

RoboPower – ROBOFEST 2010 Game

V1.4 2-17-10 Official version. Significant changes since V1.3 are in red.



[Figure 1] RoboPower playing field configuration (Jr. Division)

Mission Synopsis

Due to a landslide, a mountain road is blocked with piles of heavy rocks and mud. Unfortunately, a person is trapped in the debris. The robot has two goals: to remove the debris (water bottles filled with water) off the road (plastic table) and to rescue a trapped human (a water bottle wrapped with aluminum foil.) The human rescue can be achieved by bringing the person to the Home Base **and stopping for at least 2 seconds** for a perfect score, or by moving the person to the Safe Zone (black paper) for fewer points. **The game ends successfully when all debris bottles are removed and the human bottle is brought back safely to the Home Base within a 2 minute round.**

Learning Objectives: Motion, Friction, Object Detection, Localization, Logic, and Navigation

How to Play and Score the Game

After the opening ceremonies, the Unknown Problem (UP) will be announced and the playing field setup will be unveiled. Examples of the UP are explained below. Robots must start the game while any part of the robot is on *or* over the Home Base. A team player can touch the robot without penalties only when the robot is on *or* over the Home Base. Two minutes per round are given to complete the game. The robot may start any time after the game start signal is given.

The most important goal of this game is to move a trapped human safely to either the Safe Zone or the Home Base. However, if the person is dropped off the table, a substantial penalty (-20 pts) will be given. To receive human rescue points:

- The entire human bottle, tipped or standing upright, must be on the Safe Zone OR
- **Any part of the robot must be on or over Home Base for 2 seconds while the human bottle is with the robot. If additional debris remains, the player may then remove the human by hand to take it to the hospital, and resend the robot from Home Base without a touch penalty.**

A debris bottle must be completely removed from the table for points to be awarded. No points will be given if a bottle is just moved or pushed out of the way. Note that there is no reset of the bottles once the game is started.

If a robot is grabbed/touched by a human player or falls off the table after the game is started, penalty points (-10 pts) will be given no more than **three** times. The judge will place a red card or flag on the floor **for each touch penalty given**. Once touched, the robot must re-start from the Home Base. There will be no penalty if the robot drops parts during the game. However, there will be +5 bonus points if a robot remains intact in the active zone throughout the game.

If a team achieves a perfect score, time is recorded, and the Game ends. Without a perfect score, and if all possible scoring opportunities are over, time will not be recorded; the robot must return to Home Base or remain on the playing field for the remainder of the 2-minute round to avoid a touch penalty. For scoring details, see the score sheet at the end of this document.

Unknown Problem

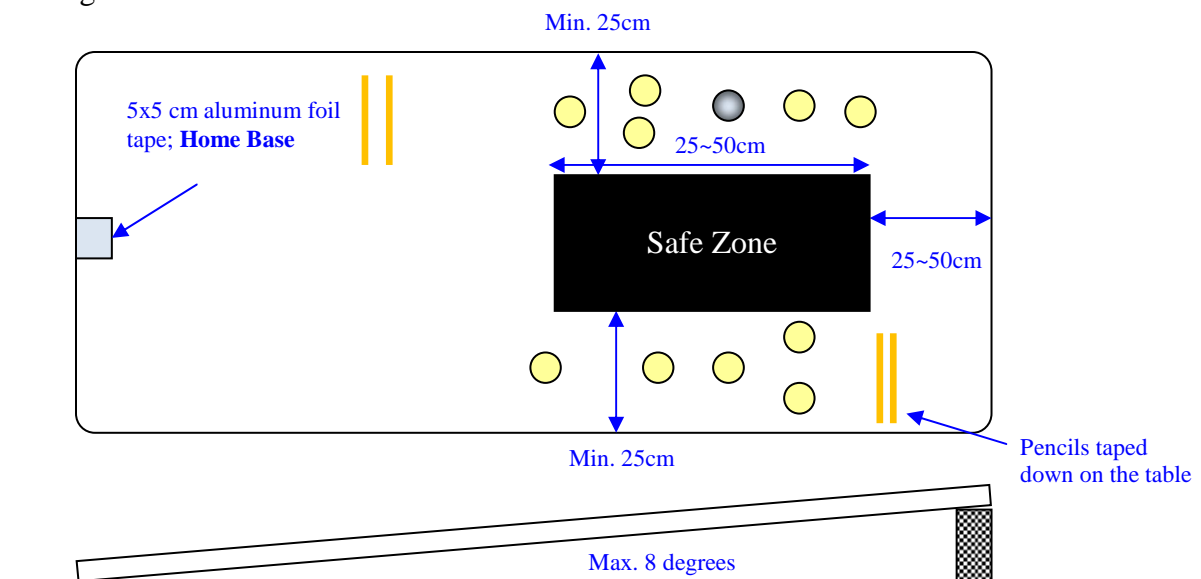
The UP will be incorporated in the Game rounds. An example might be: the robot starts from the Home Base, moves to a safe area to spin, spins 720 degrees, then goes on to continue the rest of the mission. The robot may not be touched in order to avoid picking-up penalties. Teams may decide not to do this mission, but they will lose the opportunity for 10 points.

How to Set Up the Playing Field

A 30" x 72" plastic folding table is used for the playing field. The surface is light in color (almond); however, the exact color and brightness is unknown until the competition day. The four corners of the table are rounded. Figure 2 shows possible mission field configurations for Jr. Division. Suggested tables can be found on the web at: <http://www.buylifetime.com/Products/BLT/PID-22901.aspx>. You can find the tables at local discount stores (K-mart or Lowe's) for \$50. Folding tables will be re-used in future Robofest games. If your tables have a darker colored surface, then cover them with white vinyl table cloth or paper. If you have center folding (fold-in-half) plastic tables, cover the gap in the center area with white tape or paper. White paper, poster boards, or plywood can be used on a dark floor to create a practice field.

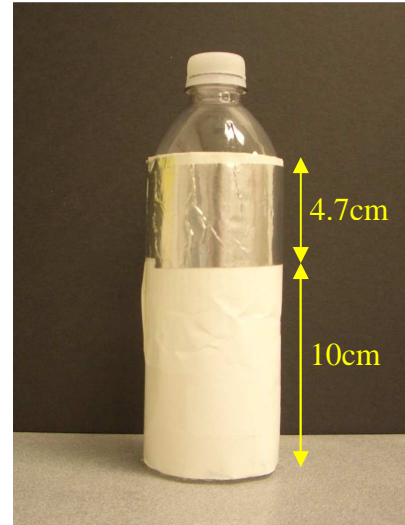
The Safe Zone is made of black paper. The sides of the paper are taped to the table so it cannot be moved by the robot.

The table should be placed on a dark colored **surface** with the legs folded under. Objects of an unknown size will elevate one end of the table as shown in [Figure 2]. The maximum angle of the slope is 8 degrees.



[Figure 2] Sr. Division playing field configuration and sample bottle locations

The number of bottles, their exact size and shape, and their locations are all unknown until the day of the competition. Bottles will be placed at least 5 cm apart near the north and south side of the black Safe Zone. **All bottles used will be approximately 0.5 to 0.6 liters in size and filled with water.** (The **maximum** mass of a **filled** bottle is 613g.) Figure 3 shows a special bottle that will represent a trapped human. The lower portion of the human bottle is covered in white paper, and the upper portion is covered with foil tape. The exact color of the debris bottles is unknown, but they should be sufficiently darker than that of the human bottle.



[Figure 3] a bottle that will represent a trapped human

To simulate uneven muddy and rocky terrain, an unknown number of standard No. 2 pencils of various lengths are taped down as bumps on the table as shown in Figures 1 and 2. The exact locations of pencils, their lengths, **their colors**, and gaps between them are unknown and unveiled on the day of the competition. **The Safe Zone shall be free of pencils.**

Aluminum foil tape, 5cm x 5cm, is used to mark the Home Base. The exact location of the Home Base is also unknown, but will be somewhere along the edge of the table end.

Junior and Senior Divisions

	Junior	Senior
Max. weight of the robot	1 kg	1.3 kg (VEX can be used)
Number of bottles	less	more
Location of bottles	Simple and easy	Complex and hard
Recommended Programming Language	icon-based graphical programming language	C or Java

Robot Specifications

- Maximum length and width during the entire span of the game is 25cm, i.e., robots cannot expand their dimensions during the game. There is no height limitation.
- Weight limitation (see the table above)
- You must use only one robot controller for each robot.
- You may use any number of sensors/sensor types (unless it is harmful to humans).
- You may use any number/type of motors/servo motors.
- You may use any material/robot kit to construct your robot. You may use tape, glue, bolts and nuts, etc. Teams may modify robots (add or remove fixtures) if the robot is in the Start Zone.
- You may use any programming language (see above table for recommended languages.)

Procedures to play rounds

After a brief coaches' meeting, the pit will be closed. After the opening ceremony, (1) an Unknown Problem (UP), (2) the number of bottles to be used, and (3) the exact locations of the bottles will be announced. Once announced, they will be the same for every team and both Round 1 & Round 2. Each team is given 2 rounds, 2 minutes per round. There is no final match.

The Emcee will announce the following before each round:

No adult is allowed in the pit area from now through the end of the competition. The use of any communications devices to remotely control robots is prohibited in this competition arena. Please turn off all such devices now. If anyone sees any suspicious activities, please get the attention of the nearest Robofest volunteer immediately. Only two team members can stay in the competition area; however, it is requested that all other members be around the competition field during the game play.

Teams will compete in a pre-determined order decided by the site host. The emcee will visit each table for team introductions (up to 30 seconds) to the general public. Note that team introductions will not be graded. Teams may test and calibrate robots while other teams are doing the team introduction.

There should be at least a 20 min break between Round 1 and Round 2. During the second round, it is suggested that teams be called in the reverse order of the first round. Note that table playing field setups are the same.

How to Determine Winners

- Jr. and Sr. Divisions will be judged separately.
- Winners in each division will be decided by average scores of the 2 rounds. Tie breaker: (1) completion time, (2) best score, (3) rerun, if needed.

The Chief Game Judge has all the discretion in making final decisions for the cases not considered in this rule.

Bill of Materials to construct a field

	Estimated Unit Cost	Quantity	Cost
Folding Tables, 30" x 72"	\$50	1	\$50
Aluminum foil tape	\$7	1	\$7
Clear packaging tape	\$3	1	\$3
Black construction paper	\$2	1	\$2
Pencils (Pack of 12)	\$1	1	\$1
0.5 – 0.6 liter water bottles full of water	\$0	10	\$0
Total			\$63

FAQ (Additional FAQs will be posted on the web at www.robofest.net)

- **Can we restart a robot after it returns home, if we want it to go out again to drop off missed bottles?** – Yes, you can send the robot again from the **Home Base** without any penalties.
- **A robot drops the bottle off the table while carrying it back home: when can a human player pick up the robot?** – It depends on the amount of time left and the number of bottles not yet handled. If only a few seconds are left, it is better not to touch the robot. If enough time is left, grab the robot and restart.
- **Will there be judging of the team's programs? In previous competitions the teams had to hand in program listings for evaluation and a score.** – We have stopped asking teams to submit hard copies of programs.
- **Can they do the UP any time during the 2 minute game time?** Yes. But remember, a team player can touch the robot only when the robot is on or over the Home Base.

Acknowledgement: We thank all the Robofest coaches, team members, and site host organizers who gave valuable input to finalize this game rule.

ROBOFEST 2010 “RoboPower” Challenge Scoring Sheet (2-17-10)

Division: Junior / Senior

Team Name: _____

Team School / Organization Name: _____ Team Number: _____

Round: First Second Track No.: _____ Team to Attempt UP? Yes No

Judging Criteria		Count	Point Value (per count)	Score Earned / Lost
Unknown Problem		 	10	
Total number of bottles dropped off by the robot – count at the end of the game			10	
Total number of debris bottles <i>wrongly</i> placed in the Safe Zone (The bottle must be completely in the black zone)			-5	
The trapped person– <i>check at the end of the game</i>	is moved to the Safe Zone? (The bottle must be completely in the black zone)	 	20	
	is moved home? (The robot is stopped at the foil for 2 seconds and the bottle is with the robot)	 	30	
	is dropped off the table?	 	-20	
Robot touched by human outside the Home Base? (Number of red cards)		0 1 2 3	-10	
The robot remained intact throughout Game?		 	5	
Max. score possible for Jr. Division for this site is: _____			Total Score	
Max. score possible for Sr. Division for this site is: _____			Time If perfect score (*)	(sec. xx)

(*) a tie breaker

Judge initials: _____ Team Captain initials: _____

If there are multiple playing fields at the competition sites, the Chief Game Judge will check consistency of the configuration of bottles on each playing field.