The goal of the 22-23 Lunabotics team was to improve mechanical subsystems previously implemented, including the excavation and collection/deposit systems, and make the robot fully autonomous in navigation and task performance.

**Autonomous Navigation**
- Perform initial stereo depth imaging with Intel RealSense D455i camera
- Generate combined point cloud using the Iterative Closest Point algorithm
- Filter the point cloud using standard deviation of the distance to neighboring points
- Using the Canny edge detection algorithm identify frontiers for the robot to explore. Select Frontier based on a weight scoring system of distance and size
- Apply C-space constraints to map
- Create a navigation path based on a modified version of the A* algorithm

**Excavation**
- Excavate BP-1 and Regolith simulant (sand and gravel)
- Mine up to 40 cm in depth
- Improved top-to-bottom configuration speed by replacing lead screw system
- Redesign of belt tensioning system
- Improved dust protection
- Added encoder and hall effect sensors for autonomy accuracy

**Results**
- Mass of the robot: 35.7 kg
- Linear slider speed of 56 seconds
- Autonomous Operation
- Can deposit 4.5 kgs of gravel
- Localization accuracy of +/- 3 cm
- Obstacle detection at a range of 4 m

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