

RobofestSM 2005 Competition Challenge: “RoboRelay”

Jan. 6, 2005 v5.2 (Official Version)

Junior Competition Division

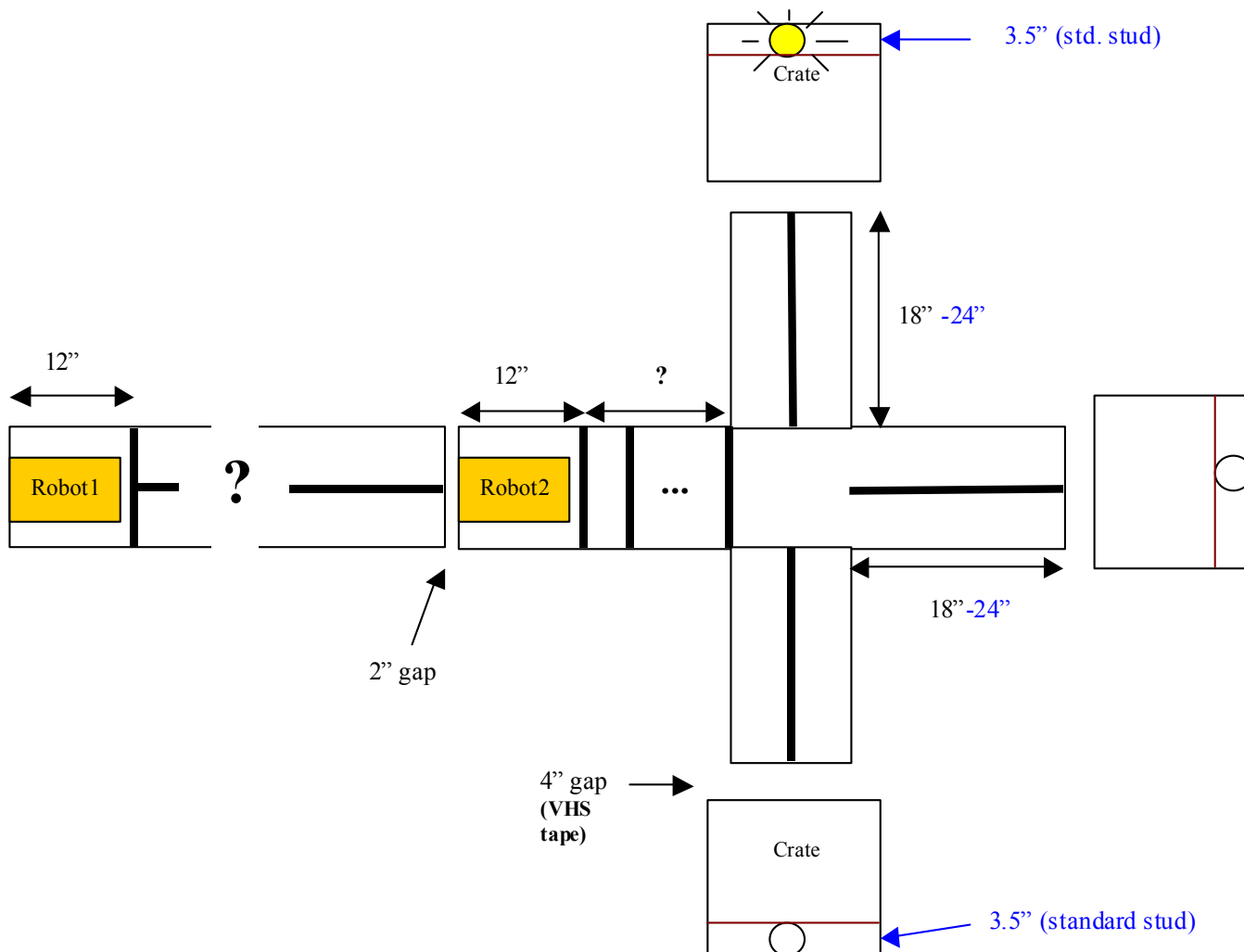


Figure 1. Playing field

I. Game Objectives

The main goal of this robot game is to execute the basic task of sending/receiving objects between two mobile robots. Additional goals are to detect light and/or tactile signals, follow a line/path, count lines, and throw an object into a box. Since the lighting condition of the competition area is unknown, it is required for students to master the ability to adjust their programs to adapt the unknown lighting environment.

II. Game Synopsis

The objective of this game is to complete the entire mission without human aid in the shortest time.

1. **Wait for the start signal and start successfully (15 points):** Two robots must be running/waiting for necessary sensor inputs. First robot carries an object that is a small mini foam basketball with

4" (10.16cm) diameter. You can buy this ball on the web at www.poof-slinky.com. The method of start signal will be unveiled on the day of the competition. It will require a light *or* a touch sensor to detect it. **You may need extra light sensor or touch sensor and materials to attach it.** If the robot does not start successfully, then the player should grab the robot and start again. The judge will give the start signal again. Also the player can start the robot manually by pressing a start button on the robot. In this case, 2 points are awarded.

2. **Follow the path to the last board for the 1st robot (10 points):** Then the first robot needs to follow a path on white multipurpose boards until the entire length of the robot reaches the last board for the 1st robot. The shape and length of the path are unknown until the competition.
3. **Reach the end of the path and stop (5 points):** If any part of the first robot reaches the end of the path and stop, 5 points are awarded. The robot does not need to follow the black line.
4. **Pass the ball to the 2nd Robot (15 points):** Passing the ball to the second robot completes the missions of the first robot. The ball must stay on the 2nd Robot.

If any failure, the first robot needs to be restarted from the beginning start signal.

5. **Automatic Start of the 2nd Robot (5 points):** After receiving the ball, if the second robot moves toward the crossroad (the center of 3 possible paths) by itself, 5 points are awarded. If the robot does not move, the team may start the robot with the ball manually. In this case 1 point is awarded. (The team may start the second robot manually at any time without the completion of the 1st robot. In this case, a human player may place the ball on the robot by hand. 1 point is awarded.)
6. **Reach the Cross Road (5 points):** If the robot follows the straight path after passing unknown number of black lines, and any part of the robot reaches the center of the crossroad, 5 points are awarded.
7. **Find the correct path (15 points):** If the 2nd robot finds (turns to) the correct path signaled by a lighted lamp that was turned on after the game started, 15 points are awarded. The entire length of the robot must be on any part of the correct black line.
8. **Shoot the ball successfully (15 points):** If the robot successfully shoots the ball into the box, 15 points are awarded. If the ball was shot, but dropped near the target crate, 5 points will be awarded.
9. **Unknown mission(s) (10 points):** After the successful shot, the second robot should complete some unknown remaining mission(s), which will be unveiled on the day of the competition right after the opening ceremony.

If any failure by the second robot, the team may start the first robot from the beginning for perfect score, or they may retry only the second robot by starting it manually.

If all missions are completed in a sequence from the beginning till the end without *any* human help, then **extra 5 points** will be given.

III. Game Rules

- The brightness of the competition area is unknown. Students should be able to adjust their programs or write programs to self-adjust on the fly for possible light changes.
- 2 minutes per game are given
- 2 chances (rounds) are given for each team
- Only two players are allowed in the official playing field. One minute will be allowed for setup before each round. Team members are responsible for catching the robot if it falls off.
- To encourage teams to try early in the *first* round, the first match teams will get 3 *flash* extra points. (If there are two official playing fields, then two teams will get the extra points). The second match teams will get 2 *flash* extra points, and the third match team will get 1 *flash* extra point.
- Average of the two scores from two rounds will be used to determine finalists. Tiebreaker is the average of the completion times. 2nd tiebreaker is the best time. Please note that there is no semi-final.
- The competition winner will be decided by the results from the finals, not the cumulative average of the three runs.

IV. Robot Qualifications

- The length of the robot must be less than or equal to 12" (No height and width limitation). However, during the game, the robot may extend its dimensions.
- You must use only one (8 bit micro-processor based) robot controller for each robot. For example, Lego RCX brick uses 8 bit Hitachi H8/3292 micro-controller.
- You may use any number of sensors / sensor types.
- You may use any number/type of motors/servo motors
- You may use any material to construct your robot
- You may use tape, glue, bolts and nuts, etc.
- You may use any programming language; we recommend icon-based graphical programming language for the Junior division.

V. Instructions for Playing Field Construction

As shown in figure 1 and 3, several 10"x36", and three (10"x18" or 10"x24") multipurpose white shelves to be used. Note that the actual width of the bookshelves you can buy from local stores in the USA is slightly less than the specified size. The thickness of the bookshelves is about 5/8". Black standard electrical tape (width of 0.75") will be taped approximately in the middle for the shelves shown in Figure 1 and 3.

The shape of the path denoted as “?” for the 1st robot in the figure 1 will be made using the following shapes in figure 2:

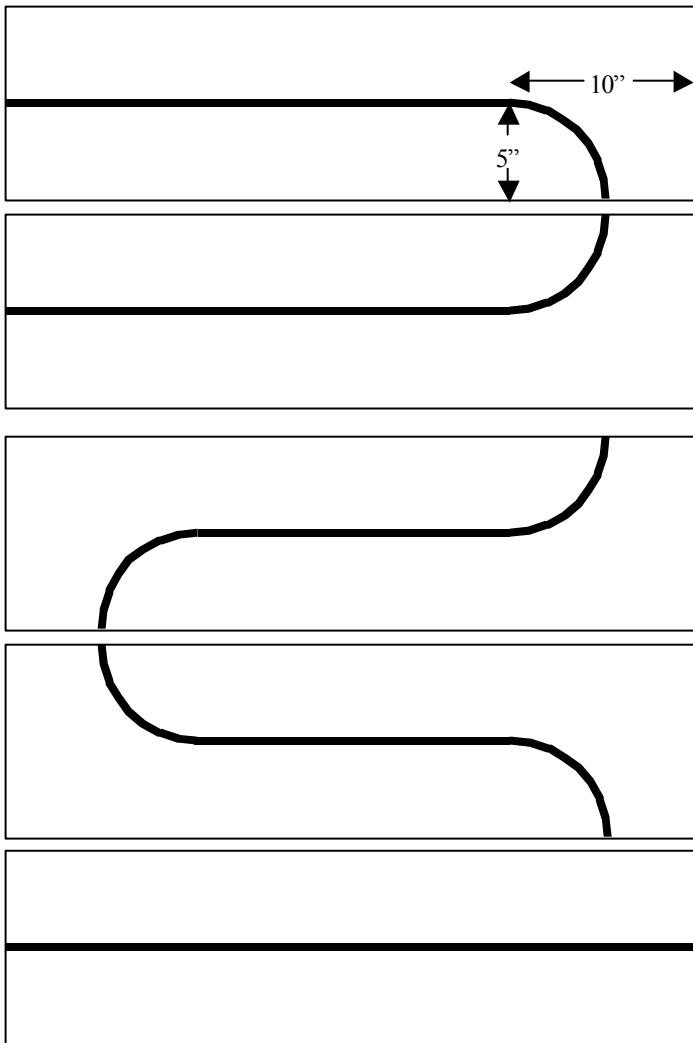


Figure 2. Curve shapes

For the 2nd robot, the path from the start line to the crossroad is straight and the length is unknown. The number of black lines between the start line and the crossroad is also unknown. (Excluding the start line, the number is greater than 1 and less than 6) The distances between those lines are uneven, but the minimum distance should be greater than 1".

All the edges (not the center area) of the shelves will be taped together using transparent packaging tape (2" width). If your robot is using skids, make sure they can slide over the tape. The color of the crates shall be black. The color of the floor where the shelves will be placed should be dark, but unknown. (For example, LTU site's floor color is dark blue). You may use this knowledge for your path following and navigation method.

There will be a 20"x30" white foam board between playing fields so the robot cannot detect inappropriate light sources.

This document is using inches as measurement unit.

VI. Purchase list for one practice playing field for teams (not for official playing field)

Item	Spec. / Description	Quantity	Estimated Unit Price	Estimated Price
Plastic pull chain lamp holder *2	Leviton	1	\$2.96	\$2.96
Easy-to-wire plug *2	Leviton	1	\$1.87	\$1.87
Electrical wire *2		10ft	\$0.13	\$1.30
All purpose white shelf*	5/8 thick, Approx. 10"x24"	3	\$3.97	\$11.91
All purpose white shelf*	5/8 thick, Approx. 10"x36"	3	\$5.47	\$16.41
Storage Crate*, *3	Sterilite, 15 1/4"L x 13 3/4"W x 10 1/2"H, 1692, www.sterilite.com	8**	\$2.99	\$23.92
40W Bulb *2	GE Softwhite x 4 bulbs	1	\$1.48	\$1.48
Standard electrical tape *	Black, PVC tape	1	\$1.19	\$1.19
Poof 4" Mini Basketball *	www.poof-slinky.com	1	\$2.17	\$2.17
			Total (w/o tax)	\$63.21

*- Purchased at Meijer *2- purchased at HomeDepot *3- go to www.sterilite.com/stores.html for more stores

** Teams may not need three target basket crates. Only one target crate is enough to practice. Also, only one crate will be used to support discontinued path in order to reduce the number of crates used. See figure 3.

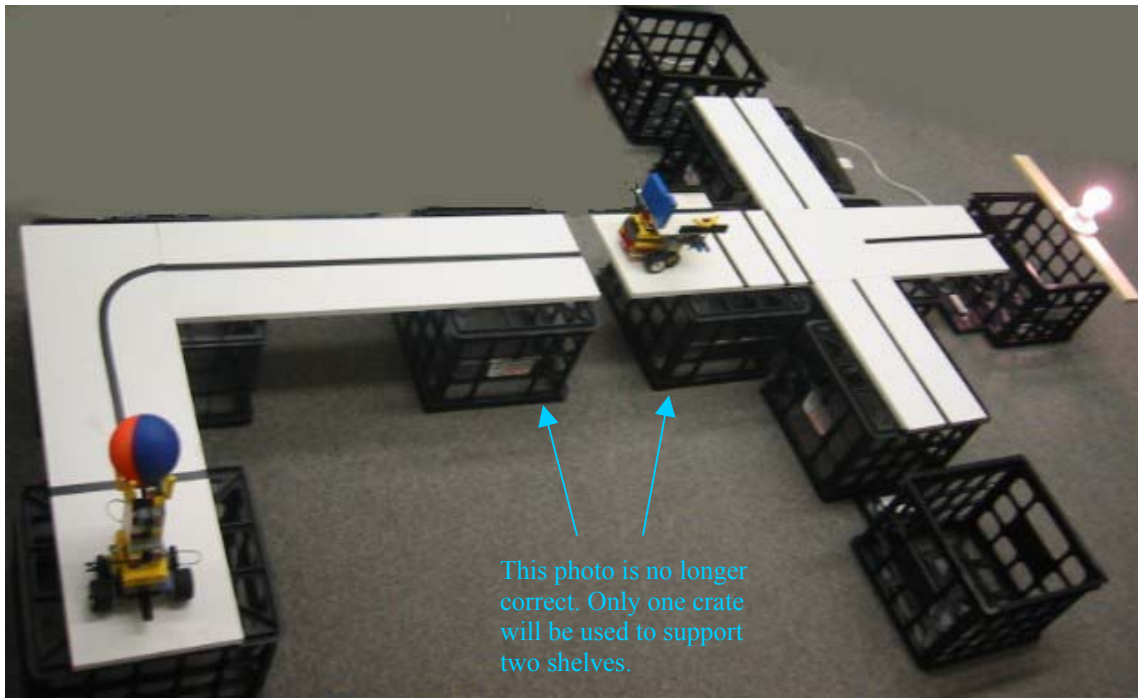


Figure 3. A sample playing field for Junior competition division

Senior Competition Division

Game rules are the same as the Junior Division. Differences are:

1. Recommended programming language is a text based high-level programming language.
2. The unknown parts denoted with the “?” marks will not contain any lines, but they will have combinations of the following perpendicular corners as shown in Figure 4. One of the following shapes will be used. The length of the straight black line at the end of the path for the 1st robot is unknown.
3. The last unknown mission may require missions for both robots.

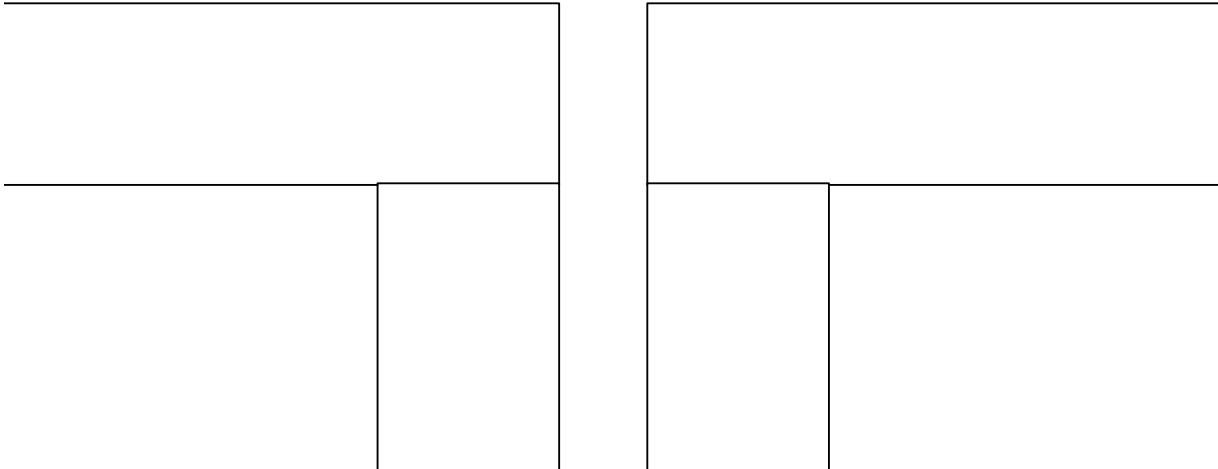


Figure 4. Two types of curves

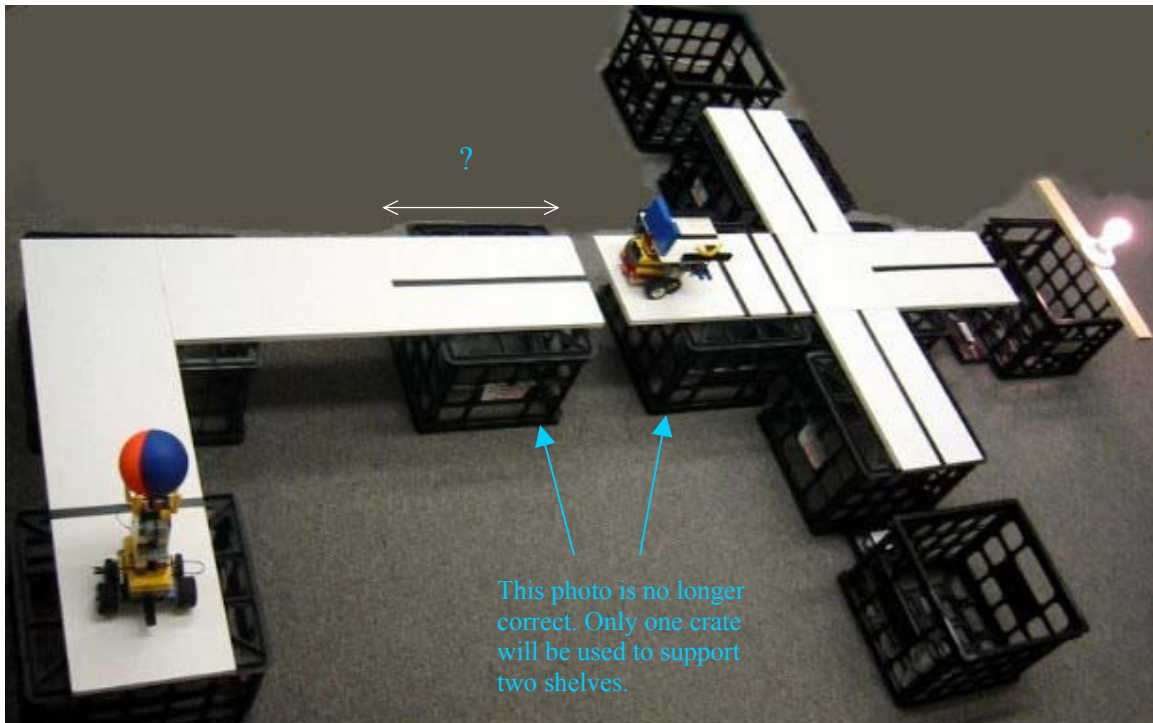


Figure 5. A sample playing field for Senior competition division

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