NASA Robotic Mining Competition

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Competition Background

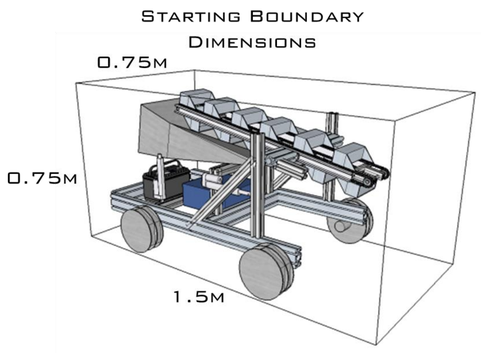
Will compete at NASA's Kennedy Space Center this May. During the competition we will be judged on the following criteria

Performance Criteria

- **The robot must mine at least 10 kg of BP-1, with 3 points awarded for each additional kg over 10 kg.**
- **While no gravel is required to be mined, 15 points will be awarded for each kg.**
- **The robot must be able to deposit the mined materials at a height of .55m above the surface of the pit.**

Design Criteria

- **Rover must not exceed a mass of 80 kg.**
- **Self-Powered**
- **Capable of operating in a dust-rich environment.**
- **Capable of traversing rough terrain.**
- **Capable of transporting and depositing the excavated material.**



Prototype Details

The Robot will have three sub

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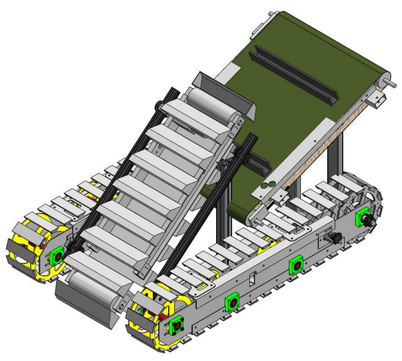

- **The Rover will fit within a 1.48m x 0.74m x 0.73m box**
- **6 Motors 3 Actuators**

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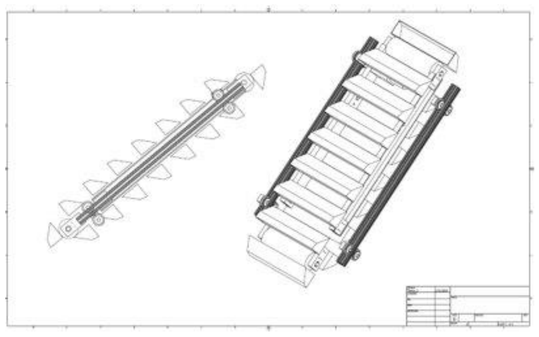
- **Max digging depth 15 cm**
- **Excavation Speed 15 kg/min**
- **Linear actuators move conveyor down**



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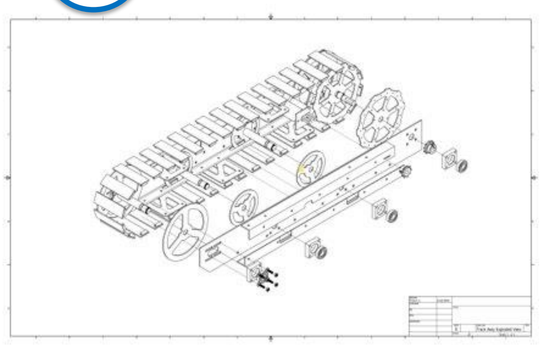

- **Max Speed: 18.9 cm/s**
- **Max Torque: 102 nm**

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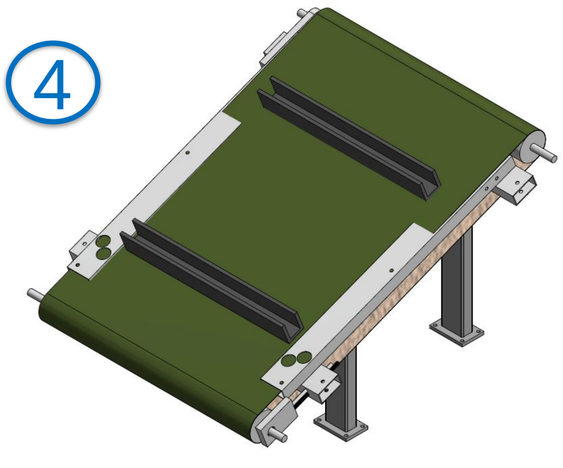
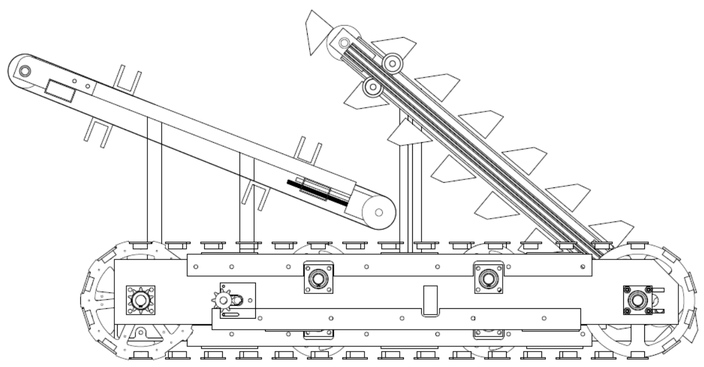


- **Fixed incline offloading conveyor belt**
- **Designed to successfully offload 25 kg.**

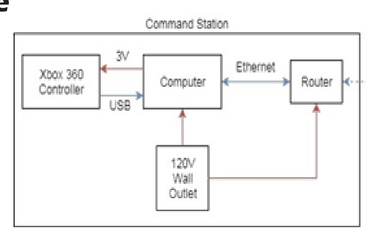
Fabrication Plan

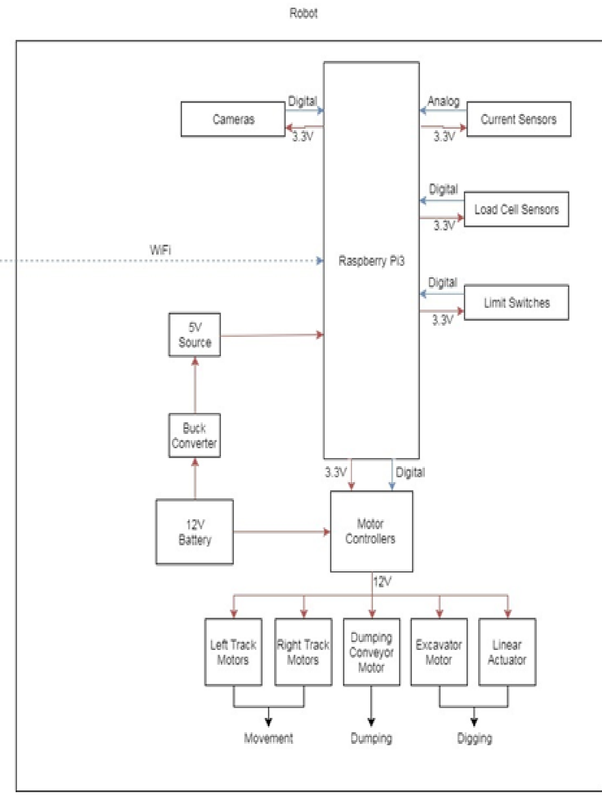
- **As this is an annual competition, last year's robot is being modified and improved for the competition in May. This will be most beneficial from a budget perspective.**
- **The new components of the robot will be a combination of machined elements, 3-D printed parts, and purchased parts. Replacing machined aluminum parts with PLA 3-D printed material will allow for major weight savings.**



System Architecture

- **The system architecture can be divided up into two main architectures, the command station and robot. The robot is made up of three subsystems and an electrical component.**
- **The drive operational mode is composed of four main commands. The robot will be able to either move forward or backward and have the ability to rotate left and right.**
- **The excavation operational mode has two primary commands, actuating the conveyor down to dig, as well as, powering of the motors for the bucket chain system.**
- **The offloading operational mode will have a command to just power the rotating conveyor.**
- **The electrical component will have the command of powering the whole robot with cameras and sensors to be able to communicate from the command station to the robot.**





Present/Future Testing

- **The locomotion system was tested on a sandy surface to determine effectiveness of the tracks on a surface close to BP-1.The test showed that the current system is capable of staying on the surface with minimal sinking.**
- **The drive shafts of the locomotion system were analyzed using finite element software to confirm our decision to reduce sizing of the shafts.**
- **The cleats of the offload conveyor will be tested for best fastening method be it; adhesive or fasteners.**
- **After completion of build the robot will be tested in a simulated environment to confirm proper movement and digging operation.**