



SENIOR DESIGN ORGANIZATION SYNOPSIS – SPRING 2013

Lunar Excavation Robot

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The nature of this project is to design and build a robot that meets NASA's Lunabotics competition criteria in order to test the team's capabilities in building robots and to further our understandings and expertise within the field of robotics and the encompassing mechanical engineering spectrum.

The Lunabotics competition holds various design standards. These standards call for designing a robot capable of traversing an obstacle course to reach a specified location in order to mine moon "material", simulant known as BP-1, reaching a minimum of 10 kilograms of mined material within 10 minutes. Other rules and regulations apply such as size and weight limitations to the robot (no larger than 1.5m x 0.75m x 0.75 m and 80kg), as well as being able to operate while completely autonomous, with a low energy-consumption operation that allows the robot to operate for extended amounts of time. The robot also needs to operate at certain bandwidths in order to reduce radio-interference. Dust-free operation and structural integrity both serve as important qualifications for robot design in order to improve the overall functionality of the robot.

The design selected will utilize a modular drive system, meaning tracked wheels and tire wheels may be used. The driving motors will have reversible rotary directions and the software will be coded accordingly in order to provide the robot with optimal turning capability. The frame consists of an outer and inner frame. The outer frame would hold the wheels and act as a main body; a foundation for the Lunabot to work from. The inner frame works inside of the outer, rotating at a pivot. The outer holds the wheels and motors while the inner frame consists of the collector bin, auger, and delivery system – a conveyor belt system. The inner frame is lowered during the collection of regolith and raised during transportation of material through the use of actuators. The front of the robot will have the rotary auger-dredge drill component with raised grooves/fins along the surface of the drum in order to dig into the BP-1 and propel the material towards the robot and into a collection bin. As this component collects dirt, it is stored in the collector bin. The collector bin houses the conveyor belt system which disposes of the collected material once it would reach the competition bins. The Lunabot is controlled through a collection of electrical components including motor drivers, a microcontroller, and communication boards which moderate the motors designated for the wheels, actuators, auger, and conveyor belt.