Boeing Mars Rover – Systems

Overview
The challenge is to create a vehicle/rover that has the ability to operate remotely in an environment where GPS can not be used and the terrain is rugged and unusual. The rover should also be capable of collecting and storing samples and information while piloted remotely with First Person View cameras. The resulting rover should be fully functional and capable of traversing an uneven terrain with minimal grades resembling Mars.

Objectives
Our objective is to design and build a vehicle to operate on a Mars-like terrain: uneven, shifting and with minimal grades. Using this rover, we must identify and collect 10 blocks (2in x 2in) within a 50 ft. area in under 30 minutes. To achieve this, we must use an FPV camera, a self created UI for the pilot and any sensors needed to complete to mission.

Approach
• Based on the given requirements provided by the sponsor, we developed a set of engineering design requirements for the rover.
• We consolidated a list of various micro-controllers, software and programming languages and used concept scoring methods to determine which would be optimal.
• We reviewed the patents for the micro controllers and other factors of each subsystem.
• The ME team created a number of designs in Solid works before creating the product.
• We tested the various codes needed to operate the driving controls and servo/motor on an RC test bed prior to implementing it on the final rover.
• Using the power requirements, we calculated the necessary battery power needed for the rover and all of its components. The latency issues were also tested based on the network we were on.
• All subsystems were tested individually before integrating onto the final product.

Outcomes
• The rover design resulted in a $900.72 expenditure of the given $1000, being well within budget.
• The team designed a user friendly UI that can be operated via an Xbox 360 controller and viewed on a computer application.
• The design process depended on the collaboration of Mechanical, Electrical and Computer Science skills and expertise
• Our rover design implemented a new approach to driving the rover without steering via the omnidirectional Mecanum wheels.