Method of Validation

Scales, accelerometers, stopwatches and yardsticks are all necessary to validate the targets and metrics previously specified. A computer and microcontroller will be used for validation as well.

Derivation of Targets/Metrics

There are certain targets/metrics that are necessary to be in compliance with the game manual and are therefore non-negotiable. An example of this would include the robot weight limit of 12 kg, which cannot be circumvented. There are other targets that are not as mandatory but are beneficial in reference to the game. A good example of this is the LED light detection. The robot will score points if it exits the starting area within 3 seconds; thus, 2 seconds to detect the start LED allows time for the robot to accelerate and exit the starting area to score. Then, there are targets and metrics that are more flexible and more subject to change because of the iterative nature of this project. This includes targets such as the robot moving at a speed of 0.3 m/s. This target is presumed to be enough but not an optimal one as this can only be confirmed in testing.

Discussion of Measurement

The tools necessary for acquiring measurements are a weight scale big enough to set the robot on top of, a tape measure, an accelerometer, a stopwatch (or phone with a timer application), a computer, a microcontroller, and a gyroscope. The computer and microcontroller will be used for target validation through system feedback such as binary outputs. The other tools will be used for determining precision and correctness with regards to weight, speed, and the distance materials are detected or picked up at.

Critical Targets/Metrics

The mission critical targets and metrics for this project are as follows:

- The robot should weigh less than 12kg while being able to support up to 15kg.

- The voltage supplied to the robot should go to zero when the emergency stop button is activated.

- The robot needs to generate enough power to support the necessary motors and other systems (5V-24V).

- The robot needs to grip the objects and successfully collect and support them at a rate of 90% or better.

- The robot needs to detect the LED light within 2 second to ensure optimal start speed.

Summary

Team 507's critical targets include a limit on robot mass, sufficient electrical power, successful collection of materials, and detection of the start LED to commence the game. Each of the critical targets will need to be verified through measurement, and this will be done via scales, the computer and microcontroller in use by team 507, and other tools. All the targets were derived by identifying targets that were either necessary, clearly beneficial, or otherwise deemed optimal for the robot's performance. After the identification of both the critical and non-critical targets for the robot's performance, team 507 can proceed confidently towards iterative design for a successful prototype.