# MICS 2012 Grid-World Robot Race

The MICS 2012 robot contest will consist of your robot navigating a grid-world with obstacles to find a goal. The grid will be 7 rows by 6 columns of 12"x 12", black, vinyl floor tiles. Even-row tiles will have 0.75" white vinyl electrical tape along all four sides, and odd-row tiles will have white tape only on vertical sides.

Robots will always start in grid cell (0,0) facing down. Their task is to navigate completely within the grid-world to the goal cell (a 5" x 5" red square in the middle of a tile) located "randomly", and then return to the starting grid cell (0,0). Upon reaching the goal cell and returning to the start cell, the robot must indicate that it has reached these cells by playing a song (or just beeping, or spinning around, etc.). The robot with the fastest round-trip time wins. A sample grid without obstacles is shown on the right below. Navigation of the grid-world will be complicated by up to four obstacles that can be placed within the grid-world. The four obstacles will be made from 4"x 4" lumber (or two 2-by-4's nailed together) with their shapes on the left below.
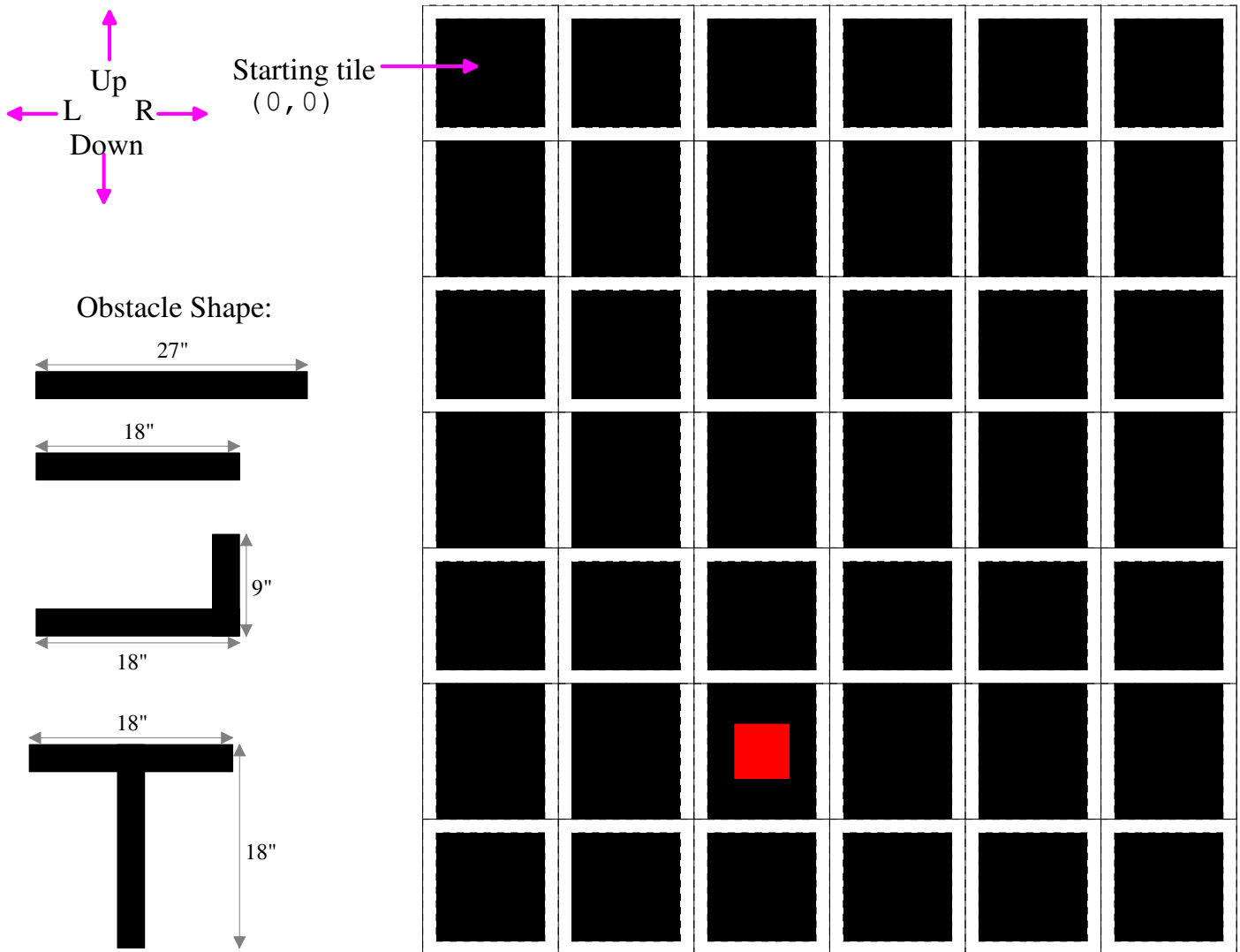
The obstacles will be painted flat black and will be oriented such that the 4" lumber is centered on grid lines. The goal cell will be reachable by at least one side which is not along the outer border.

Each robot will attempt to navigate through two different grid-worlds. On each attempt, a robot will be allowed a maximum of 4 minutes to navigate a grid-world. Robots will always start in the middle of the (0, 0) starting (upper-left-hand-corner) tile facing "down". If a robot completely exits the grid-world (i.e., all of its wheels cross the outer border strip), it will be returned to the starting point by its builder **while the clock is still running**. The robot will be restarted facing "down" with the same program being run.

The Winner:

1. The robot successfully navigating both grid-worlds in the shortest combined time is the winner.
2. If no robot successfully navigates both grid-worlds, then the robot successfully navigating either grid-world and finding the red square in the other grid-world in the shortest combined time is the winner. The "combined time" is the time to successful navigate one grid-world plus the time to find the red square in the other grid-world.
3. If no robot successfully navigating either grid-world and finds the red square in the other, then the robot successfully navigating either grid-world in the shortest time is the winner.
4. If no robot successfully navigating either grid-world, then the robot successfully finding the red square in both grid-worlds in the shortest combined time is the winner.
5. If no robot successfully finds the red square in both grid-worlds, then the robot finding a single red square in either grid-world in the shortest time is the winner.

During a grid-world run, a robot's first time to find the red square will be used, even if it is later restarted from the starting point.

Additional Rules:

1. Each robot must be fully autonomous, i.e., no communication to an external computer or human operator.

2. The maximum size of a robot at any point in the competition is 10" by 10" by 18" (vertical).

3. A robot which, as determined by the judges, intentionally damages the playing field in any fashion will be disqualified immediately. This includes leaving any "trail of bread crumbs, " or mark its path in any way. Once a robot is disqualified, the robot shall not be permitted to engage in any additional grid-world runs.

4. Each robot will be allowed 4 minutes to find the red square and return to the starting tile on each of two different grid-worlds. At any point during a robot's attempt on a grid-world, the team can decide to restart their robot from the starting tile, but the clock will continue to run.

5. The robot will be restarted if it completely exits the grid-world (i.e., all of its wheels cross the outer border strip). It will be returned to the starting point by its builder **while the clock is still running**. The robot will be restarted facing "down" with the same program being run.

6. Robots may NOT be reprogrammed or physically modified between grid-world runs. The robot must run the same program when restarted on a grid-world, but any knowledge about the grid-world obtained before it was restarted **can** be retained.   The robot must run the same program when running on the second grid-world. The only allowed repair is changing batteries, and this must not result in a delay of the competition.

7. Upon reaching the 5" x 5" red square **and** upon returning to the starting tile after successfully navigating the grid-world, a robot must indicate its happiness by beeping, playing music, spinning around, doing a little dance, waving its arms, lighting a light, or displaying a message. Before starting a grid-world attempt, inform the judge what robot behavior to look for upon reaching the red square and returning to the starting square.

8. Before the competition starts, all robots must be checked in **and be left with the judges**. Robots will be randomly numbered at check-in time. After check-in, two different grid-worlds will be constructed by the judges placing obstacles. Robots assigned odd numbers will run in ascending order (1, 3, 5, etc.) on one grid-world, while even-numbered robots (2, 4, 6, etc.) run on the other grid-world. Then, the odd and even robots will switch grid-worlds and again run in ascending order.

9. Any robot that violates the spirit of the contest rules, in the judgment of the organizers, will be eliminated from competition.   All decisions by the judges are final!

10. The tiles used in completion are Home Dynamix Flooring: Dynamix Vinyl Tile 1052 Black which can be ordered from: http://www.powersellerusa.com/dynamix-vinyl-tile-10521.html. A box of 20 is about $20, and a box of 30 is about $30.

11. The white strips will be 3/4 (0.75) inch wide, Duck brand 667 Pro Series, white, vinyl electrical tape.

12. The red square will be spray painted on the tile. The paint used will be Fire Red (20005) Walmart Brand, ColorPlace interior/exterior fast dry spray paint.