

# MicroMouse Competition Rules

## IEEE Fall 2023 R2 & R1 SAC

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## **1. Introduction**

### **1.1. Competition Title: MicroMouse Competition**

### **1.2. Competition Description**

In this competition the participant, or team of participants, must design and build an autonomous robotic “mouse” capable of traversing a maze of standard dimensions from a specified corner to its center in the shortest time possible.

## **2. Participant Eligibility**

### **2.1. IEEE Membership**

All participants shall be registered IEEE student members attending the university they identified when registering for the SAC.

### **2.2. Team Composition**

Teams shall consist of one to five participants. A team of four or five participants shall not include more than two graduate students. A team of two or three participants shall not include more than one graduate student. Teams consisting of individual graduate students are not allowed. In the case of a team with more than one participant, it should be possible to demonstrate that each participant made a significant contribution.

### **2.3. Number of Teams**

There is a limit of 2 teams that one university may register for this competition.

### **3. MicroMouse Robot Rules**

#### **3.1. Fabrication**

The MicroMouse robot submitted by a team must be designed and built from scratch.

#### **3.2. Self Containment**

The MicroMouse robot shall be self-contained (no remote controls). The robot shall not use an energy source employing a combustion process.

#### **3.3. Dislodged Parts**

The MicroMouse robot shall not separate from any part of itself whilst navigating the maze. To complete the maze, the robot, in its entirety, must enter the center of the maze.

#### **3.4. Method of Movement**

The MicroMouse robot shall not jump over, fly over, climb, scratch, cut, burn, mark, damage, or destroy the walls of the maze.

#### **3.5. Micromouse Size**

The MicroMouse robot shall not be larger, either in length or in width, than 25 centimeters. The dimensions of a MicroMouse robot that changes its geometry shall not be greater than 25cm x 25cm (length and width, respectively). There are no restrictions on the height of the robot.

#### **3.6. Inspection**

All MicroMouse robots are subject to inspection prior to starting their competition, to ensure they are within the specifications outlined by these rules, and that they do not pose potential safety hazards.

#### **3.7. Rules Violation**

Any violation of these rules will constitute immediate disqualification from the contest and ineligibility for any associated prizes.

### **4. Maze Specifications**

#### **4.1. Maze Dimensions**

The maze is composed of 18cm x 18cm unit squares arranged to form a 16 x 16 unit grid. The walls of the units of the maze are 5 cm high and 1.2 cm thick (assume 5% tolerance for mazes). An outside wall encloses the entire maze.

## **4.2. Maze Coloration**

The sides of the maze walls are white, the tops of the walls are red, and the floor is black. The maze is made of wood, finished with non-gloss paint.

### **4.2.1. Maze Fabrication Inconsistencies**

Do not assume the walls are consistently white, or that the tops of the walls are consistently red, or that the floor is consistently black. Fading may occur and parts from different mazes may be used. Do not assume the floor provides a given amount of friction. It is simply painted plywood and may be quite slick. The maze floor may be constructed using multiple sheets of plywood. Therefore there may be a seam between the two sheets on which any low-hanging parts of the robot may snag.

## **4.3. Start/End Zones**

The starting square of the maze is located at one of the four corners. The starting square is bounded on three sides by walls. The start line is located between the first and second squares. As the mouse exits the corner square (signified by crossing the start line), the run timer starts. The destination is a gateway to the four-unit square at the center of the maze. The destination square has only one gateway.

## **4.4. Lattice Points**

Small square posts, each 1.2 cm x 1.2 cm, at the four corners of each unit square are called lattice points. The maze is assembled so that there is at least one wall at each lattice point.

## **4.5. Multiple Paths**

Multiple paths from the starting square to the destination square are allowed and should be expected. The destination square will be positioned so that a wall-hugging mouse will NOT be able to find it.

# **5. Competition Rules**

## **5.1. Time**

Each team is allocated 10 minutes of access to the maze, starting when the competition administrator acknowledges the team and grants access to the maze. Any time used to adjust the team's MicroMouse robot between runs is included in these 10 minutes. A run-time is recorded for each run (from the start cell to the center zone) in which the robot successfully reaches the destination square. The minimum run time within the 10-minute trial shall be the mouse's official time.

## **5.2. Stopping/Removing the MicroMouse Robot**

Each run shall be made from the starting square. Multiple runs, or run attempts, may be made within the allotted 10 minute maze time. The team may abort a run at any time and return the MicroMouse robot to the starting square. If the robot has reached the destination square and has acquired a “run time,” the robot may take the maze back to the corner starting square on its own. Alternatively, it may be removed at any time without affecting the runtime of that run. If the robot is placed back in the maze at the starting square, a one-time penalty of 30 seconds will be added to the robot’s next run time.

## **5.3. Reprogramming After Reveal**

After the competition maze is revealed to the teams at the start of the competition, the operator shall not reprogram his or her MicroMouse robot but may elect to change the positions of switches located on the robot.

## **5.4. Room Conditions**

The illumination, temperature, and humidity of the room shall be those of an ambient environment. (40 to 120 degrees F, 0% to 95% humidity, non-condensing).

### **5.4.1. Ambient Lighting**

Do not make any assumptions about the amount of sunlight, incident light, or fluorescent light that may be present at the competition site.

## **5.5. Run Time**

The run timer will start when the front edge of the Micromouse robot crosses the start line and stops when the front edge of the mouse crosses the finish line. The start line is at the boundary between the starting unit square and the next unit square clockwise. The finish line is at the entrance to the destination square.

## **5.6. Starting a Run**

Every time the MicroMouse robot leaves the starting square, a new run begins. If the robot does not enter the destination square, no runtime is recorded. For example, if the robot re-enters the starting square (before entering the destination square) on a run, that run is aborted, and a new runtime will begin when the robot leaves the starting square.

## **5.7. Continued Navigation**

If the MicroMouse robot continues to navigate the maze after reaching the destination square, the time taken will not count toward any run. The robot may and should make

several runs without being touched by the operator. Once the robot has found the center, it is common practice to explore the maze via an alternate path on the return trip to the starting square.

### **5.8. Modifying the Robot**

The team may not feed information about the maze to the MicroMouse robot. Therefore, changing ROMs or downloading programs is NOT allowed once the maze is revealed. However, participants are allowed to do the following:

- Change switch settings (e.g. to select algorithms).
- Replace batteries between runs.
- Adjust sensors.
- Change speed settings.
- Make repairs.

### **5.9. Changing the Robot's Weight**

After the team's 10 minute time allotment begins, they shall not alter their MicroMouse robot in a manner that alters its weight (e.g. removal of a bulky sensor array or switching to lighter batteries to get better speed after mapping the maze is not allowed). The judges shall arbitrate all interactions with the robot.

## **6. Scoring**

### **6.1. Regionality and Presentation**

There is only one official IEEE MicroMouse contest each year in each area or region. All MicroMouse robots, whether or not they have competed in previous contests, compete on an equal basis. All robots must be presented to the judges by the original team.

### **6.2. Scoring**

First place goes to the team with the shortest official time (without the team touching its MicroMouse robot during runs). Second prize to the team with the next shortest time, and so on. Teams with the MicroMouse robot that does not enter the center square will be ranked by the judges based on the following criteria:

- How close the robot gets to the destination square without being touched.
- Evidence that the mouse knows where it is relative to the destination square. If, on occasion, the robot becomes immobilized in a corner or on a wall, the team may manually intervene to correct the problem (with care not to modify the mouse's intended direction of movement. The frequency of such corrections will be considered by the judges while scoring).

### **6.3. Requesting Breaks**

If requested, a break may be provided to the team after the completion of a run if another team is waiting to compete. The 10 minute timer will stop. When the team resumes their play, the 10 minute timer will continue. Judges and administrators shall determine whether a breaks are allowed on a case by case basis.

### **6.4. Judges' Discretion**

The judges reserve the right to ask the team for an explanation of their MicroMouse robot and its actions. The judges also reserve the right to stop a run, declare disqualification, or give instructions as appropriate (e.g., if the structure of the maze is jeopardized by continuing operation of the mouse).