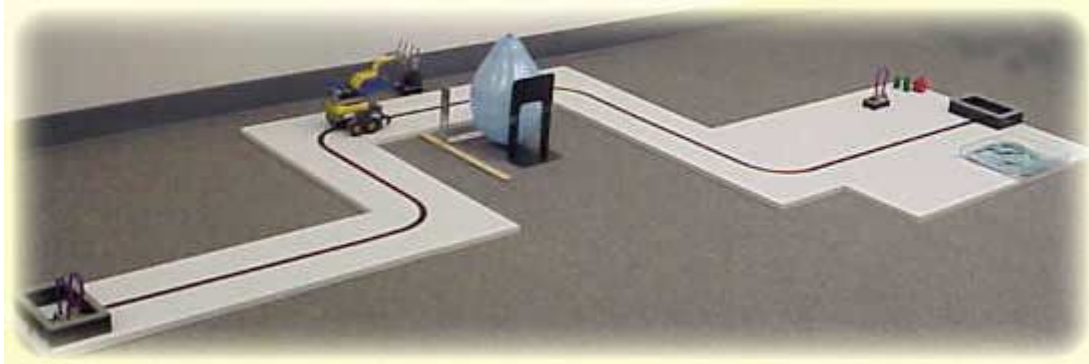


ROBOFEST2001 GAME

ROBOMESSENGER

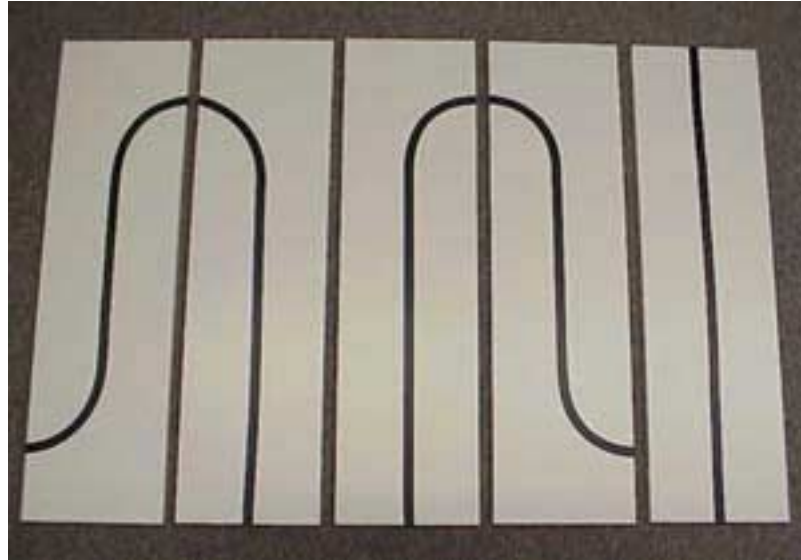


(Fig. 1) A sample playing field

Mission ID	Missions	Points	Repeatable?
1	Driving to the destination	5	Yes
2	Returning back home	10	Yes
3	Delivering a package	10	Yes
4	Popping a balloon	15	No
5	Picking raffle ticket(s)	10	Yes
6	Grabbing a package	15	No

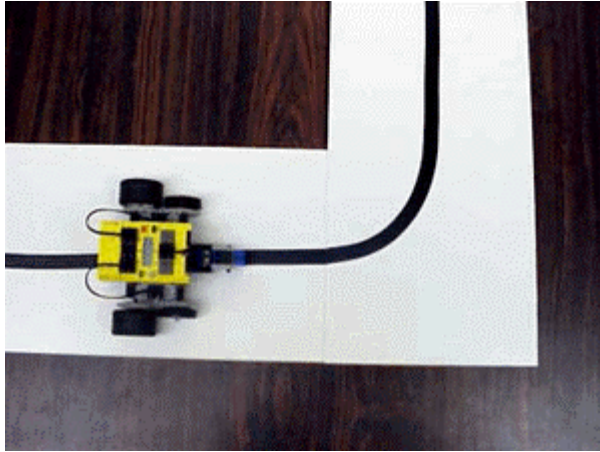
How to Construct a Playing Field

- Figure 1 above shows an instance of a RoboFest 2001 playing field. The shape and length of the actual playing field is unknown.
- Tracks
 - Six to ten 10"x36" white bookshelves with line must be used. Note that the actual width of the 10"x36" bookshelves you can buy from local stores like Home Depot, K-Mart, and Meijers is slightly less than 10". Bookshelves will be taped together. If your robot is using skids, make sure they are all right with tapes.
 - Black electric tape (width of 0.75") approximately in the middle of each book shelf as shown in the following figure 2.

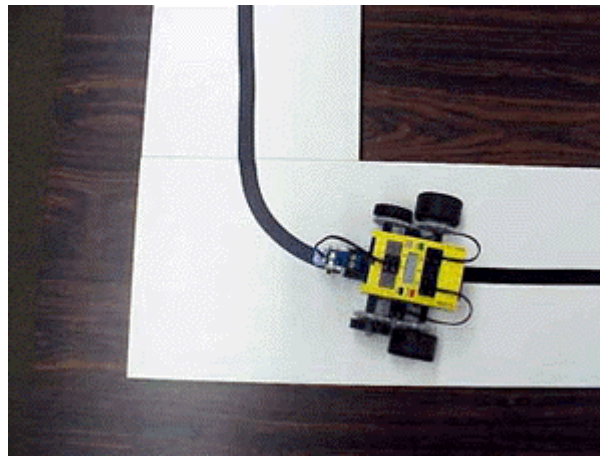


(Fig. 2) Legal bookshelves

- Any connected line you can make with six to ten bookshelves will be the playing field! This means that the length of the total path is unknown.
- The thickness of the bookshelves is about $5/8$ ".
- The color of the floor (may be tables) where the bookshelves will be placed is dark. You may use this knowledge for your navigation method (However, any robot parts may not extend more than 1 inch, except the balloon area which will be explained later). There may be intentional gaps between tables, if tables are used, therefore bookshelves may create bridges. Team members are responsible for catching the robot if it falls off.
- Figures 3 and 4 show how to make curves, clockwise and counterclockwise.

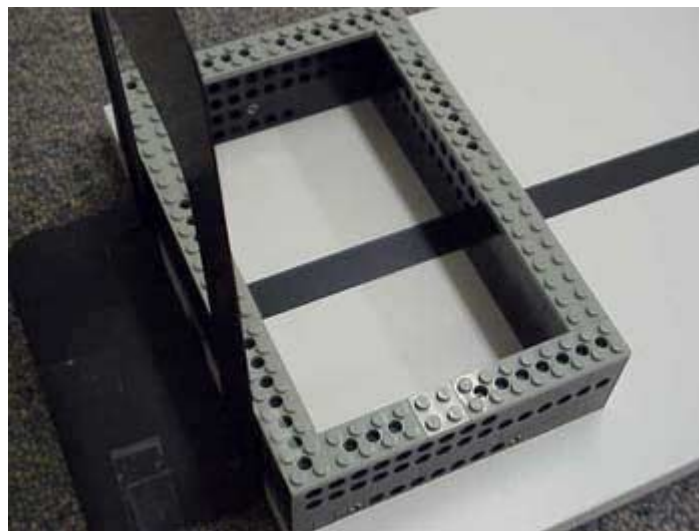


(Fig. 3)



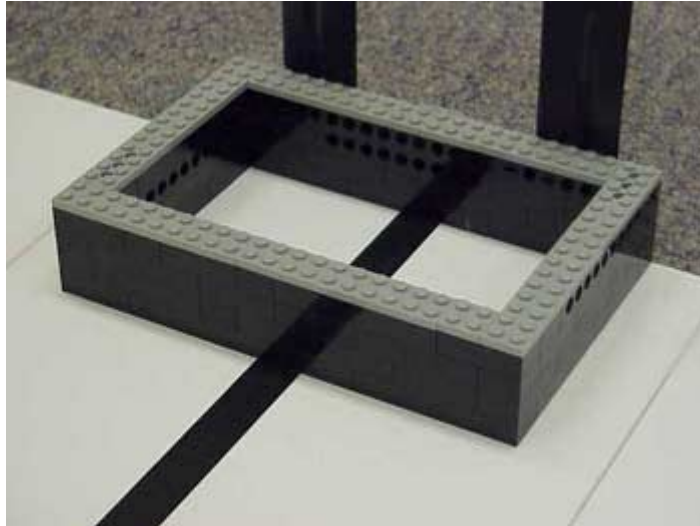
(Fig. 4)

- Home base is made entirely of Lego pieces. Width and length: 16 x 24 Lego buttons. Height: 4 standard Lego blocks and thin gray panels. It is centered, taped and may be backed by a bookend as shown in Figure 4.



(Fig. 5) Home base

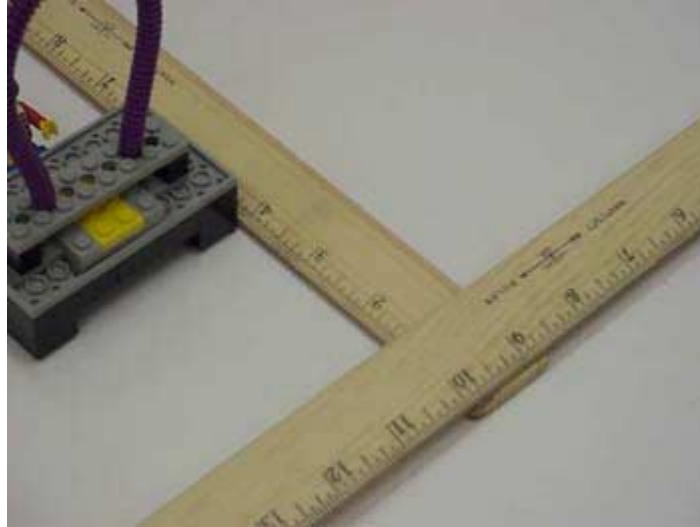
- Destination: The same drop box as in the home base (Fig. 6). As shown in Fig. 7, an extra book shelf without a line at the left side of the main book shelf will host a package on an office desk. Also, a raffle tray is placed on another extra white book shelf at the right side of the main book shelf. The location of the office desk is shown in Figure 8.



(Fig. 6) Destination base



(Fig. 7)



(Fig. 8) The location of the office desk

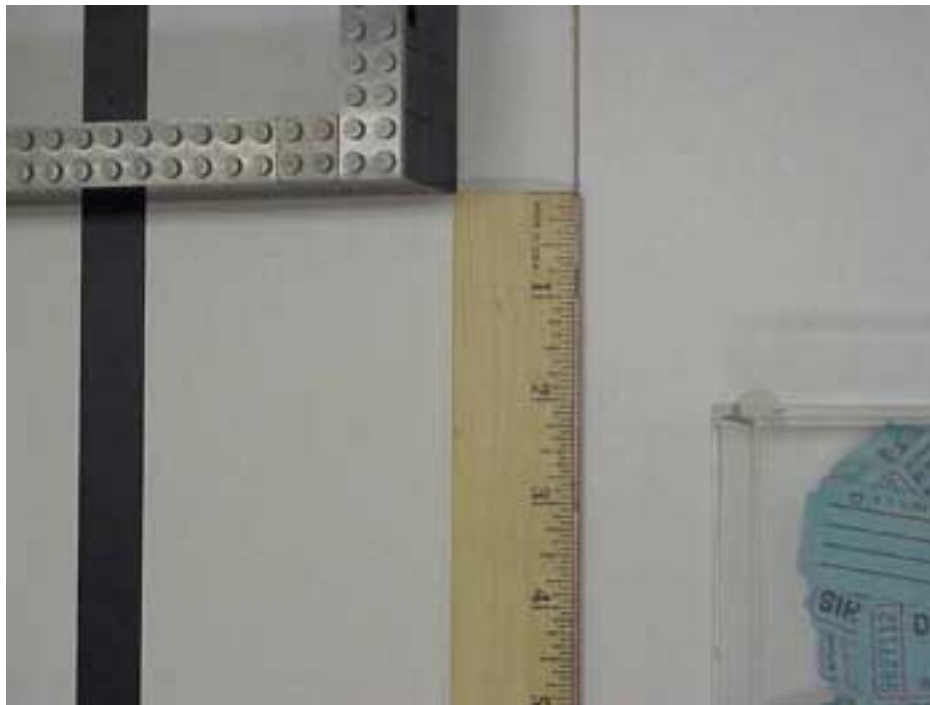
- Raffle Tray: The size of the tray is 8" by 10". The height is 1 and 5/12 inches. You may buy a boxed frame at Meijers (see figure 9) or you can make it with cardboard. Figure 10 shows the location of the tray. It is **taped** onto the bookshelf.



(Fig. 9) Raffle tray

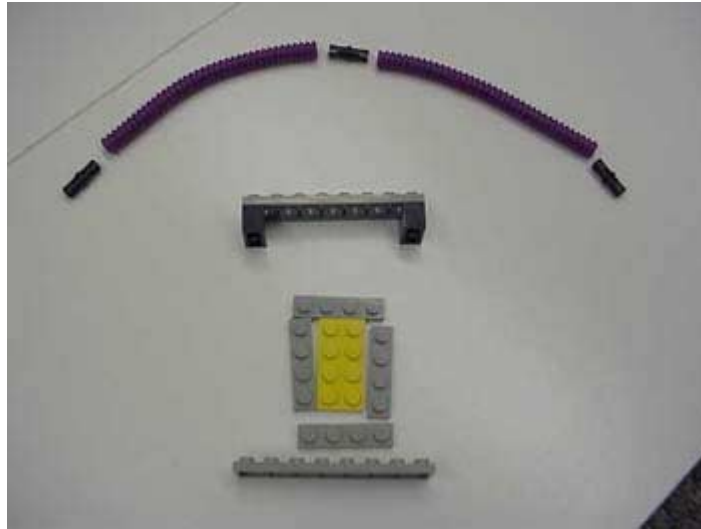


(Fig. 10)



(Fig. 11) The location of the raffle tray

- Mail Package: At least two mail packages are required for each playing field. The following figures 12 to 15 shows how to make it using standard Lego pieces.



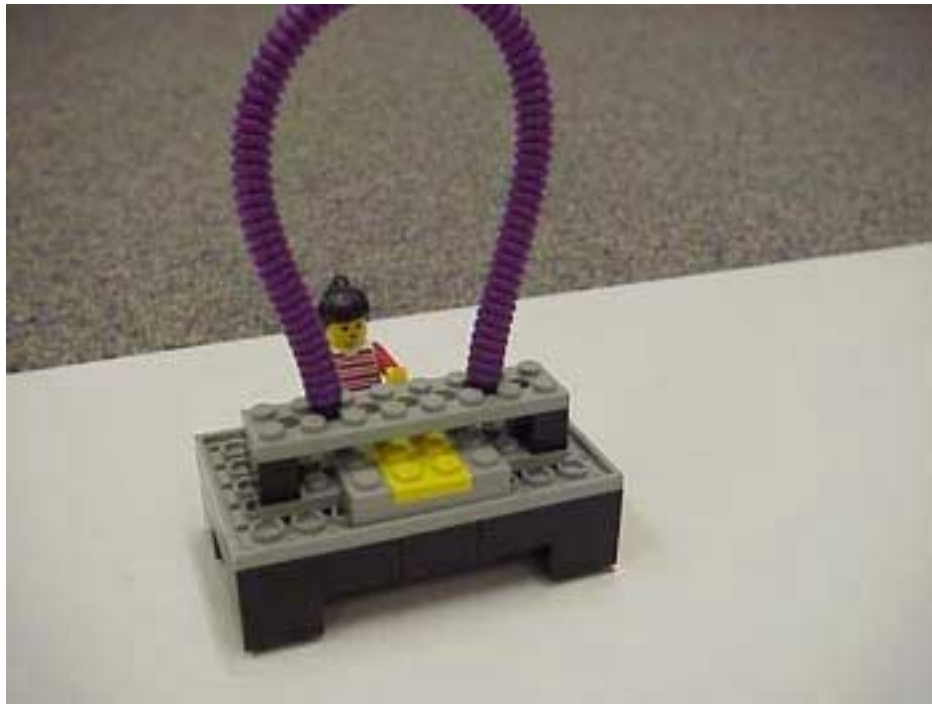
(Fig. 12)



(Fig. 13)



(Fig. 14)

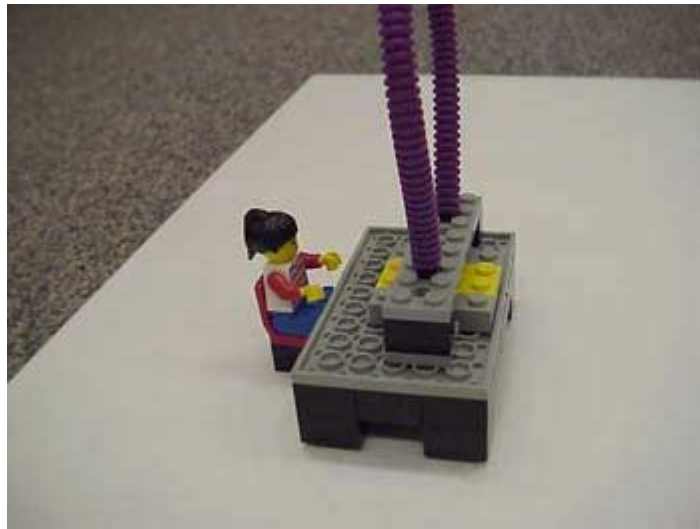


(Fig. 15) Office desk with a mail package

- Office Desk: This can be made by using the 9x5 Lego panel as shown in Figure 16. The height is two standard Lego blocks. The mail package will be placed at the center of the desk as shown in Figure 16 and 17. An office assistant shown in the figure is optional.

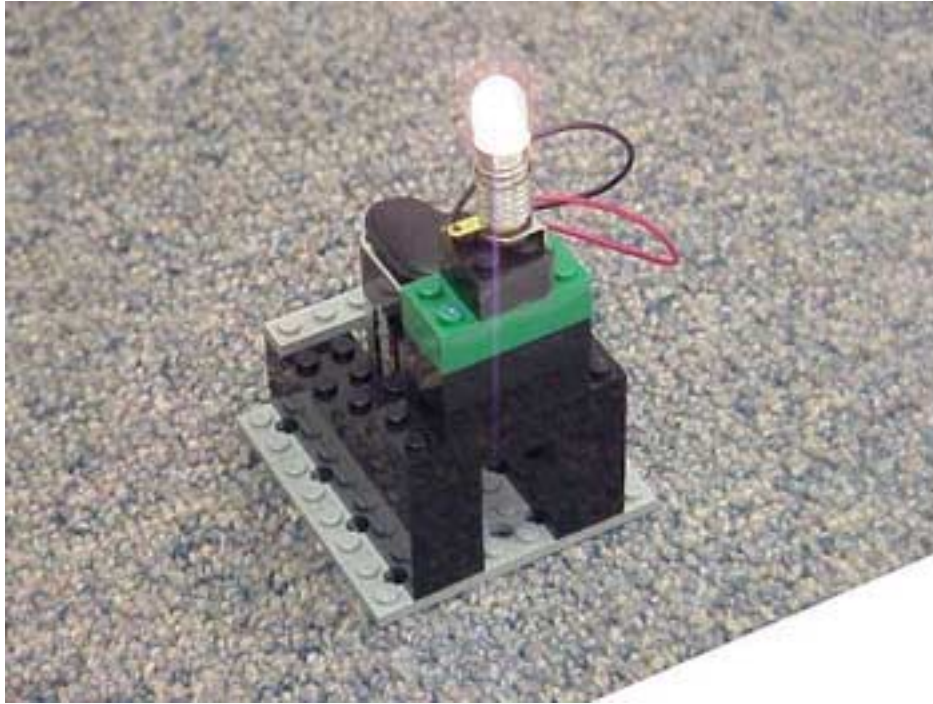


(Fig. 16) Office desk

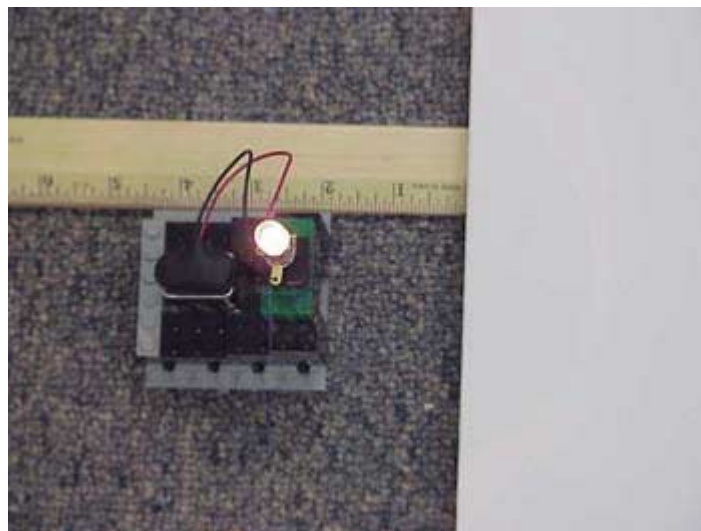


(Fig. 17) The location of the package on the desk

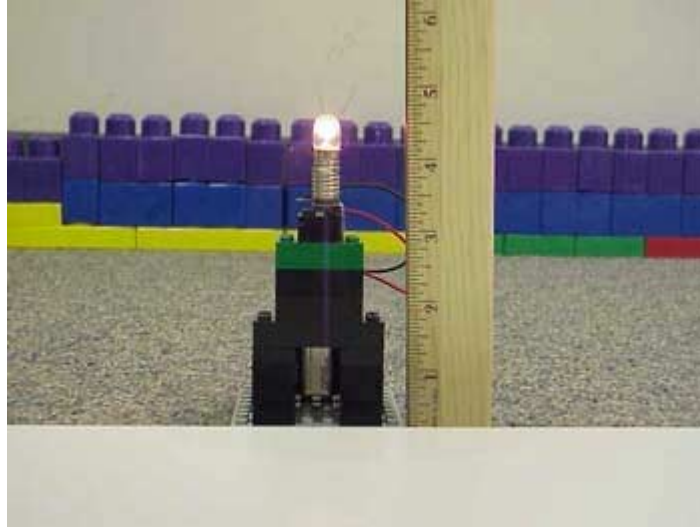
- Lamp light: To be placed on the left side of the track in between home base and the destination. The lamp light must be made of the following as shown in Fig. 18 and 20:
 - Battery holder by Lego blocks
 - One 9 volt battery.
 - A 9 volt battery snap connector. You can purchase this at Radio Shack.
 - A threaded base lamp holder with mounting bracket and solder tabs. You can purchase this at Radio Shack.
 - Screw-base lamps. Radio Shack #46, Screw-Base Lamps, 6.3 volts and 250mA. The center of the bulb is 2 inches away from the board as shown in Figure 19. The height of the lamp bulb is about 4.5 inches from the ground as shown in Figure 20.



(Fig. 18) A lamp light

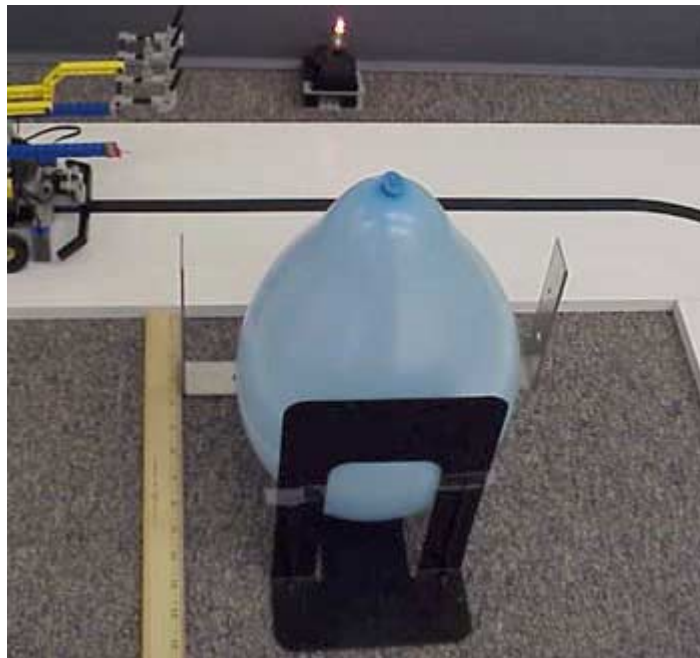


(Fig. 19) The location of the lamp light

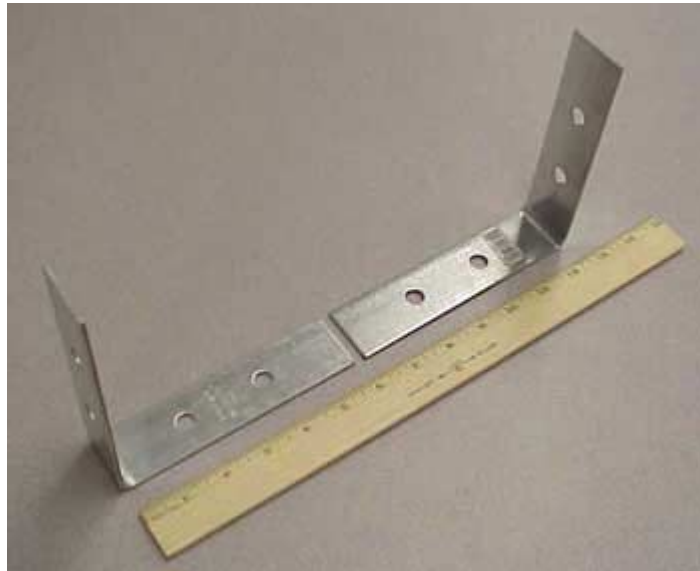


(Fig. 20) The height of the lamp light

- Balloon, Balloon Holder and Balloon Protector: The balloon is to be placed exactly opposite side of the lamp light backed by a bookend. It will be taped to the book end as shown in Figure 21. The diagonal size of the balloon prepared by referees is 8 inches. The balloon is two inches away from the edge of the board as shown in Figure 23. There is 12 inch area made by a Balloon Protector where popping the balloon is valid as shown in Figures 21, 22 and 23. This area is necessary to prevent the robots from extending their arms at the beginning of the travel. The protector can be made by two corner angles found in hardware stores. The size is 6x6 inches and width is one inch. In case of any illegal trials to break the balloon, referees may ask restart. Penalty points are negative 5 points, since the robot should be touched by human hands.



(Fig. 21) The balloon, balloon holder, and balloon protector



(Fig. 22) Balloon protector



(Fig. 23) The location of the balloon, and balloon protector

Missions in Detail

Mission 1: Driving to the destination

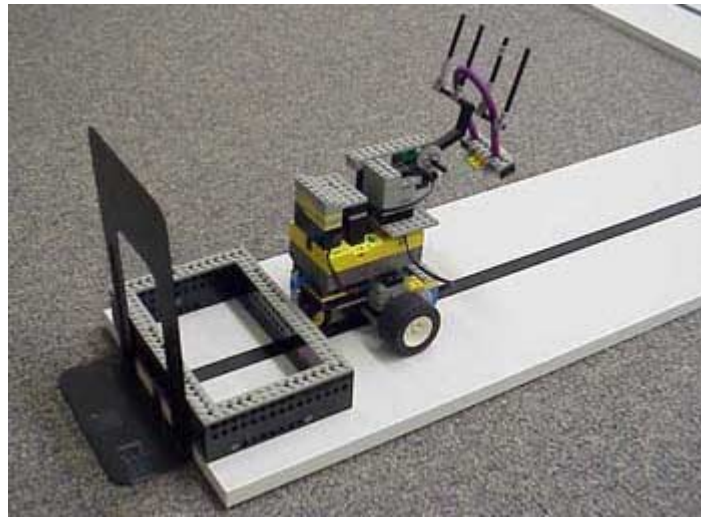
A robot will be placed at the home start position as shown in (Fig. 5). After a robot driver presses the "run" (green) button, the robot must be completely autonomous. No human intervention is allowed to complete the task. One robot will follow the track with a black line. If the robot reaches the destination as shown in (Fig. 6), the mission is completed and 5 points will be awarded.

Mission 2: Returning back home

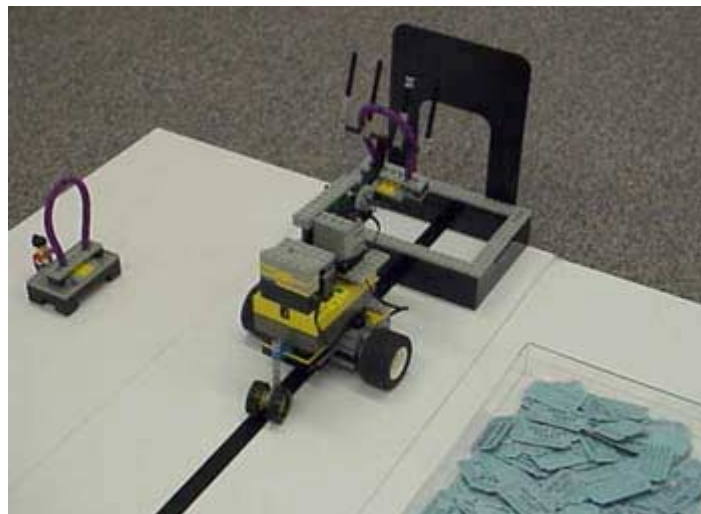
If the robot comes back home after reaching the destination, the mission is completed. The robot does not need to stop its motors when it detects the end at the home position. Total points earned are $5+10=15$.

Mission 3: Delivering a package

A package is loaded to the robot by a robot driver as shown in (Fig. 24). After the robot reaches the destination as shown in (Fig. 25), if the robot drops the package into a drop box, the mission 3 is completed. The valid delivery can be announced when any part of the mail package touches the ground surface. If not, no points will be awarded. After the delivery, if the robot returns home, the total points earned are $5+10+10 = 25$.



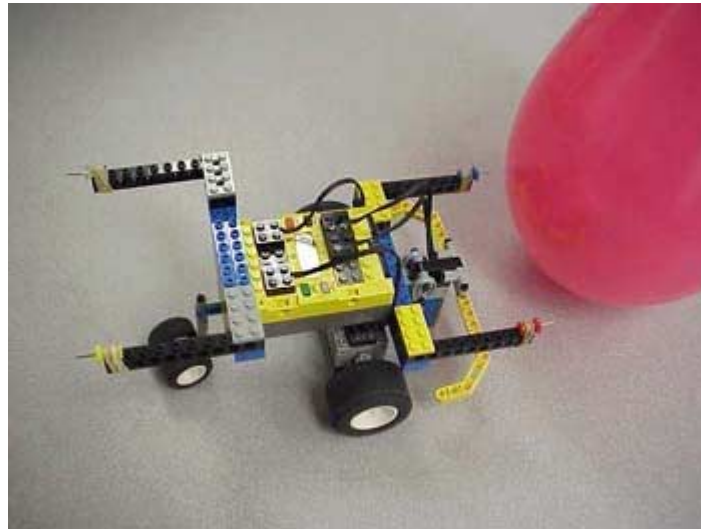
(Fig. 24)



(Fig. 25)

Mission No. 4: Popping a balloon

Somewhere in between the home base and the destination, there will be a lamp as shown in Fig. 1, 21, 22, and 23. A balloon is located at the other side of the lamp. The mission is to pop the balloon using up to 4 (push) pins. You may use rubber bands to attach (push) pins to Lego blocks as shown in figure 26. You must not stretch robot arms from the beginning of the travel hoping the robot breaks the balloon. There is an 11 inch area where you can attempt to break it as shown in Figure 21-23. If the robot pops the balloon and returns back home, 25 (15+10) points will be awarded.



(Fig. 26)

Mission No. 5: Picking up raffle ticket(s)

Raffle tickets will be placed in a tray at the right side of the destination. The mission is to pick a minimum of one raffle ticket and bring it back to the home base. You may use the standard scotch tape up to 6 inches or double sided scotch tape up to 3 inches. The width of the tape is 3/4 inches. If it drops all the tickets, while the robot travels back to home, **5** points will be deducted. If the robot touches the destination, picks up some tickets and returns back home safely with a minimum of one raffle ticket, then the points awarded are $5+10+10 = 25$.

Mission No. 6: Fetching a package

A package with a ring as shown in Figure 15 and 17 will be placed on the office table at the left bookshelf of the destination. The mission is to grab it (15 points) and bring it back to the home base and drop it into the box (10 points) at the home base. If the robot fails in grabbing it, the package can be reset by referees and the robot may retry during the next trip. In the case of dropping the package while it travels back home, there will be **10** points deducted, but it may retry during the next trip.

Time allowed: 2 minutes and 30 seconds. You can run as many trips as possible in this amount of time.

Penalty: If your robot is completely out of control and/or you want to retrieve it by hand, alert the referee, who will allow you to pick it up. However, 5 points will be

deducted as a penalty, in any case. You can touch your robot only at home base without the penalty.

Multiple Missions: You are allowed and encouraged to complete multiple missions per trip. The best scenario as follows: popping the balloon (15), reaching the destination (5), dropping a package (10), picking up tickets (10), grabbing the package (15), return home (10), and dropping the package into home box (10). Total points are 75!

Construction of the robot

- Size of the robot
 - Length: Less than 15 inches including any extensions such as arms, antennae, bumpers, etc.
 - Width: Less than **11** inches including any extensions. Note that the width of the bookshelf is about 10".
 - Height: no restriction.
 - Weight: no restriction.
- The robot must use standard Lego pieces, pins, and scotch tape (width: 3/4", only for raffle tickets).
- You may not glue/tape Lego pieces. However, advanced robots may use any method to connect pieces.
- You can use only one RCX or other board such as a Handy Board per team.
- You may need an extra motor and extra light sensors. You may also use rotation sensor(s).
- You may use any sensors and any actuators.
- You may use any number of sensors, actuators.
- You may not use Lego remote controller.

Programming the robot

- Lego Robots: You may program your robot using any of the programming environments available such as Lego MindStorms™ RIS RCX code programming (1.0, 1.5, or 2.0beta), RoboLab, NQC with RcxCC, Java with TinyVM, Visual Basic with OCX, or LegOS/C.
- Other Robots: No limitations

Suggested Ideas

- If you only have the Lego Mindstorms box without extra sensors: Try missions 1 and 2 as many times as possible.
- If you have one extra motor: You can try missions 1, 2, 3, 5, and 6
- If you have one extra motor and one extra light sensor: You can try all missions!
- If you have one extra motor and two extra light sensors: You can try all missions with improved speed!
- If you have a rotation sensor, you will be able to grab the package every time!

- It is recommended that High School Lego teams use NQC programming language.

Common Sense Rules

Construction of the robot body is to be done by the students. All programming is to be done by the students. Parents, teachers, or coaches may not assemble the robot bodies or write the program code for the team at any time during the preparation period or during the contest. Especially on the day of the competition, be wary of getting caught up in the excitement and forgetting that this is a student contest! Any direct participation (writing code, assembling robots) is a violation of the rules. The offending team will be out of the consideration of winning even if the team scores 100% on everything. Volunteers will be video taping the team table areas.

Team's Responsibility

- All the teams must check-in by 10:30am. The registration begins at 9:00am in the gym.
- You may need to adjust your programs, because the light condition is different in the gym at LTU. You need check the light values for the black line, white area on the bookshelf, and lamp light in the gym. Again, only team members are allowed to modify your programs. Coaches, parents, teachers are not allowed to touch computers and the robot during the competition.
- Remember, robots are playing in the real physical world! Even if flash lights are forbidden, cameras and camcorders using auto focus function are emitting infra red lights.
- It is the team's responsibility before the game, to ensure the track is all satisfactory. Remember, we are using pieces of bookshelves. There may be big cracks even if referees have checked the track before each game.
- Whenever new programs are downloaded, both your robot and the IR tower MUST be covered by a box. If not, you damage other robots and/or your program will be corrupted. Do not forget to bring a cardboard garage to house RCX to prevent interference from other RCX while downloading programs. It will be a nice idea to cover RCX's infrared sensor with electric tape after downloading a program in order to prevent it from receiving somebody else's program.
- Team member names must be registered through robofest.net website by a registered coach. Certificate will be printed based on the the data on the website. No exceptions.

Prizes sponsored by Blue Cross Blue Shield of Michigan

The best score out of three (or two) rounds will be used to determine the following winners.

Lego Robots (5 th – 12 th grade)	1 st	\$300 Book gift certificates
	place	
	2 nd	\$250 Book gift certificates
	place	\$200 Book gift certificates

	3 rd place	
Advanced (Handy Board) Robots (9 th – 12 th grade)	1 st place 2 nd place	\$300 Book gift certificates \$250 Book gift certificates
College Level Advanced Robots	1 st place	\$200 Book gift certificates

Special Award Trophies decided by Judges

- Five special awards based on programming and mechanical design
- Two mentorship awards to coaches

Judges will visit your table to ask questions. You are required to show your programs as well as your robot to the judges. Each Handy Board team is required to submit a hard copy of source code when checking-in.

FAQ

- **Q:** My robot delivered the package to the destination, but could not return home. If I pick it up by hand, how much do I get?
- **A:** 5 for reaching the destination, 10 for the dropping the package, but 5 penalty due to the hand pickup. So total is 10.
- **Q:** My robot picked up some raffle tickets after reaching the destination, but could not return home. If I pick my robot up by hand, how much do I get?
- **A:** 5 for reaching the destination, 10 for the tickets, but 5 penalty due to the hand pickup. So total is 10.
- **Q:** My robot got three tickets, but dropped two and returned back home. Do we get 10 points for picking up tickets?
- **A:** Yes. The mission requires to get at least one ticket. Sorry, no bonus points, if the robot brings more than one ticket...
- **Q:** Can we connect more than 3 sensors?
- **A:** Yes, it may be possible for some combinations of sensors. You can stack 2 or more touch sensors on a sensor input and program using just one Touch Sensor Watcher. The drawback is that the Touch Sensor Watcher cannot distinguish which touch sensor has been touched. Also you can stack 1 touch sensor and 1 light sensor on the same sensor input port. They must be programmed using a Light Sensor Watcher. Usually, a Light Sensor Watcher receives values between 0 and a number less than 99 from a light sensor. If touch sensor is pressed, you will get the value 100 from the light sensor watcher.

Special Rules for Advanced (Handy Board) Robots

More than one balloon will be located either left of right side of the track. No lamp light will be used to locate the balloon. Handy board robots can use any sensors such as distance sensor(s) to detect the balloon.

Scoring table sheet which referees will be using is [here](#) (MS Word file format).

Last Updated 3-17-01

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