

4. EGR 101 and EGR 345 Project - Robotic World Cup (Fall 2006) - Last Revised October 16, 2006

NOTE: This version is not final and subject to minor changes

4.1 OVERVIEW

The project is intended to emphasize proper project management and team skills to produce a complex engineering system from concept to completion.

The competing teams from EGR 101 and EGR 345 will place their apparatus on opposite sides of targets. Each team will consist of two robots, both placed on the same side of the center line. The front robot is for offense, and can shoot balls, while the rear robot is for defense only. The EGR 101 students will use game controllers to move their robots and shoot balls manually. The EGR 345 students must make a robot that moves autonomously. To 'see' the position of the other robots, ultrasonic distance sensors will be provided. Teams will score points when they can shoot past the opposing team into one of three goals.

The competition for EGR 101 and EGR 345 students will be held Saturday December 2nd, 2006.

4.2 RULES

1. The geometry of the playing field is as shown in Figure 1. Balls are shot by the offensive robots towards the opposing teams goals. The objective of the game is to score as many points in your opponents goal while minimizing the number they can score on yours. The playing field has been constructed so that the playing surface is clear of obstacles, except the opponents.

get area.

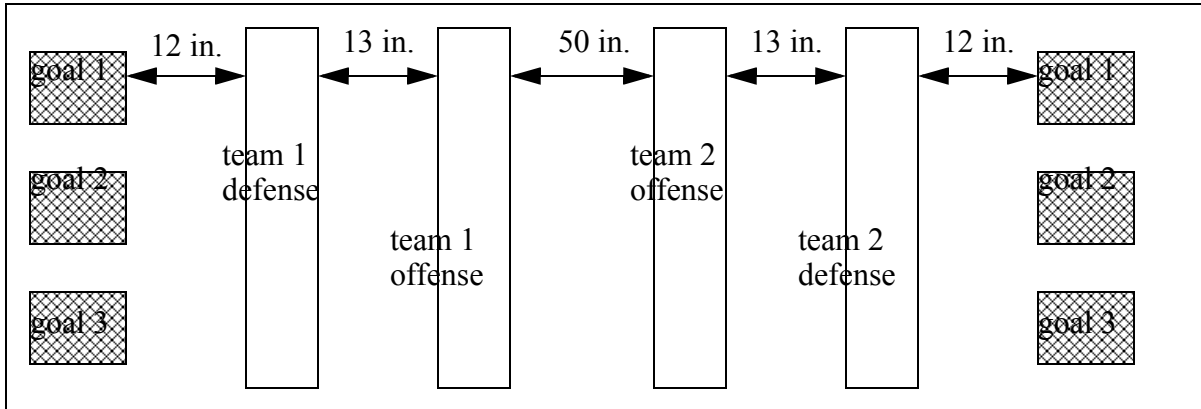


Figure 1 - Playing Field

- Both the offense and defense robots are connected to trucks that run on rails. The robots are connected to the trucks as shown in Figure 2. Each of the holes will have a 1/4in by 3in pins (this is not finalized) than can be used to locate the robot below. The truck is intended to follow the robot, not support it. The rails are not to be used for propulsion

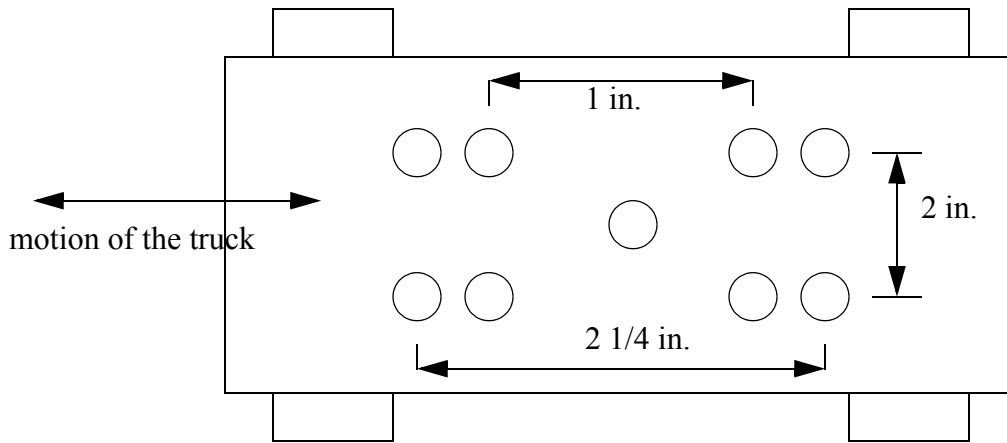


Figure 2 - Truck Mounts

- (EGR 345) The electrical connections are made with a DB-25 connector and the air hoses are attached with 1/4" fittings. The robots are expected to propel themselves using the playing field surface, and modifications to the truck are not permitted. The position of all 4 carts will be available using ultrasonic distance sensors. These will provide analog output voltages that will be available on pin

5 to 8 of the DB-25 connector.

1	+5 Vdc	10	robot 1 firing
2	+24Vdc	11	robot 2 firing
3	common	12	robot 3 firing
5	robot 1 pos.	13	robot 4 firing
6	robot 2 pos.	15	air advance
7	robot 3 pos.	16	air retract
8	robot 4 pos.	17	start

Figure 3 - Electrical Connections

- (EGR 101) The motor will be controlled using a classic Nintendo game controller. The buttons will be pushed to move the cart left/right. The motor will be connected to the controller using spade connectors provided by the lab instructor. The motor can be used for a drive mechanisms that pushes against the playing field surface. The controller will also be used to shoot the balls. A momentary pushbutton on the controller will be used to switch air to a cylinder. When pressed the cylinder will advance, when released it will retract. The cylinder on the robot will be connected to the truck using a 1/4" hose and quick disconnects.
- The defensive and offensive robots can be no wider than 8 in. wide and centered on the trucks before, during, or after the competition. The lowest height of the robots should be the playing field surface. Aside from the ball loading mechanisms, and connection cables, the robot should not project above the bottom of the rails (height 9 1/2 in.). The maximum mass for a defensive robot is 1kg. The maximum mass for an offensive robot is 1.3kg. The depth of the robot must not be more than 12 inches, or interfere with other robots or the nets.
- (EGR 101) The offensive robots are expected to shoot balls straight forward from the center of the cart using provided pneumatic cylinders. These cylinders will be attached using two pneumatic hoses and provided quick disconnects. The compressed air jet cannot be used for defensive purposes, or to divert the path of a ball that is already moving.
- (EGR 345) The offensive robots are expected to shoot balls straight forward from the center of the cart. Compressed air is available for this function although other solutions are possible. If using the compressed aid there are two valves available using pins 15 (advance) and 16 (retract) on the DB-25 connector. These will activate one of two hoses. Please note that both hoses cannot be on at the same time. The opposing target will be able to tell when a ball has been shot by watching pins 10 to 13 on their DB-25 connector. The compressed air jet cannot be used for defensive purposes, or to divert the path of a ball that is already moving.

6. Each ball will be loaded manually. After a ball has been shot the robot can move toward the ultrasonic sensor where a ball loader will be present. A team member can drop the ball into the loader. The loader will act as a funnel that students can position before the competition starts, but must not be touched after the start. When loading balls students must not enter the playing area.
 7. The field is slightly sloped so that if a ball is effectively stopped, it will roll off the field and not count as a goal. Balls that miss goals will also be considered dead.
 8. Each team will be given 10 balls that they can use at any time during the game, although the offensive robot may only hold one ball at a time.
 9. The competition duration is 2 minutes. This will be preceded with a 2 minute setup warning. Once the competition starts competitors will be disqualified if they touch the robots.
 10. Balls must enter and stay in one of the three opposing goals to be counted as a goal. The goals are 8 inches wide by 8 inches high. Balls that enter the goal and bounce out will not be counted as goals. Balls that are shot during the 2 minute competition, but successfully enter afterwards will be counted as goals.
 11. The device will shoot practice golf balls. These are approximately 1.5 +/- 0.1 inches in diameter. The Balls that will be provided are similar to 'Top Flite 24 Practice Golf Balls' purchased from Target for \$3.99. (model # 59016-White).
 12. Entries that are deemed unsafe to people, equipment, playing field, etc. by the judges will be disqualified.
 13. (EGR 101) Components that may be purchased include those listed below. Exceptions are permitted only when approved by Dr. Sirkus on the Blackboard website.
 - Tamiya brand gearboxes
 - Wheels and tires
 - Fasteners (nuts, bolts, threaded rod, etc.)
 - Electrical components (Motors, switches, etc.)
 - Pneumatic components (Cylinders, fittings, etc.)
- Prohibited materials are listed below. Using these will result in immediate disqualification unless approved on Blackboard by Dr. Sirkus.
- Cardboard
 - Paper
 - Tape of any form (duct, electrical, masking, etc.)
 - Refuse materials (beverage containers, paper towel tubes, etc.)