RoboZone   Robofest 2009 Game Rules

V1.0   1-11-09 (Official version; changes after v0.4 are in red color. To register teams, please go to www.robofest.net)

Figure 1. A sample RoboZone ring and a possible initial position. Note that the starting directions of the robots are unknown.

Game Synopsis

The objective of the RoboZone game is to find a square shiny zone on the table and be the first to occupy it for three seconds. A bottle covered with white paper is placed on the center of the zone and the location of the zone is unknown prior to start of the game. Orientations of the robots are also unknown.

A robot may also win a game, like RoboSumo, when it pushes it's opponent off of the table or if the opponent falls off the table by itself. A robot is off the table when any part of it touches the floor, even if that part is no longer connected to the main body of the robot.

Background

This game is designed to improve and expand the traditional RoboSumo (http://www.robofest.net/2008/robosumo/) game that has the following problems:

- It does not encourage the use of sensors to detect the opponent
- Teams may use the same program and robot design over and over every year without changes; it has been unfair to rookie teams
- Possible unfair reset by the judge affected the game results
- The duration of the game was too long, if there are no apparent winners
- It is difficult to make the game schedule when there are many teams at one competition site
- Usually, a heavy robot with stronger motors is the winner even if it does not have intelligence using sensors

Unknown Problem (UP) task

Before the RoboZone matches, each team must complete an unknown problem task: to draw a shape (lines or convex polygon), for example a square. The RoboZone robot must be designed to hold a pen, pencil, pencil lead, or marker to draw lines on white paper. Teams must use the same robot frame for both the unknown problem task and the RoboZone game. Any material, including tape and rubber bands, can be used to hold the pen. Weight of the robot does not matter during this drawing task. Teams may need to transform the robot promptly in order to play the RoboZone game after the unknown problem task.

The shape and its size is unknown until the day of the competition. The unit for the size can be metric.

The purpose of this task in Robofest is to let students use mathematics/geometry concepts in solving the problem. Therefore, it is not allowed to use so called "Record and Play" or similar function in the programming tools.

At the end of allotted programming time, all the robots must be turned in to the judges on a table at testing area(s). One team member must remain with the robot, but touching it is not allowed. Testing will be ordered by judges in random order. At that time judges will ask the student how they solved the problem. Judges may visit team table to check their programs if necessary.

Judges will rank the drawings. There will be no ties in rank. Guidelines on how to rank the drawing will be available at www.robofest.net on February 28, Warm up Competition day.

A single sheet of paper for judging each drawing will be taped to the floor. If a robot goes off of the paper and leaves marks on the floor, it must be stopped immediately and will be penalized. Once the robot is touched by a human, the team cannot redo/continue the drawing. No adult help is allowed to complete the unknown problem.

Based on the drawing rank, groups will be formed in such a way that best ranking teams will not be included in a same group. There will be prizes for the top ranking teams from this drawing task regardless of the game competition results.

RoboZone Group Tournament
- We will use the group tournament method to decide winners. Recommended group size for qualifying competitions is 3 or 4. Note that if group size is 2, then it becomes single elimination tournament. Therefore, the number must be greater than or equal to 3.
- How to decide number of groups: For example, let's assume there are 14 Jr. Game teams at a site and the site host decides to use 4 as the group size, since the number of groups must be multiple of 2. In this case, the number of groups will be 4.
- ***How to form a group***: top ranking teams will select the rest of the teams for a group by lottery. First ranking team will select 2 teams, rank 2nd will select 2 teams, rank 3rd will select 3 teams, and rank 4th will select 3 teams by lottery in this example.
- A team will have matches with all other teams in the same group. In this example, there will be (4x3)/2 = 6 matches in a group with 4 teams. One top team will be chosen from each group for the semi or final match based on the number of games won. In the event of a tie between the two best teams, then prior match result between them will determine the winner. In the event of a tie between more than two best teams (for instance 3 teams won twice), then the drawing rank will determine the winner.
- After group winners are decided, there will be two semi-finals and a final match as depicted as a sample in the following figure 2. If number of groups is two, then there will be only one final.
- Site host organizer has all the discretion in deciding the group tournament rules.
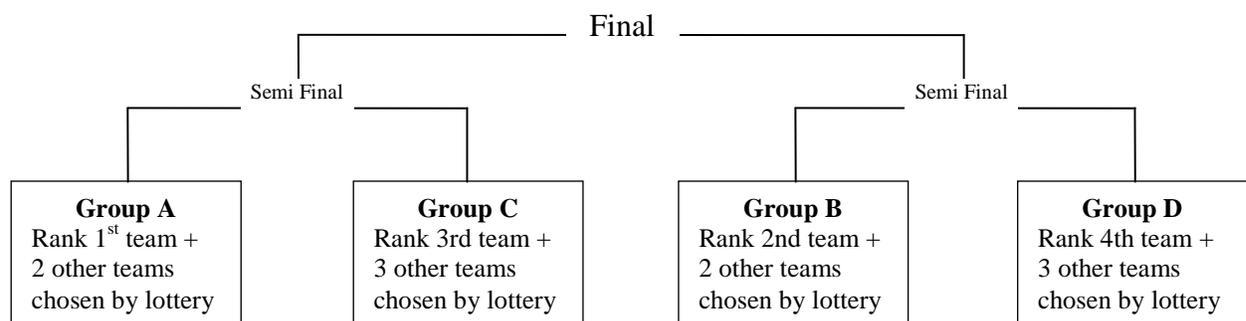
Final

Semi Final | Semi Final

Group A	**Group C**	**Group B**	**Group D**
Rank 1st team + 2 other teams chosen by lottery	Rank 3rd team + 3 other teams chosen by lottery	Rank 2nd team + 2 other teams chosen by lottery	Rank 4th team + 3 other teams chosen by lottery

Figure 2. A Sample Group Tournament with 14 teams

RoboZone Match Rules
- A match consists of up to three games. The first robot to win two games wins the match.
- Maximum time for each game is 2 minutes.
- Only one team member is allowed to enter the competition area to start the robot.
- A judge will weigh and measure the robots before the match.
- For each game, the judge will designate the starting location and orientation for each robot
- When positioning the robot on the table, a team member may calibrate sensors for several seconds before the game start signal is given by the judge.
- After the game is started, each robot must wait for 5 seconds. If a robot moves, during this wait-time, the robot loses the game automatically.
- During the 5 second wait time, a judge will place the Zone and bottle at an unknown middle location between the two robots considering the size (width and length) of the two robots. See figure 1, 3, and 4 for possible initial configurations. Note that back-to-back and side-by-side positions are also possible.

Figure 3. A possible initial position   Figure 4. Another possible initial position

- Immediately after the game is started, both players and judges should move back out of the way at least 10 feet. There are two important reasons:
    1. Robots use sensors (such as ultra sonic). A robot may perceive a player as an object.
    2. So the spectators can see the game!
- Players may not touch their robots or approach the table for the remainder of the game.
- Once the game is started, no human touch is allowed.
- Reset of the playing field is not allowed.
- *Definition of the Zone occupation*: the target center point (see figure 6) must be completely covered with any part that is connected to the robot for 3 continuous seconds. (A detached part from a robot covering the target center point does not count.) The counting will continue, even if two minute game time is elapsed.
- If both robots survive for 2 minutes without occupying the zone successfully, the game is tie. If the match results in a tie (for example: one win, one lose, and one tie), the drawing rank will determine a winner. (Note that there is no tie rank.)
- The max break time between games is 2 min.
- Judges will have discretion in making decisions during the game and the judge's decision is final.
- Coaches need to teach that teams should shake hands after the match.

Playing Field Set-up
A plastic folding table is used to make the playing field (the RoboZone ring). The surface is light in color; however, the exact color and brightness are unknown until the competition day. The exact size of the table is also unknown. For example, it may be 30" x 72'". Four corners of the table are rounded. You can find the tables at local discount stores or on the web at:
http://www.lifetime.com/tableschairs/commercial6footfolding.aspx

The height of the table is about 1¾ inches (4.5 cm). The tables will be re-used in future Robofest games. If your tables have a darker colored surface, then cover it with a white vinyl table cloth or paper. If you have a center folding (fold-in-half) plastic table, cover the center area with white tape or paper. Please note that the light condition of the venue is unknown. The table should be placed on a dark floor and there should be no glare from the floor surface. If the floor is not dark, black foam boards or papers must be placed under the table. Suggested foam boards or papers can be found at office supply stores or on the web at:
http://www.officedepot.com/a/products/460851/Office-Sturdy-Foam-Boards-x-Black/
http://www.staples.com/office/supplies/p1__225878_Business_Supplies_10051_SEARCH

The bottle will be covered with white paper and have aluminum foil tape as shown in the picture. A strategy to distract the opponent robot may be that your robot would move the bottle to another location on the table.
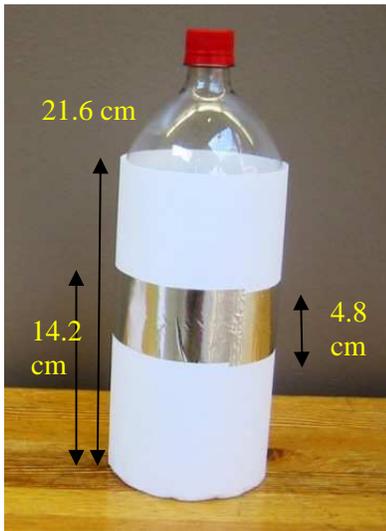
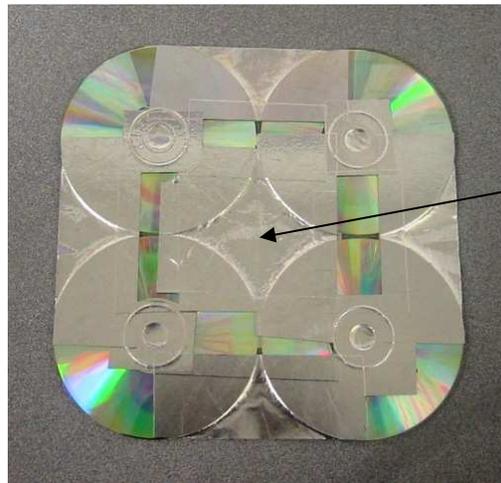Figure 5. The bottle on the center of the zone

Figure 6. How to make the Zone: (re-)use 4 CDs or DVDs. Tape them with aluminum foil tape both sides. This Zone will be taped down on the table using double-sided tape. Note that there are no open areas between the CDs. Reflective tape fills gaps and center.

Specifications & Differences between Junior and Senior divisions

	Junior	Senior
Grades	5-8th	9-12th
Robot Kits/parts	Any (see below)	Any (see below)
Recommended Programming Language	Icon-based	Text-based
Max. length and width(*)	25 cm	25 cm
Max. Height	unlimited	unlimited
Weight of the robot(**)	**1kg (2.2 lbs)**	**1.3kg (2.9 lbs)**
Bottle size / water amount	2 liter / approx. 300 ml	2 liter / approx. 300 ml
Unknown Problem Task	Easier	Difficult

(*) the robot cannot extend its dimension during the RoboZone game; this size limit is only for the RoboZone game, not for the unknown problem (drawing) task.
(**) weight limit is only for the RoboZone games, not for the unknown problem (drawing) task.

Robot Construction/programming Rules
- The robots must be totally autonomous (computer brains on board) meaning, no remote control or human intervention of any kind. Wireless communication to/from a host computer or controller outside the playing field is not allowed.
- You must use only one robot controller for each robot.

- You may use any number of sensors / sensor types.
- You may use any number/type of motors/servo motors.
- Any type of autonomous robot is allowed, including kits and custom-built robots.
- Not allowed: vacuum or sticky wheels.
- Maximum voltage allowed: 9 volts using standard batteries. Any special batteries must be pre-approved.
- The robot must not use any shiny material similar to the aluminum foil or CD; Especially shiny VEX metal parts must be covered with non shiny material. Bright light source that can be detected by the other robot is not allowed.
- Your robot cannot be designed to deliberately damage the other robot or the ring.

Special Note
The use of cell phones, laptops and other communications devices is prohibited in the competition arena. Please turn off all such devices. If you need to use any communications device, please leave the room first. Some robots can be controlled by Blue Tooth devices, and this is a competition for completely autonomous robots. ***If anyone sees someone using a cell phone, laptop or other communications device, please get the attention of the nearest Robofest volunteer immediately. Only one team member is allowed to stay in the competition area to start the robot; it is, however, required that all other members be around the competition field during the game.

Special Rules for Video Submission Entry Teams
If there is no qualifying site near the team location or under special circumstances, teams still can compete in Robofest Game competition by Video Submission Entry. Teams do not need two robots for this video entry to demonstrate RoboZone game. However, teams in this category must send an email to chung@LTU.edu to request the unknown drawing problem and other details for the demo to be included in the video at least two weeks before the submission deadline. For other details such as the submission form, please refer to the Robofest 2009 Rules.

Bill of Materials to construct a field

	Est. Unit Cost	Quantity	Cost
Folding Tables, 30" x 72" (discount store)	$50	1	$50
Aluminum foil tape	$4	1	$4
Plastic 2 litter Soda Bottle (empty)	$.10	1	$0.10
Total			$54.10

FAQ (Additional FAQs will be posted on the web at www.robofest.net)
- *Will there be judging of the team's programs?* We have stopped asking teams to submit hard copies of programs, but judges may visit team tables to check programs and ask questions. Source code inspection may result in affecting the unknown problem task (drawing) ranking.
- *What is the purpose of the aluminum foil on the bottle?* Once a robot removes the bottle, then the robot may change its strategy – to escape from the opponent. The aluminum foil on the bottle is to make the bottle unique on the RoboZone field. Adoption of this strategy is optional.
- *Can we use vision (on-board camera) sensors?* Yes
- *Can we use legged robots?* Yes
Additional FAQs will be maintained on the web at www.robofest.net

Possible Variations of this game for the future
- Multiple zones with different objects
- Zones to avoid
- Multiple tables and various shapes
- More than 2 teams at the same time / Team alliance