



THE
ANNUAL
ROBOTICS
COMPETITION
OF SLIIT

TECHNICAL SPECIFICATIONS

UNIVERSITY CATEGORY



SLIIT UNI
THE KNOWLEDGE UNIVERSITY

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1 INTRODUCTION

1.1 The Maze Trials

Do you dream of escaping the ever-shifting Maze? Then step right up, because the Maze Trials are back and this time, it's Micromouse mayhem!

We've built a brand-new Maze inspired by the ever-changing trials you know and love. Walls slam shut, dead ends open, and patrol the periphery, all controlled by a central computer program known as E.V.I.L. But fear not, because your ticket to freedom comes in the form of these little heroes – your Micromice!

These autonomous marvels of engineering will be your champions in the Maze. Built and programmed by you, these tiny titans will navigate the treacherous corridors, searching for the hidden exit and securing your passage to... well, that's classified.

The competition is fierce. Points will be awarded for speed, efficiency, and for navigating the ever-changing maze. But beware, the Murder Drones are programmed to eliminate any Micromice that linger too long. So, grease up your gears, hone your coding skills, and get ready to prove you're the ultimate Maze Champion!

May the fastest, smartest mouse win! And remember, ... always remember... never trust E.V.I.L.

1.2 About the ROBOFEST

ROBOFEST is an annual robotics competition organized by the Sri Lanka Institute of Information Technology (SLIIT) where competitors showcase their technical aptitude, imagination, and innovation through designing, building, and competing with their very own robots.

ROBOFEST 2024 university category competition is a Micromouse challenge which aims to be more innovative and exciting than the previous year's contest with updated rules and contest format. Each team would compete by designing and building a fully autonomous Micromouse according to the technical specifications highlighted in this document. The task to be performed, features of the maze and additional information are also included in this document. Based on the guidelines given a panel of impartial judges would adjudicate the competition and award the best performing teams with valuable prizes.

1.3 The Micromouse Challenge

The objective of the contest is to design and build a Micromouse with adaptive intelligence to explore and navigate different maze configurations and solve the maze in the shortest time possible.

2 THE COMPETITION

2.1 Contest Eligibility

2.1.1 Team

- A team may consist of up to five people.
- All members of a team should be from the same university/ institute.
- Solo entries are also accepted.

2.1.2 Registration

- All entrants to the contest must register their teams before the deadline for applications on the **1st of July 2024**.
- Each team should register a unique name under which the members would be registered.
- In the event that there are 2 or more teams with the same name, the name will be allocated on a first-come, first-served basis.
- Event organizers may reject a team name during registration if it is deemed inappropriate, and the team would be informed to submit a different name.

2.2 Rules for the Micromouse

- **Self-Containment:** The Micromouse shall be completely self-contained, fully autonomous and shall receive no outside assistance.
- **Power Source:** The Micromouse shall not use any power sources that use combustion processes or emit pollutants. The voltage between any 2 points of the robot's circuit should not exceed 24V at any given time.
- **Micromouse Size:** The dimensions of the Micromouse should conform to the following size constraints: A maximum length of 14.5cm, and a maximum width of 14.5cm. There are no restrictions on the height of the Micromouse.
- **Micromouse Weight:** The weight of the Micromouse should remain constant during the competition. A contestant may not alter the Micromouse in any way that alters its weight, and any battery replacements should keep the overall weight of the robot within +/- 5g of the initial weight measured during the initial inspection. If any parts of the robot are replaced during the competition (subject to the conditions in section), the robot should be weighed again.
- **Locomotion:** The Micromouse is not allowed to jump over, fly over, climb, scratch, cut, burn, mark, damage, or destroy the walls of the maze.
- **Dislodged Parts:** The Micromouse should not leave any part of its body behind while navigating the maze.
- **External communication:** RF modules cannot be used during the competition. If the Micromouse is equipped with such a module, it should be disabled/ powered off for the duration of the competition.
- **Operation modes:** Manual switches are allowed to change operating modes/ algorithms of the Micromouse. Reprogramming or modifying the code of the Micromouse is not allowed once the robot is presented for the initial inspection.

2.3 Rules for the Maze

2.3.1 Maze Dimensions

The maze is composed of 18cm x 18cm unit cells arranged as a grid of 16 x 16 units. The walls of the units of the maze are 5 cm high and 1.2 cm thick (assume 5% tolerance for mazes). The outside wall encloses the entire maze. A sample maze is given in Figure 1.

The length of a side of a unit cell is 18cm, the length from a wall to the end of a lattice point is 19.2cm (Figure 2).

2.3.2 Maze Construction

The maze would be constructed using PVC sheets, and the floor would be covered in a non-gloss black sticker. The sides of the walls would be colored a white non-gloss coating with the top edge colored red.

Note: The coloring on the walls, sides or floor of the maze may not be consistent due to fading and variations during construction. The floor would be constructed of several segments which may lead to a seam between two segments.

2.3.3 Room Conditions

The illumination, temperature, and humidity of the room shall be those of an ambient environment.

2.3.4 Lighting Conditions

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

2.3.5 Lattice Points

Lattice points (posts), each 1.2 cm x 1.2 cm, and 5 cm high are located at the four corners of each unit cell. The maze is constructed such that at least one wall is connected to each lattice point, with the exception of the destination square.

2.3.6 Start/ End

The starting cell of the maze would be located at one of the four corners of the maze and would be bounded by walls on three sides. The **Start Line** is defined as the line between the first and second cell of the maze. The destination goal is a four-cell cell located near the center of the maze with only one entry point. The **Finish Line** is defined as the line across this entry point into the destination cell.

Note: Multiple paths may exist to the destination cell and should be considered when developing the maze algorithm.

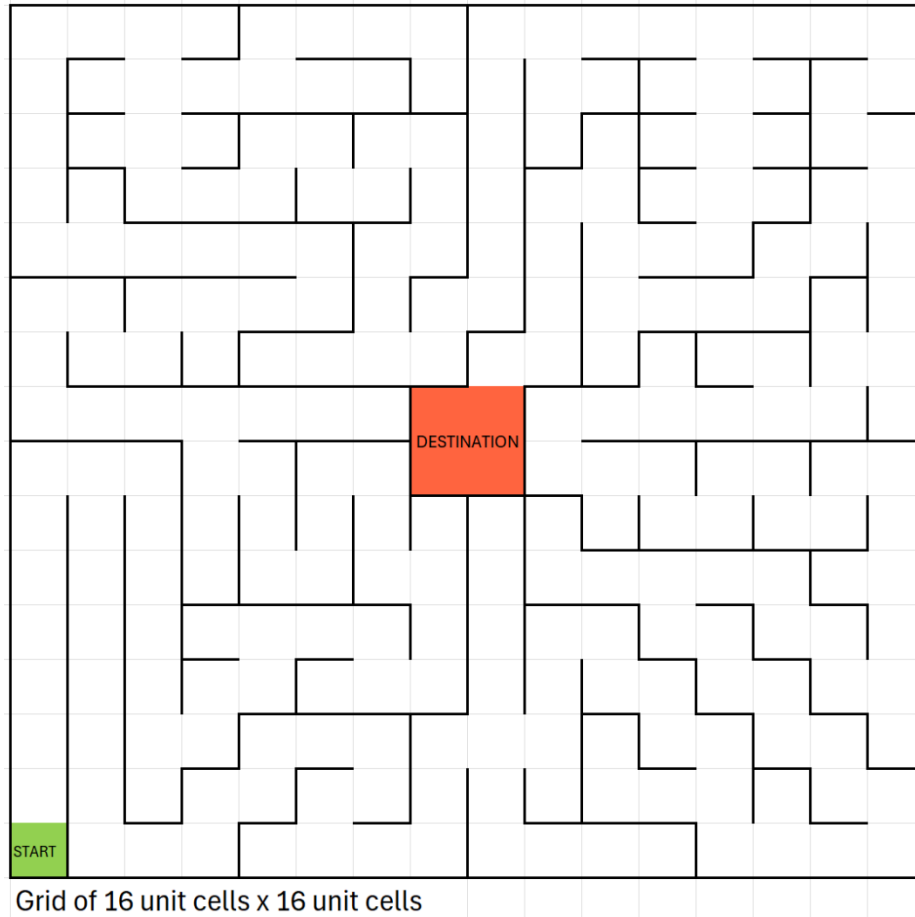


Figure 1: Sample Maze with Start and Destination

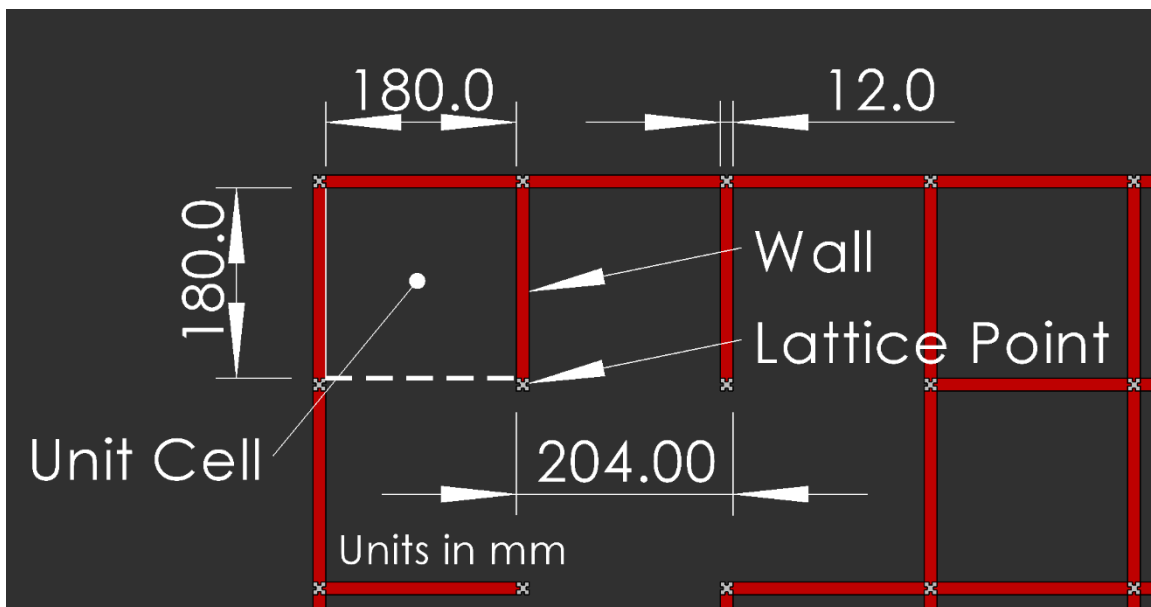


Figure 2: Maze Dimensions (units in mm)

2.4 Rules for the Elimination Rounds

2.4.1 Initial Inspection

Each team should pass the initial inspection by the panel of judges to ensure conformity to the rules given in Section 2.2.

The Judges may request to inspect any Micromouse at random during the course of the elimination round and the Micromouse should conform to the rules throughout the duration of the elimination round.

2.4.2 Trial Time

Each team is allocated **8 minutes access to the maze**, referred to as the “**Trial Time**” and the timer starts when the contest officials acknowledge the contestant and grants permission to begin their attempt. Any time taken to adjust the Micromouse between runs is also included in the 8-minute allocation.

2.4.3 Runs

Each team will be given a **maximum of 5 attempts** or “**Runs**” during the allocated Trial Time. The decision for performing either “Search Runs” or “Fast Runs” is up to the discretion of the teams.

A Run is considered to have started once a Micromouse leaves the starting cell and ends when either the robot reaches the destination cell or returns to the starting cell before entering the destination cell. In the case of the latter

Resetting the Micromouse back to the starting cell will also terminate the current Run.

2.4.4 Rounds

The elimination would consist of 2 rounds with each team being allocated a Trial Time. Each team should be ready with their Micromouse to start the Trial when called upon by the contest officials.

The schedule for Trial Runs will be notified in advance.

2.4.5 Run Time

The run timer will start when the front edge of the Micromouse crosses the Start Line and stops when the front edge of the Micromouse crosses the Finish Line. (Refer Section 2.3.6 for the definition of the Start and Finish lines)

The time taken to travel from the start cell to the destination cell with any incurred time penalties is considered as the “**Run Time**” of the Micromouse for that attempt.

The Run Time will be measured by the contest officials and will be displayed during the competition.

The minimum Run Time within the Trial Times of both rounds shall be the mouse’s **Qualifying Time**. Teams will be ranked according to their Qualifying Times and the slowest teams will be eliminated.

2.4.6 Penalties

2.4.6.1 Contact Penalty

The Micromouse will incur a **3 second penalty** for each collision or contact made with the walls of the maze. Successive collisions within a period of **3 seconds** will be considered for a single penalty.

2.4.6.2 Reset Penalty

Once the Micromouse completes a run by traveling from the start cell to the destination cell, the Micromouse is required to navigate back to the starting cell to successfully complete an attempt. However, the contestant may opt to Reset the Micromouse by manually lifting the mouse from the destination cell and placing it back at the starting cell. This would incur an additional time **penalty of 20 seconds** to the current Run Time of the Micromouse.

2.4.7 Restarting the Micromouse

In the event that the Micromouse gets physically stuck within the maze and is unable to move, the contestant may request the judge's permission to Restart the mouse by manually lifting it and placing it back at the starting cell. This would terminate the current Run and no Run Time would be recorded.

2.4.8 Adjusting the Micromouse

Software modifications and reprogramming is allowed between rounds. However, teams are not allowed to reprogram/ modify the code of their Micromouse during a Trial Time.

The Micromouse should be fully autonomous and can be switched on or off when inside the start cell. Any adjustments to sensors/ mode changes using the permitted manual switches can only be made once the Micromouse has ended the current Run. Any changes made during a Run would terminate the Run and a Run Time would not be recorded.

When the Micromouse is inside the start cell and has not started a Run, contestants are allowed to:

- Change switch settings (e.g. to select algorithms)
- Replace batteries
- Adjust Sensors
- Change speed settings
- Make repairs (with approval from judges)

2.4.8.1 Replacing Components and Making Repairs

Depleted batteries can be replaced with components of similar specifications without changing the overall weight of the Micromouse.

Note: Contestants are required to bring their own chargers/ spare batteries and make sure that the robot is ready for operation during the allocated time slot.

Replacing any other components which may be damaged or worn out during the competition would require approval from the panel of judges. However, the replacement parts should match the original component and should not alter the control characteristics of the Micromouse.

Note: Judges have the final say in allowing or denying any adjustments or replacements to the Micromouse by the contestants.

2.4.9 Additional Rules for the Elimination Round

If a Micromouse is unable to complete a successful Run during the allocated Trial Time, the contestant would be given a score based on how close the mouse gets to the destination cell, and the total number of cells explored. This score would only be used to rank the teams which do not have a recorded Qualifying Time.

The decision of the judges will be final.

2.5 Rules for the Final Round

2.5.1 Initial Inspection

Each team should pass the initial inspection by the panel of judges to ensure conformity to the rules given in Section 2.2.

Once a Micromouse passes the initial inspection the robot should be placed within the designated area (isolation zone) within view of the contest officials. The robot may not be removed from this area without prior approval from the contest officials.

All contestants must submit their robots for the initial inspection before the maze layout is revealed. Robots which are not kept within the isolation zone before this time will not be permitted to participate in the competition.

2.5.2 Competition Time

Each team is allocated **10 minutes access to the maze**, referred to as the “**Competition Time**” and the timer starts when the contest officials acknowledge the contestant and grants permission to begin their attempt. Any time taken to adjust the Micromouse between runs is also included in the 10-minute allocation.

2.5.3 Runs

Each team will be given a **maximum of 10 attempts** or “**Runs**” during the allocated Competition Time. The decision for performing either “Search Runs” or “Fast Runs” is up to the discretion of the teams.

A Run is considered to have started once a Micromouse leaves the starting cell and ends when either the robot reaches the destination cell or returns to the starting cell before entering the destination cell. In the case of the latter

Resetting the Micromouse back to the starting cell will also terminate the current Run.

2.5.4 Run Time

The run timer will start when the front edge of the Micromouse crosses the Start Line and stops when the front edge of the Micromouse crosses the Finish Line. (Refer Section 2.3.6 for the definition of the Start and Finish lines)

The time taken to travel from the start cell to the destination cell with any incurred time penalties is considered as the “**Run Time**” of the Micromouse for that attempt.

The Run Time will be measured by the contest officials and will be displayed during the competition.

The minimum Run Time within the Competition Time shall be the mouse’s **Official Time**. First prize goes to the mouse with the shortest Official Time. Second prize to the next shortest, and so on.

2.5.5 Penalties

2.5.5.1 Contact Penalty

The Micromouse will incur a **3 second penalty** for each collision or contact made with the walls of the maze. Successive collisions within a period of **3 seconds** will be considered for a single penalty.

2.5.5.2 Reset Penalty

Once the Micromouse completes a run by traveling from the start cell to the destination cell, the Micromouse is required to navigate back to the starting cell to successfully complete an attempt. However, the contestant may opt to Reset the Micromouse by manually lifting the mouse from the destination cell and placing it back at the starting cell. This would incur an additional time **penalty of 20 seconds** to the current Run Time of the Micromouse.

2.5.6 Restarting the Micromouse

In the event that the Micromouse gets physically stuck within the maze and is unable to move, the contestant may request the judge's permission to Restart the mouse by manually lifting it and placing it back at the starting cell. This would terminate the current Run and no Run Time would be recorded.

2.5.7 Adjusting the Micromouse

No information on the maze configuration can be entered into the Micromouse and software modifications are not allowed during the competition once the maze has been revealed.

The Micromouse should be fully autonomous and can be switched on or off when inside the start cell. Any adjustments to sensors/ mode changes using the permitted manual switches can only be made once the Micromouse has ended the current Run. Any changes made during a Run would terminate the Run and a Run Time would not be recorded.

When the Micromouse is inside the start cell and has not started a Run, contestants are allowed to:

- Change switch settings (e.g. to select algorithms)
- Replace batteries
- Adjust Sensors
- Change speed settings
- Make repairs (with approval from judges)

2.5.7.1 Replacing Components and Making Repairs

Depleted batteries can be replaced with components of similar specifications without changing the overall weight of the Micromouse.

Note: Contestants are required to bring their own chargers/ spare batteries and make sure that the robot is ready for operation during the allocated time slot.

Replacing any other components which may be damaged or worn out during the competition would require approval from the panel of judges. However, the replacement parts should match the original component and should not alter the control characteristics of the Micromouse.

Replacement of memory modules or Microcontrollers with permission from the judges would require the original software/code to be used and the contestant must assure the judges that no modifications to the code or the addition of maze information has been made.

Note: Judges have the final say in allowing or denying any adjustments or replacements to the Micromouse by the contestants.

2.5.8 Additional Rules

If a Micromouse is unable to complete a successful Run during the allocated Trial Time, the contestant would be given a score based on how close the mouse gets to the destination cell, and the total number of cells explored. This score would only be considered if there were no contestants with Run Times eligible for the prizes.

The decision of the judges will be final.

3 ADDITIONAL INFORMATION

Any amendments to the rules will be updated on the ROBOFEST website: www.robofest.lk Please do not hesitate to contact us if further information or clarification is required. You may contact the ROBOFEST organizers through email at robofest@slit.lk or contact the University Category Coordinator.

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