

# ***2009 IEEE Region 1 Student Conference Micromouse Competition Rules***

## **1. Purpose**

The objective of the competition is to build a robot, which can negotiate a specified maze in the shortest time. A robot participating in this competition is termed a “Micromouse.” The person who places the Micromouse in the maze and starts its operation is termed a “Handler.”

## **2. Maze Specifications**

1. The maze shall comprise 16 x 16 multiples of an 18cm x 18 cm unit square.
2. The walls constituting the maze shall be 5 cm high and 1.2 cm thick. Passageways between the walls shall be 16.8 cm wide. The outside wall shall enclose the entire maze.
3. The sides of the maze shall be white, and the top of the walls shall be red. The floor of the maze shall be made of wood and finished with non-gloss black paint. The coating on the top and sides of the walls shall be selected to reflect infrared light and the coating on the floor shall absorb it.
4. The start of the maze shall be located at one of the four corners. The starting square shall have walls on three sides. The starting square orientation shall be such that when the open wall is to the “north,” outside maze walls are on the “west” and “south.” At the center of the maze shall be a large opening that is composed of 4 unit squares. This central square shall be the destination. A red post, 20 cm high, and 2.5 cm on each side, may be placed at the center of the large destination square if requested by the handler.
5. Small square posts, each 1.2 cm x 1.2 cm x 5 cm high, at the four corners of each unit are called lattice points. The maze shall be constituted such that there is at least one wall touching each lattice point, except for the destination square.
6. The dimensions of the maze shall be accurate to within 5% or 2 cm, whichever is less. Assembly joints on the maze floor shall not involve steps greater than 0.5 mm. The change of slope at an assembly joint shall not be greater than 4. Gaps between the walls of adjacent squares shall not be greater than 1 mm.

## **3. Micromouse Specifications**

1. A Micromouse shall be self contained. It shall not use an energy source employing a combustion process.
2. The length and width of a Micromouse shall be restricted to a square region of 25 cm x 25 cm. The dimensions of a Micromouse which changes its geometry during a run shall never be greater than 25 cm x 25 cm. The height of a Micromouse is unrestricted.

3. A Micromouse shall not leave anything behind while negotiating the maze.
4. A Micromouse shall not jump over, climb, scratch, damage, or destroy the walls of the maze.

## 4. Contest Rules

The basic function of a Micromouse is to travel from the start square to the destination square. This is called a run. The time it takes is called the *run time*. Traveling from the destination square back to the start square is not considered a run. The total time from the first activation of the Micromouse until the start of each run is also measured. This is called the *maze time*. If a mouse requires manual assistance at any time during the contest it is considered *touched*. By using these three parameters the scoring of the contest is designed to reward speed, efficiency of maze solving, and self-reliance of the Micromouse.

1. The scoring of a Micromouse shall be done by computing a handicapped time for each run. This shall be calculated by adding the time for each run to 1/30 of the maze time associated with that run and subtracting a 10 second bonus if the Micromouse has not been touched. The run with the fastest handicapped time for each Micromouse shall be the official time of that Micromouse.

Examples:

A Micromouse is activated and takes 30 seconds to leave the start square. It navigates the maze without being touched and takes 140 seconds to reach the final square. The maze time is 30 seconds and the run time is 140 seconds. The handicapped time is  $140s + (30s/30s) - 10s$  or 131 seconds.

The Micromouse now returns to the start square by itself and begins the second run. It leaves the start square at 3 minutes (180 seconds) and starts a run that takes 30 seconds without being touched. The run will have a handicapped time of  $30s + (180s/30s) - 10s$  or 26 seconds.

The same Micromouse now returns by itself to the start square and begins a third run in 30 seconds. It reaches the destination in 20 seconds without being touched. The maze time is 240 seconds – one minute for the previous run and return plus 180 seconds. The run will have a handicapped time of  $20s + (240s/30s) - 10s$  or 18 seconds.

2. Each competition Micromouse shall be subject to a time limit of 15 minutes on the maze. Within this time limit, the Micromouse may make as many runs as possible.
3. When the Micromouse reaches the maze center it may be manually lifted out and restarted or it may make its own way back to the start square. Manually lifting it out shall be considered touching the Micromouse and will cause it to lose the 10 second bonus on all further runs.

4. The time for each run shall be measured from the moment the Micromouse leaves the start square until it enters the finish square. The total time on the maze shall be measured from the time the Micromouse is first activated. The mouse does not have to move when it is first activated but it must be positioned in the start square ready to run.
5. The time taken to negotiate the maze shall be measured either manually by the contest officials or by infrared sensors set at the start and destination. If infrared sensors are used, the start sensor shall be positioned at the boundary between the start square and the next unit square. The destination sensor shall be placed at the entrance to the destination square. The infrared beam of each sensor shall be horizontal and positioned approximately 1 *cm* above the floor.
6. The starting procedure of the Micromouse shall not offer a choice of strategies to the handler.
7. Once the maze configuration for the contest is disclosed, the operator shall not feed the Micromouse with any maze information.
8. The illumination, temperature, and humidity of the room in which the maze is located shall be those of an ambient environment. Requests to adjust the illumination may be accepted at the discretion of the contest officials.
9. If a Micromouse appears to be malfunctioning, the handlers may ask the judges for permission to abandon the run and restart the Micromouse at the beginning. A Micromouse shall not be re-started merely because it has taken a wrong turn.
10. If a Micromouse team elects to stop because of technical problems, the judges may, at their discretion, permit the team to run again later in the contest with a 3 minute maze time penalty. For example, assume a Micromouse is stopped after 4 minutes; it must be restarted as if it had already run for 7 minutes, and will have only 8 more minutes to run.
11. If any part of a Micromouse is replaced during its performance, such as batteries or EEPROMS, or if any significant adjustment is made, the memory of the maze within the Micromouse shall be erased before restarting. Slight adjustments, such as to the sensors may be allowed at the discretion of the judges, but operation of speed or strategy controls is expressly forbidden without a memory erasure.
12. No part of the Micromouse (with the possible exception of batteries) shall be transferred to another Micromouse. For example if one chassis is used with two alternative controllers, then they are the same Micromouse and must perform within a single 15 minute allocation. The memory must be cleared with the change of a controller.
13. The contest officials shall reserve the right to stop a run, or disqualify a Micromouse, if they believe its continued operation is endangering the condition of the maze.