TECHFEST 2022-23
MICROMOUSE CHALLENGE

OBJECTIVE:

Participants are required to build an autonomous, self-contained robot, Micromouse, which can get to the centre of a maze in the shortest possible time. A micromouse essentially comprises of a drive motor or motors to move it; a steering and turning method; sensors to detect the presence or absence of maze walls; sensors or control logic to oversee the action of the rest and keep the vehicle 'on track' or to solve the maze; batteries to provide power.

MAZE SPECIFICATION:

- The maze shall comprise 16 x 16 multiples of an 18 cm x 18 cm unit square.The walls constituting the maze shall be 5 cm high and 1.2 cm thick. Passage ways between the walls shall be 16.8 cm wide, outside wall shall enclose the entire maze. *(see figure 1.1)*
- 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. *Caution: 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. Parts from different mazes may be used. Do not assume the floor provides a given amount of friction.*
- 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 which is composed of 4 unit squares. This central square shall be the destination.
- Small square posts, each 12 mm x 12 mm x 50 mm 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.
- 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.
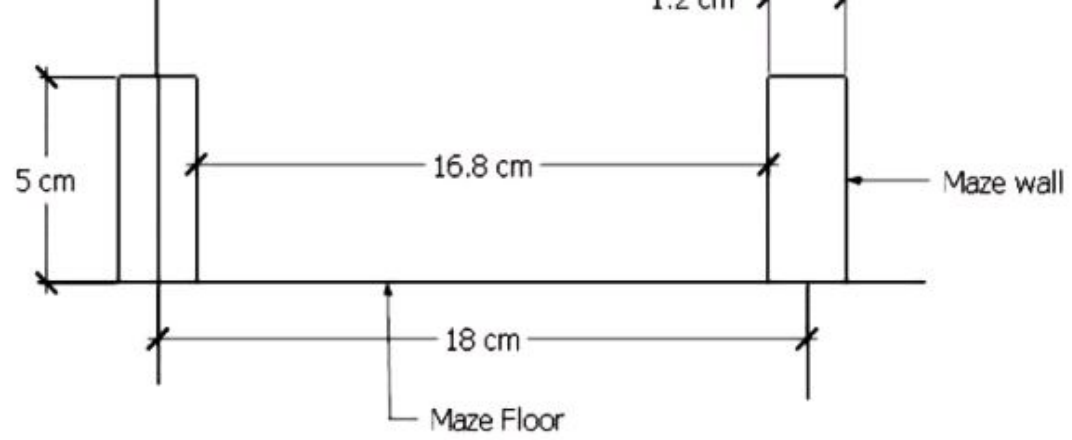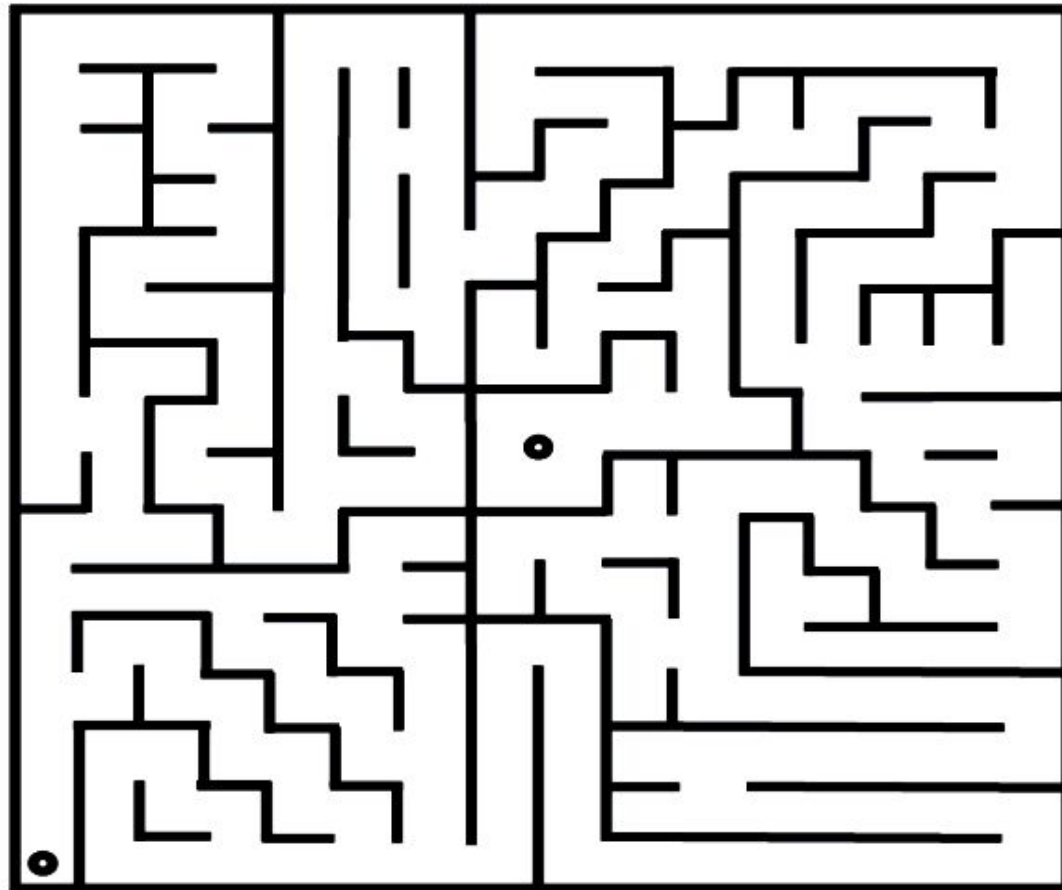
5 cm

16.8 cm

Maze wall

18 cm

Maze Floor

Fig 1.1

SAMPLE MAZE

MICROMOUSE SPECIFICATION:

- A micromouse shall be self-contained. It shall not use an energy source employing a combustion process.
- A micromouse shall not be larger in length or width than 16 cm. The height of a micromouse shall not exceed 100cm.
- The method of wall sensing is at the discretion of the builder. However, the mouse must not exert a force on any wall to cause damage **(Judges can debar any machine if it is likely to cause damage to the maze in any way)**.
- The method of propulsion is at the discretion of the builder, provided that the power source is non-polluting. If the judges consider that a mouse has a high risk of damaging or sullying the maze, they will not permit it to run. Nothing may be deposited in the maze.
- A micromouse shall not leave anything behind while negotiating the maze.
- A micromouse shall not jump over, climb, scratch, damage or destroy the walls of the maze.
- The use of lego kits or any other readymade kits in making the micromouse is not allowed. *Note: Participants need to ensure that the size of the micromouse shouldn't hinder/obstruct its movement in the maze.*

COMPETITION RULES:

- Participants have to submit their machines to organizers at the time of registration at IIT Bombay. All contesting machines shall be collected before the maze is unveiled.
- After the maze is unveiled, the mouse handler is given 3 minutes before the start of his/her run to make adjustments (if any) to the mouse sensors and calibrate the sensors. However, NO selection of strategies must be made and NO information on the maze configuration should be entered or captured into the memory. Any participant doing so will be disqualified instantaneously.
- Each contesting micromouse is allocated a total of 7 minutes of access to the maze after the 3 minutes sensor adjustment time. The maze-time clock will commence after the expiry of the 3 minutes time limit even if the handler is still making adjustments to the sensors.

- Any time used to adjust a mouse between runs is included in the 7 minutes.
- The time taken to travel from the start square to the destination square is called the "run" time. Traveling from the destination square back to the start square is not considered a run. The total time taken from the first activation (after calibration is done or calibration time is over, whichever is less) of the micromouse until the start of each run is also measured. This is called the 'maze' or 'search' time. If the micromouse requires any manual assistance at any time during the contest, it is considered "touched." Scoring is based on these three parameters.
- The micromouse may make up to 7 runs.
- The starting procedure of the mouse should be simple and must not offer a choice of strategies to the handler. For example, a decision to make a fast run to the centre as time runs out must be made by the micromouse itself. The starting procedure should be submitted to the judges when the mouse is registered on the day of the contest.
- Do not make any assumptions about the amount of sunlight, incandescent light, or fluorescent light that may be present at the contest site.
- The run timer will start when front edge of the mouse 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. The finish line is at the entrance to the destination square.
- Every time the mouse leaves the start square, a new run begins. The previous run is aborted if the mouse has not entered the destination square. For example, if a mouse re-enters the start square (before entering the destination square) on a run, that run is aborted, and a new run will be deemed begun, with a new time that starts when the starting square is exited.
- After reaching the destination square, the mouse may continue to navigate the maze for as long as their total maze time allows.
- If a mouse continues to navigate the maze after reaching the destination square, the time taken will not count toward any run. Of course, the 7-minute timer continues to run. When the mouse next leaves the start square, a new run will start. Thus, for better "Run time", a mouse may make several runs without being touched by the operator. It should make its own way back to the beginning to do so.

- The judges reserve the right to ask the operator for an explanation of the Micromouse. The judges also reserve the right to stop a run, declare disqualification, or give instructions as deemed appropriate (e.g., if the structure of the maze is jeopardized by continuing operation of the mouse).

  Note: The judges have the discretion to request a micromouse to retire early if by its lack of progress it has become boring or if erratic behaviour it is endangering the condition of the micromouse maze.

- A contestant should not feed information on the maze to the micromouse. Therefore, changing ROMs or downloading programs is NOT allowed once the maze is revealed. However, contestants are allowed to:
  - ➔ Replace batteries between runs
  - ➔ Adjust sensors (gain, position, etc.)
  - ➔ Change speed settings
  - ➔ Make repairs
- A contestant should not alter a mouse 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 declared is not allowed).
- The contestants should be prepared with the circuit diagrams, algorithms, and code listings to convince the judges that any alteration they do in the total 5 minutes span does not add topological information about the maze to the mouse.

JUDGING:

- Winners will be decided on the basis of the shortest official time, which is calculated as

  Search Penalty = 1/30th of the Search Time in seconds

  Touch Penalty= (N/5)*(Best Run Time) Where N = Number of touches to the best run

  For example, if a micromouse, after being on the maze for 4 minutes,

  starts a run that takes 20 seconds to reach the destination after being

  touched twice; the run will have an Official time of

  20 + (2/5)*20+1/30th of (4 x 60 seconds) = 36 seconds

- If micromouse does not reach the center of the maze then micromouse performance is based on the distance achieved, purposefulness versus random behavior and quality of control.

TEAM SPECIFICATION & ELIGIBILITY:

- All students with a valid identity card of their respective educational institutions are eligible to participate in the competition.
- One team can have a maximum of **4** members.
- Students from different institutes can be a part of the same team.

IMPORTANT NOTE:

- The machine may be checked for its safety before the race and will be discarded if found unsafe for other participants and spectators. The name of your machine must be prominently displayed on the machine.
- Judge's decision shall be treated as final and binding on all.
- The organizers reserve the right to change any or all of the above rules as they deem fit. Change in rules, if any, will be notified to the registered participants.

CERTIFICATE POLICY:

- Certificate of excellence will be awarded to the top 3 teams.
- E-Certificate of participation will be given to all the teams qualified for the finale except the top 3 teams.
- Disqualified teams will not be considered for any certificates.

The Winners will have to mail the following information (immediately after the announcement of the results) to abhishek@techfest.org

Subject: Micromouse Challenge, team id- your position (example: Micromouse Challenge, MC211234 – 1st position)

Body of mail:
1. Account Holder's Name
2. Account Number
3. Bank name and Branch name.
4. IFSC Code