Introduction and Overview of Basic Strategy

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Introduction and Overview of Basic Strategy

This report is intended to serve as the plans for the construction of a robot for the 2013 Engineering Physics 253 robot competition, as well as a method of soliciting feedback from the instructors and TAs of the course.

In each section detailing a mechanical system (firing mechanism, chassis, etc.) the materials, dimensions, fabrication process, and method of assembly have been included, culminating in a step-by-step description of the function of the part. Rough calculations (force required, weight, speed) have been provided where appropriate. The chassis section includes the method by which each component will be fastened to the robot, as well as a description of how the balls will be moved from the collection mechanism and prepared for firing.

The electrical design and sensor system sections include detailed descriptions of the circuits involved in each: schematics and proposed methods of cable management, in particular. The sensor system section additionally includes a complete diagram of all sensors in relation to the TINAH board, with expected input/output values, and the electrical design section includes a list of each protoboard/PCB to be used, with approximate size, number of connections, and physical location.

Potential issues as well as associated solutions and alternative methods are included in the risk management and contingency planning section. Probabilities have been estimated and assigned to each problem, as well as impact and changes to the project each would cause.

The task list, major milestone, and team responsibilities is relatively self-explanatory. A proposed calendar, list of each team member’s main areas of responsibility, and rough Gantt chart are included.

The basic strategy or the robot is fairly simplistic, working from the idea that the simplest ideas are the easiest to implement successfully. The robot will initially acquire tape, collect balls by forcing the collecting wheel into the back of the arena. After collecting, the robot will reverse, spin 180 degrees, and ‘wobble’ back and forth while moving forward until it acquires tape. At this point, it will advance until it reaches the end of the tape, and continue forward (no longer following tape) until it comes into contact with the front wall, at which point it will maneuver such that the front of the robot is perpendicular to the targets.

At this stage we rotate our wheels, so that, without having moved the chassis of the robot, we can move side-to-side in front of the targets. Each time a target is detected with both of our 1000 Hz detectors, the robot will stop and fire a ball. This ball, ideally, will be collected immediately after firing. After three seconds of waiting, the robot will continue to move sideways, repeating the process at each detected target. When the robot reaches the opposite wall, detected by one of the side-mounted touch sensors, it will reverse direction. If and when it runs out of balls, it will continue to move in the direction it was moving, until the rear-mounted QRD sensors indicate that the robot is directly in front of tape. At this stage, we will reverse, leaving the wall far enough to rotate, acquire tape, and proceed to collect more balls in the same manner as previously described.