Curtin University

Robofair 2013
Autonomous Robots Competition

Task

The goal of this challenge is to collect three blocks from a grid. In order to do so, the robot must autonomously navigate a maze, find a block on the grid and return it through the maze to the Drop Zone. The blocks must be removed one at a time; i.e. the robot must navigate the maze and grid three times to recover all blocks. Blocks will be coloured and extra points will be awarded for returning the blocks in the correct order (red, green, blue).

Arena

Maze

The maze will be of a size 2.4 x 2.4 metres. An example of a possible maze may be seen in figure 1; however competitors should note that the maze will be different on the day of the event. Walls of the maze will be a minimum of 200mm high and there will be a minimum gap width of 35cm in all places throughout the maze. The maze will be completely surrounded by walls with only one entry and one exit points.

Figure 1. Maze dimensions (not to scale)

The floor of the maze will be black and all walls and drop zone will be painted white. The size of the Drop Zone will be 35 x 35 cm. The robot's approximate starting position and orientation is marked with a red arrow.

Grid

The size of the grid will be 2.4 x 2.4m with 8x8 crosses (figure 2), lines will be white and 30mm wide, cells will be black and 270x270mm (figure 3). There will be no wall marking the edge of the grid. Entrance to the grid will be fixed at the bottom-left corner, as indicated in figure 2.

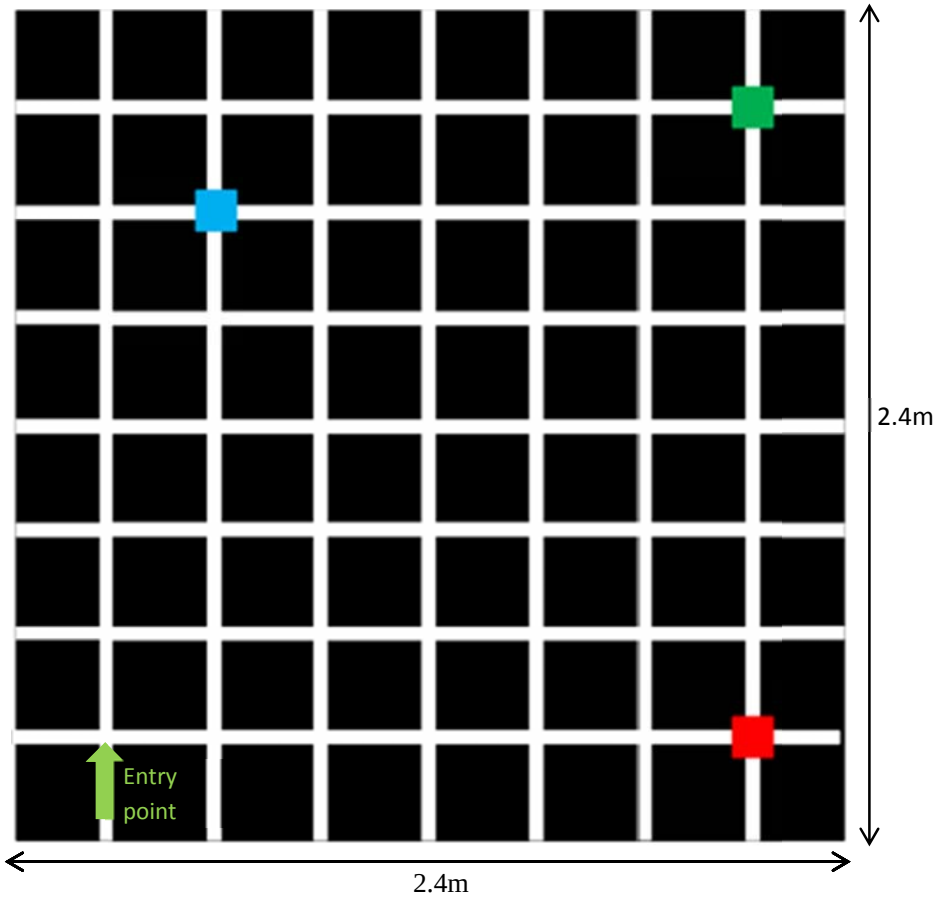

Figure 2. Grid dimensions (not to scale)

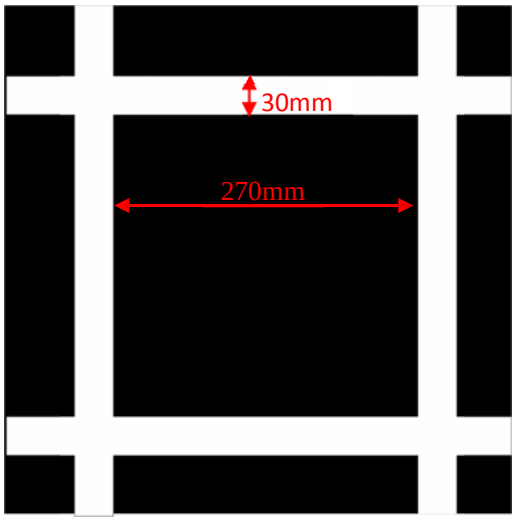

Figure 3. Grid Cell measurements

Blocks

Blocks will have 3 colours: red, green and blue. Blocks will be placed randomly at vertices in the grid as in figure 2. Dimensions of the blocks are 10x10x10cm (figure 4). Blocks will be removed from the Drop Zone by a referee as soon as they are delivered.

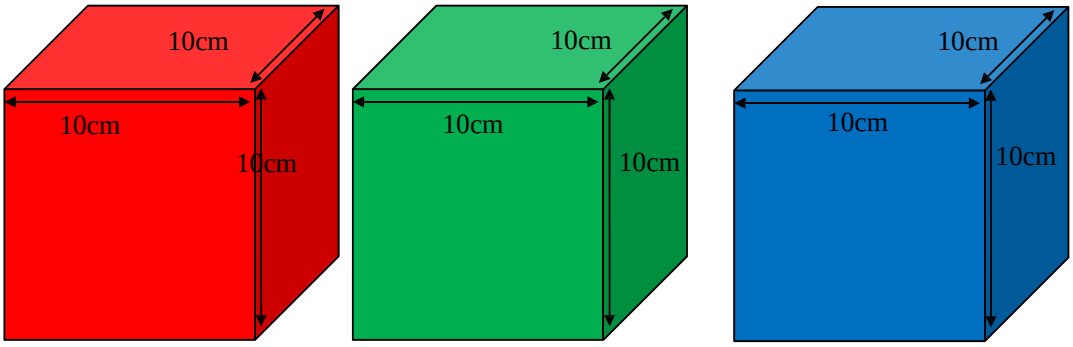

Figure 4. Block Dimensions

Rules

Robot dimensions

The robot must fit in a 25x25cm square. No restrictions on the shape or height.

Budget

No upper limit specified.

Scoring

The final score will be determined with the following formula.

Score = RG + (CB * 100) + (BD * 200) + COB + (600 - time) – (100*R)

Where:

RG: Reaching the grid for the first time will earn 100 points.

CB: Number of blocks collected (picked up).

BD: Number of blocks deposited in the drop zone.

COB: A 100 point bonus will be awarded for collecting the blocks in the order red, green, blue. Bonus points will be awarded only upon *collection* of the final block.

(600 - time) A time bonus will be awarded at the completion of the task equal to 600 minus the time taken by the robot in seconds. There will be a time limit of 10 minutes to complete the task.

R: Number of restarts.

Thus if a robot takes 6 minutes to collect 3 blocks in the correct order, with one restart and fails to deliver the last block it would earn:

Score= 100 + (3 * 100) + (2 * 200) + 100 + (600 - 360) - 100= 1040 points