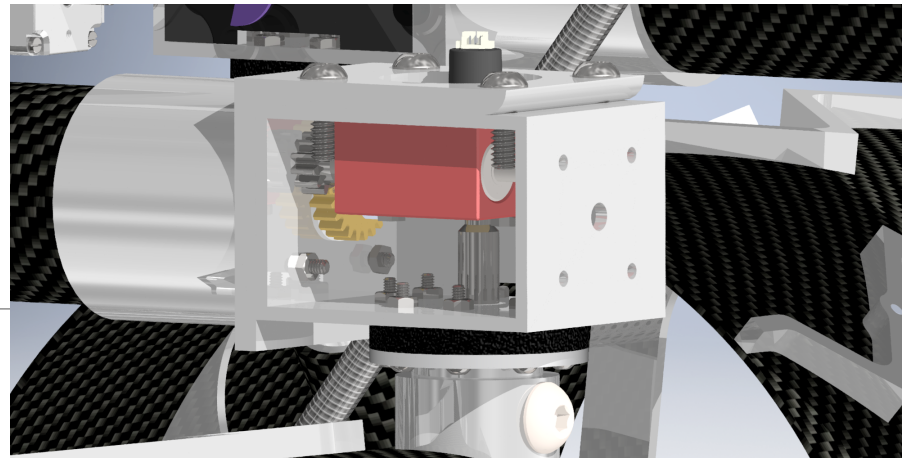
Design

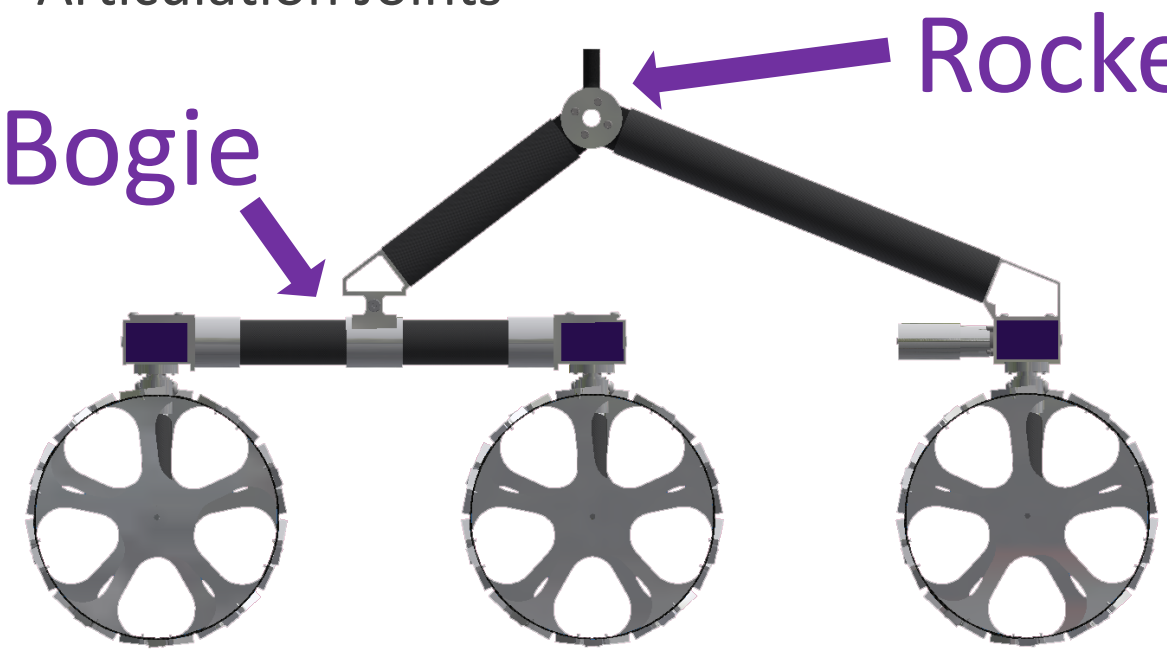


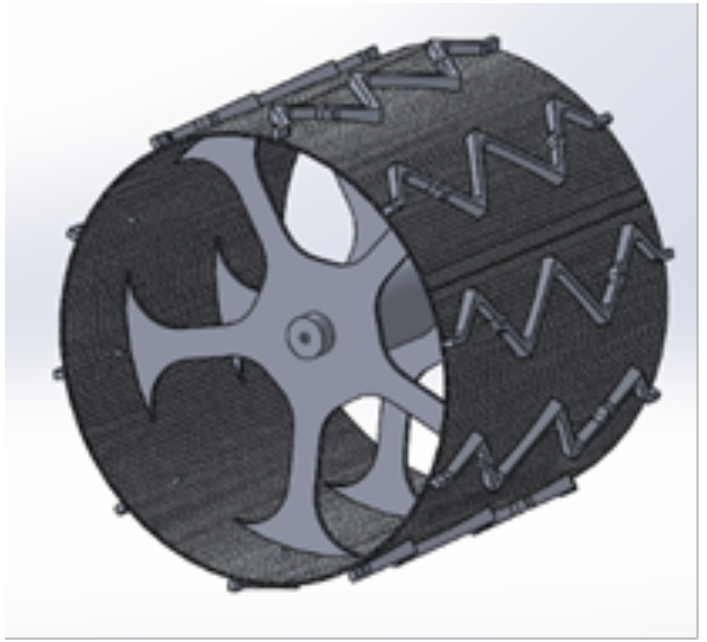
Physical Systems

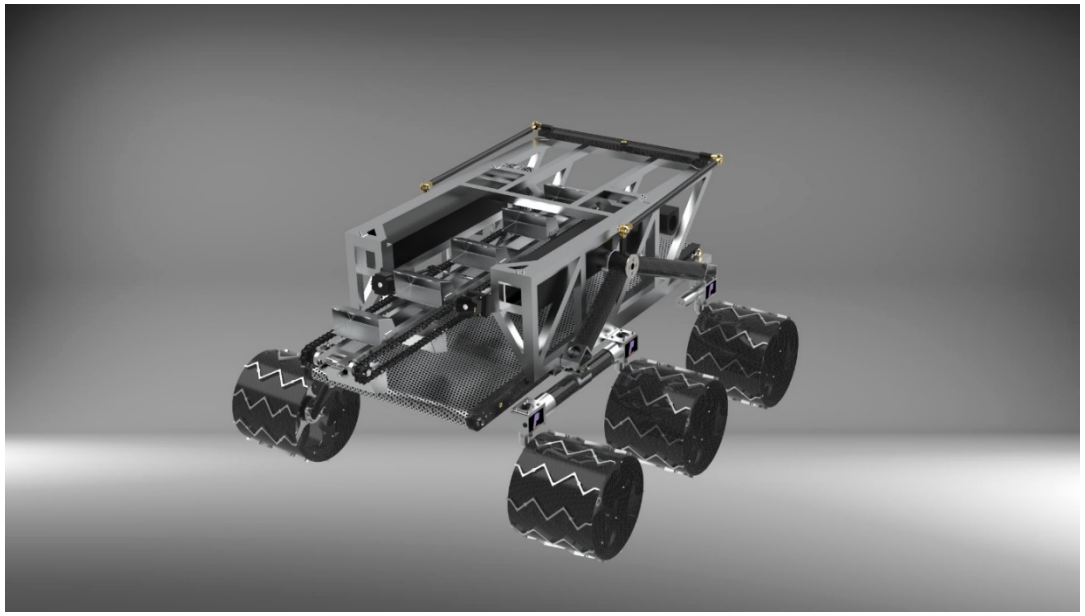
Mobility System

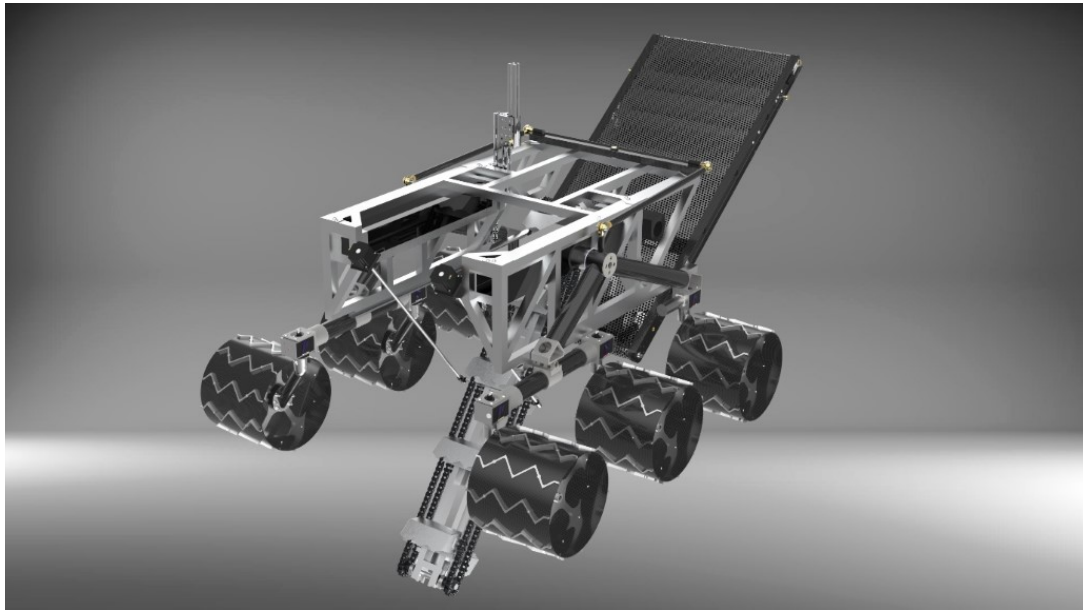
- Rocker Bogie Suspension System
- Hybrid Carbon Fiber – Aluminum Wheels & Treads
- Articulation Joints



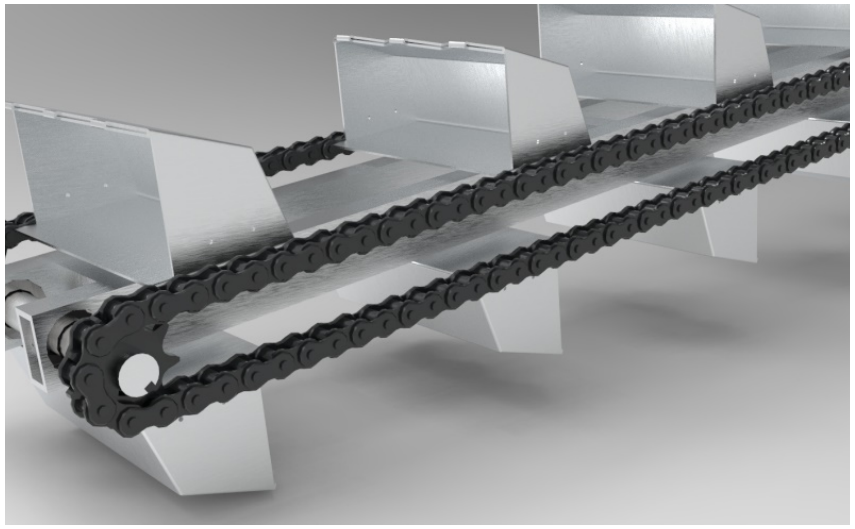


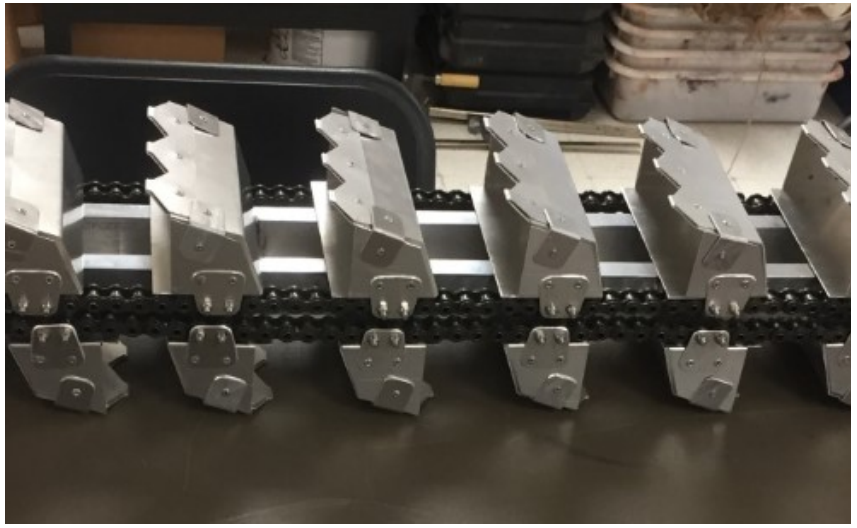






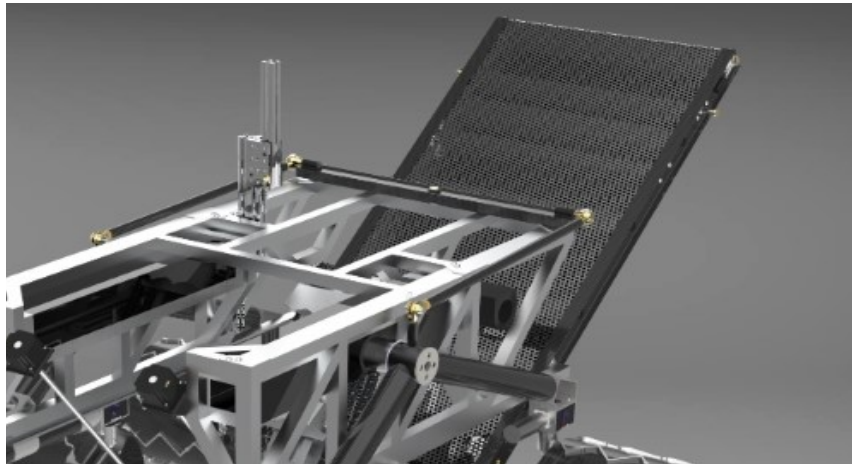
Excavation & Deposition System





Excavation System

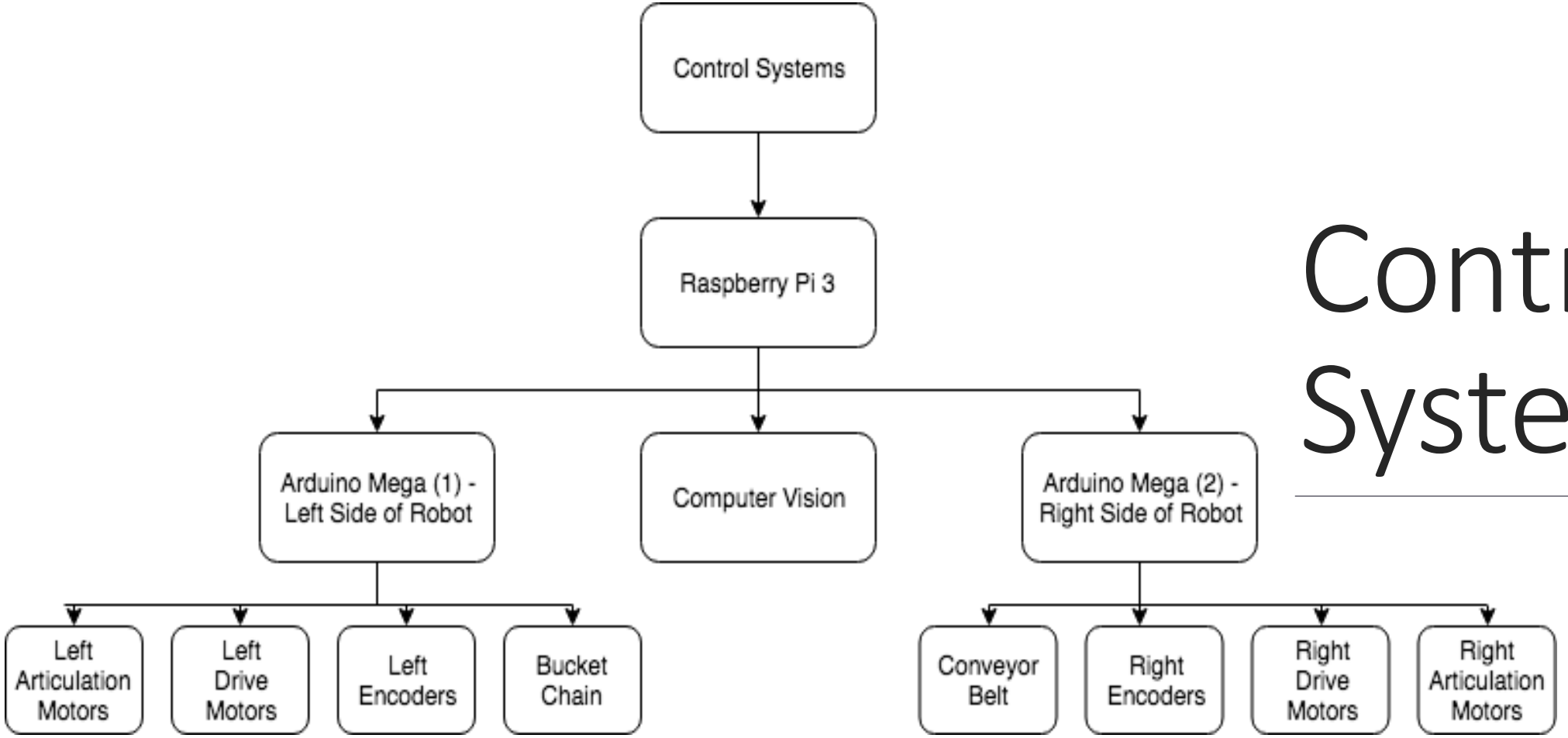
- Dual Z-Axis Motors
- Chain Tensioning System
- High Torque Motor with Custom Gearbox
- Benefit of continuous excavation

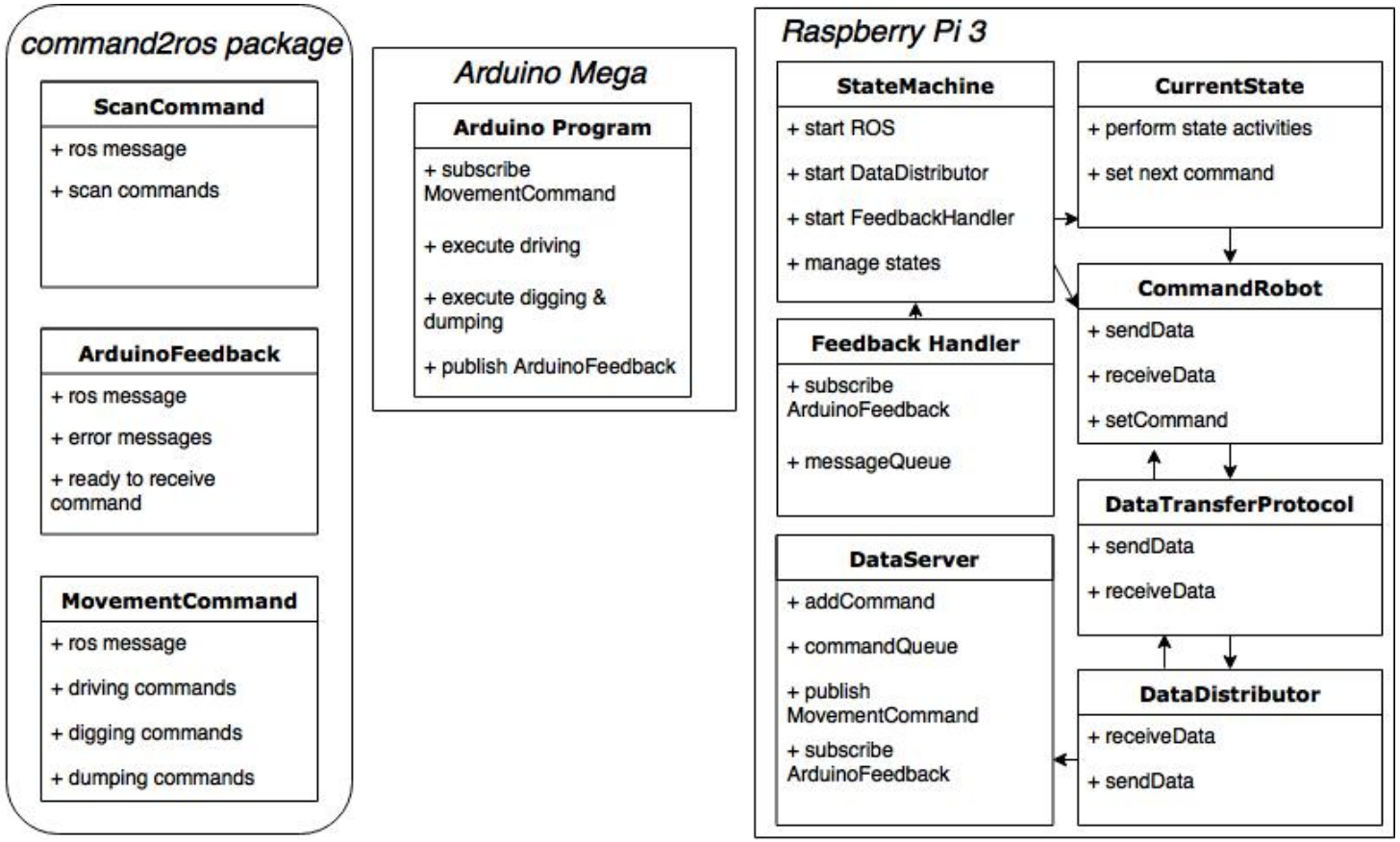


Deposition System

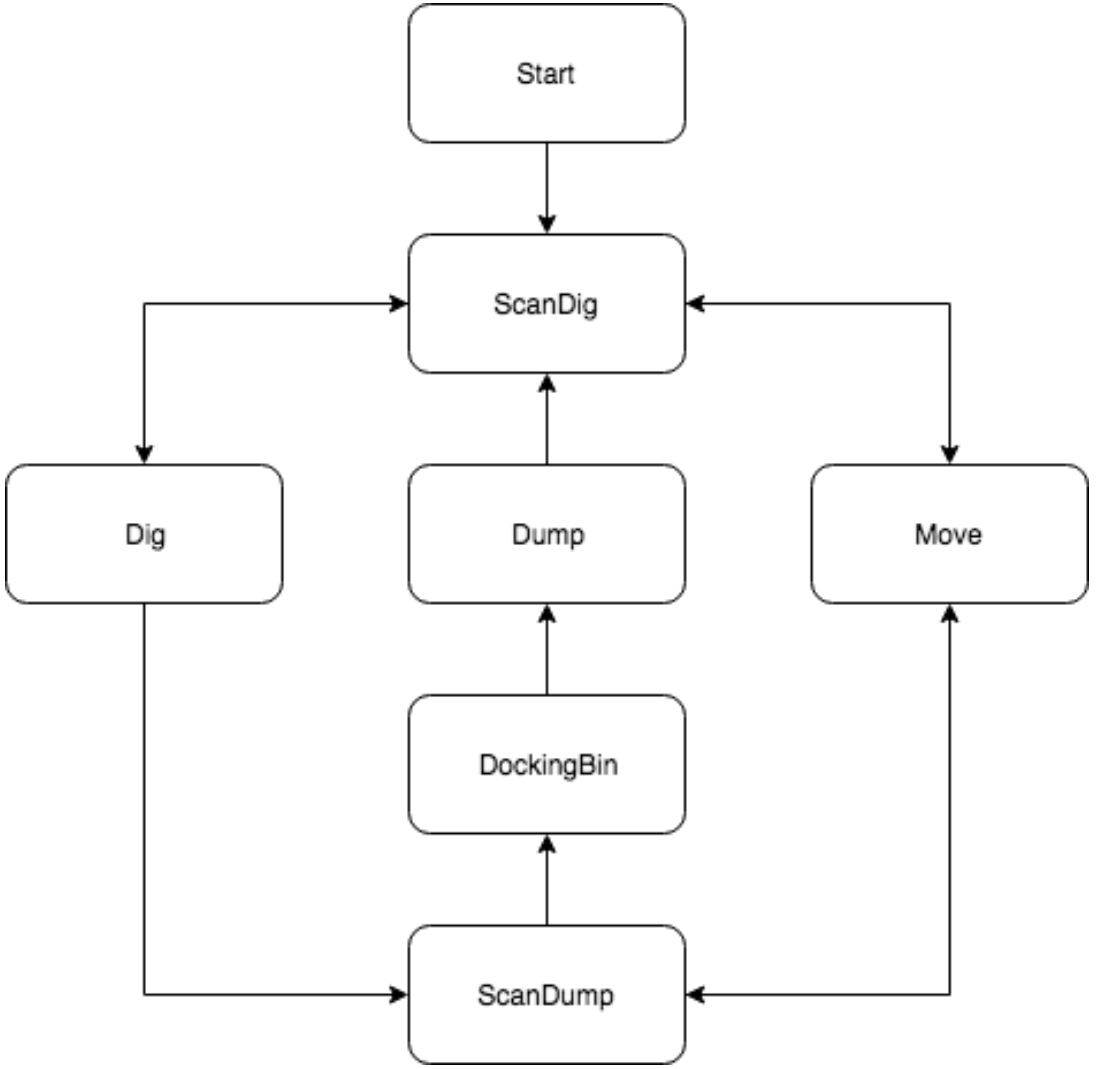
- Mesh BP-1 Filter Surface
- Dual Internally-mounted Drive Motors
- High-torque Lead Screw extension/retraction system
- 20 kg Icy Regolith Load Capacity

Control Systems





Software Data Protocol



State Machine Flow Chart

Demonstration

Rover Testing

STEM Outreach

STEM Day on campus, fostering Space and STEM interests for future generations

Acknowledgements

- Supported in part through NASA/Oregon Space Grant Consortium, grant NNX15AJ14H
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