

WINTER CHALLENGE

GAME: TUBE TIME

- Place a 24 inch bicycle tube on pegs
 - Pegs placed at 5, 7, and 9 feet high
 - Tubes are standard inner tubes inflated to 5 psi.
 - Human Player not required.

TASK: PROTOTYPE A FULL SIZE ROBOT

- Must fit FIRST standard size
 - 36" by 30" by 60" high
- Must be able to demonstrate full function
 - Does NOT have to be motorized; MANUAL function **to demonstrate the pick up and hang of the tube** is mandatory.
 - Must display packaging of motors, controllers, CPU, **sensors**, and anything needed to function.
 - May use dummy components made of wood, or other materials.
 - Must display basic wiring and/or plumbing. Can be color string, yarn, or wire.
 - Must have a written **description of each robot** function **and definition of the team game strategy**.
 - **Must have a Bill of Material and details of the weight calculation of the equivalent "final robot" made of FIRST approved components.**

PROGRAMMING

- Must write **the plan** for the 15 sec. Autonomous Mode at start.
- **Write the plan for how the robot would be controlled for Manual Mode.**
- **Write the plan for the 10 sec. Autonomous Mode** at end.
 - How would you get your robot back home?
- Please see further details on page 2.

CONSTRUCTION MATERIAL

- Material is your preference.
 - Wood, cardboard, foam, steel, aluminum, PVC, etc.
 - Color string, yarn, tubing, or wire.

NOTE:

- Scoring will be based on the following:
 - Originality.
 - Function.
 - Appearance.
 - **Presentation of game strategy.**
 - **Presentation of the Robot Program.**
 - **Presentation of the estimated weight of the equivalent "official" FIRST robot.**
 - Team knowledge of robot.

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Additional Programming Details:

Note: ***bold, italic, underlined*** words are revisions to the handout dated 23-Sept-2004.

Programmers need to be sure there are adequate FIRST approved sensors represented on the prototype so that the robot can be programmed to meet the following:

The game time will be broken into three distinct elements:

1. 15 seconds of autonomous mode to position the robot at one of the infrared beacons. The team receives 25 points if this position is reached using any sensor-based method. Dead reckoning or time based sequencing will NOT get the points.
2. ***1 minute 45 seconds*** of manually controlled robot operation to perform the rest of the game objectives. ***Only the 5 ft. peg will be used. Each tube will have a point value of 10 points on the 5 ft. peg. The upright to the right of the alliance viewed from their home end of the field is the one that will be scored regardless of which robot places the tube on the peg.***
3. ***10 additional*** seconds for any robot still mobile at the end of the first 2 minutes. This will be a second autonomous mode time of ***10 seconds***.
 - a. Any robot that autonomously finds its way back to its home position will earn a BONUS of 50 points for the team PLUS doubling the point value before the bonus is applied.
 - b. Home position is defined as straddling the line in front of the operator station: the same line where the robot started the game. The robot direction the robot is heading need not be the same as when started; just so the robot is within 3 feet of the wall and straddling the same line from which it started.
 - c. The robot must have moved at least 5 feet in this autonomous mode in order to be awarded the bonus point.
4. FIRST approved sensors include Banner sensors, limit switches, potentiometers, and other such devices that meet the requirements for electronic equipment as could be purchased per the FIRST competition rules for the 2004 season.

This is expected to be a student exercise. The engineer-mentors are expected to be mentors, not the designers.

Each team will have 5 minutes to present to Team Ford FIRST their project.

The students should provide the documentation that shows at least the following details:

1. Description of the sensors that were selected and what function each sensor performs.
2. Description of how each sensor is read by the robot controller.
3. Flow Chart that shows the order of the program operation.
 - a. This would show how the robot is controlled during the manual time.
 - b. This would show how each sensor is to be integrated into the program.
 - c. This would show how the program keeps track of which autonomous time period it is executing.
 - d. This would show the program algorithm for getting to the beacon.
 - e. This would show how the robot finds its way home.
4. **THERE IS NO ACTUAL PROGRAM REQUIRED**; only the documentation of the development of the program.

Judging will be based on the thoroughness of preparation, the quality of the presentation, the inclusion of the sensors on the prototype robot, and the response of the students to questions from the judges.

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The GAME for the Event:

Each team will provide a robot consisting of:

- (1) blindfolded person (the robot body);
- (1) blindfolded arm person who handles the part following the command of the driver during Manual Mode and the Sensors during Autonomous Mode;
- (2) persons will function as Sensors who command the robot and arm during Autonomous Mode;
- (1) driver who commands the robot and the arm during Manual Mode and can say nothing during Autonomous Mode.
- All (5) persons representing the robot must hold on to a rope that is 5 feet long for the complete match.

Robot will be “disabled” if anyone lets go of the rope. A disabled robot must stop and stay in position for the rest of the match.

The match will be run per the description in the programming details:

- 15 sec. Autonomous to the Beacon; (25 points)
- 1 min 45 sec. Manual Mode; (10 points for each intertube on the team peg 5 ft. above the floor; there will be NO 7 ft. or 9 ft. peg for this mock event). The team peg is the one to the right of the team as it faces the field from its home position.
- 10 sec. Autonomous trying to get home (using only the “sensors” as the robot guidance). (Double a + b then add 50 points if get within 3 ft of start position and move a minimum of 5 ft. during this mode.)

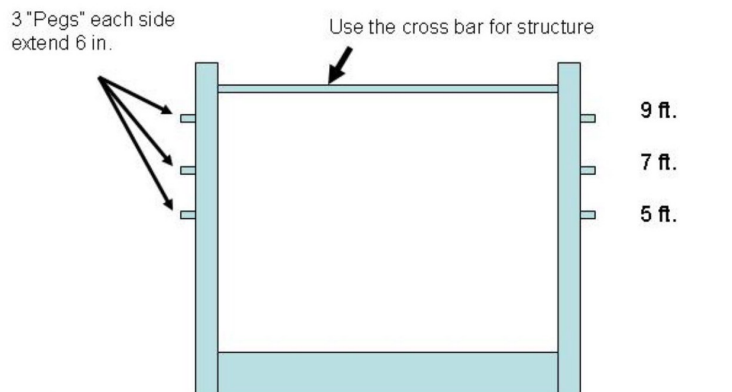
There will be (8) inner tubes available at the start of the game (4 on each end of the centerpiece of the field. It does not matter which inter tube is on the peg; the peg determines which team gets the points.

The student members of ALL teams NOT involved in the current match will outline the field and serve as the field boundary. There is to be no touching of the robot (persons) or the inner tubes by these students.

Lines on the field for Autonomous mode will be tape on the floor.

The beacon will be where the tape meets the people surrounding the field of play.

Sketch of the field piece with all pegs shown.



Note:
Do NOT Scale.

30 Nov 2004