ROBOFEST 2023
ANNUAL SLIIT ROBOT COMPETITION

TECHNICAL SPECIFICATIONS
UNIVERSITY CATEGORY

Organized By

Department of Electrical and Electronic Engineering
Sri Lanka Institute of Information Technology

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INTRODUCTION

SLIIT ROBOFEST, the premier robotic competition in Sri Lanka, is dedicated to making the annual competition more innovative, exciting, and competitive each year. Thus, this year's competition has been designed to challenge the competitors in terms of technical aptitude, innovation, and imagination, which, no doubt, will make for an interesting and tightly contended competition.

To compete, each team must design and build a fully autonomous robot with the technical specifications outlined in this document. Key features of the terrain and the tasks to be performed are also described in this document. Based on the design and performance of the robots, an impartial panel of judges will adjudicate the competition.

Also, please note that any amendments to the rules will be updated on the website, www.robofest.lk. If you have any questions or clarifications, you may contact the ROBOFEST organizers through email at robofest@sliit.lk or contact Mr. Anuradha Kumarasinghe at 0773687578 / anuradha.s@sliit.lk.

THE COMPETITION TASK

The objective for the contestant is to impart to the micromouse an adaptive intelligence to explore different maze configurations and to work out the optimum route for the shortest travel time from start to finish.

GENERAL RULES

1. Before the maze is unveiled, the micromouse must get accepted from the initial qualification process and kept in view of the contest officials.

2. The competitors must be prepared to start **within 5 minutes** after the call, if not the run is lost.

3. The robot has 5 minutes to complete the path. During this time, it can try to find more than one path. The maximum number of runs is limited to 10.

4. The time taken to travel from **the start to the destination is called the 'run' time.**

   Traveling from the destination square back to the start square is **not** considered a valid run. The total time taken from the first activation of the micromouse until the completion of each run is limited to **5 minutes**. If the micromouse touches the maze walls any time during the contest is considered as **'contacted'** and its 'run time' is penalized with **3 seconds**.

   Scoring is based on these parameters. Touching the robot during a run by an operator is not

allowed and leads to a termination of the present run.

5. The total time on the maze (maze or search time), which is 5 minutes shall be measured from the time the micromouse is first activated. The time for each run (run time) shall be measured from the moment the micromouse leaves the start square until it enters the destination square. The run time will start when the front edge of the micromouse crosses the start square and stops when the micromouse is fully inside the destination square.

6. Every time the micromouse leaves the start square, a new run begins. If the micromouse has not entered the destination square, the run will be terminated. In a case, if a micromouse re-enters the start square (before entering the destination square) on a run, that run is cancelled, and a new run will be considered begun, with a new time that starts when the front edge of the micromouse crosses the start square.

7. If the micromouse reaches the destination square, it may stop and remain at the maze center, or it may continue to explore other parts of the maze or make its way back to the start. When the micromouse chooses to stop at the center, it may be lifted out, manually, and restarted by the handler and **it will be considered as a restart penalty**.

8. Competitors may carry out either a **'Search-run'** or a **'Fast-run'** where in the search-run, the robot can trace all the paths from the starting square to the destination square followed by a fast-run in which the robot moves through the optimum path determined by the search run.

9. After the search-run, a team is allowed to take up to 9 attempts to reach the destination square.

10. Each micromouse is allowed a maximum of **5 minutes** to perform on the platform. The judges have the discretion to request a micromouse to retire early if by its lack of progress, or if by erratic behavior, it is endangering the state of the maze.

The scoring of a micromouse shall be obtained by computing a time score for each run as follows:

$$Score = (300 - T) + C * 0.1 - R * 20 - P * 3$$

where,

T - Best run time in seconds (the most successful run time to reach the destination).

C - The maximum number of visited cells.

R - Number of restart penalties.

P - Total number of touch penalties.

No marks will be given if the micromouse is not able to reach the center.

11. The time taken to complete the maze shall be measured **by the contest officials.**

12. The micromouse handler is given **2 minutes**, from the moment the micromouse is taken out of the cage to make any adjustments (if any) to the sensors of the micromouse.

    However, **no selection of strategies must be made and no information on the maze configuration should be entered or captured into the memory, or software modifications are not allowed during the contest.**

    The robot must be fully autonomous. The contestant can only switch it on at the beginning and switch it off at the end.

13. The maze or search time clock will commence after the expiry of the **2-minute** time limit even if the handler is still adjusting the sensors.

14. A maximum 5-minute time is given for the calibration.

15. Only if a micromouse gets stuck in the maze, the handler can ask the judge's permission to terminate the run and restart the micromouse at the beginning.

    The handler cannot restart the micromouse when it has taken a wrong turn.

    For each restart, a time penalty of 20 seconds will be added.

16. If the robot reaches the center and is not able to reach back to the starting position, then one team member can position the robot at the start point and it will lead to a restart penalty.

17. If any part of a micromouse is replaced during its performance - such as batteries or EPROMs - or if any significant adjustment is made, then the previous memory of the maze within the micromouse must be erased before re-starting. Slight manipulations of sensors probably be accepted, but the operation of speed or strategy controls is expressly forbidden without a memory erasure. It is assumed that the micromouse will have software stored in EPROMs. However, at the judge's discretion, but not in normal circumstances, a micromouse with battery-backed-up RAM may be allowed to download control software if the memory is erased accidentally during a run. The handler, in this instance, must assure the judges that the original software has been reloaded.

18. Under normal circumstances, no part of the micromouse may be transferred to another micromouse. However, the judges may allow a change of batteries or controller in exceptional cases, if due to accidental damage. Thus, if one chassis is used with two alternative controllers, then they should be using the same micromouse and must perform within a single 5-minute allocation. The memory must be cleared with the change of controller.

19. A contestant may not alter a micromouse 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 judge's verdict is final.

20. If no successful run has been made, the judge will make a qualitative assessment of the micromouse's performance, based on distance achieved, 'purposefulness' versus random behavior, and quality of control.

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THE DECISION OF THE JUDGES WILL BE THE FINAL DECISION.

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PLAYING FIELD (MAZE)

1. The maze shall comprise **14 x 14 multiples** of a **16 cm x 16 cm unit square as shown in Figure 1**. The walls constituting the maze shall be **5 cm high and 1.2 cm thick**. Passageways between the walls shall be **14.8 cm wide**. The outside wall shall enclose the entire maze.

2. The side of the maze walls 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 a non-gloss **black sticker**. The coating on the top and side of the wall shall be selected to reflect infrared light and the coating on the floor shall absorb it.

    WARNING: Do not assume the walls are consistently white, that the tops of the walls are consistently red, or 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 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 a micromouse may snag.

3. The start square of the maze shall be located at one of the four corners. 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**.

4. Square posts, each **1.2 cm x 1.2 cm x 5 cm high**, at the four corners of each unit square 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.

5. 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 degrees. Gaps between the walls of adjacent squares shall not be greater than **2 mm**.

6. Multiple paths to the destination square are allowed and are to be expected.

7. Lighting conditions of the stage may vary, and competitors should adjust their robots accordingly. Only 2 people from a team can be involved in adjusting and setting the robot on the arena and other team members can also stay on the stage without getting involved in

the arena.

8. You will be given a sample maze (Figure 1) to carry out any test runs or calibrations on the day before the competition.
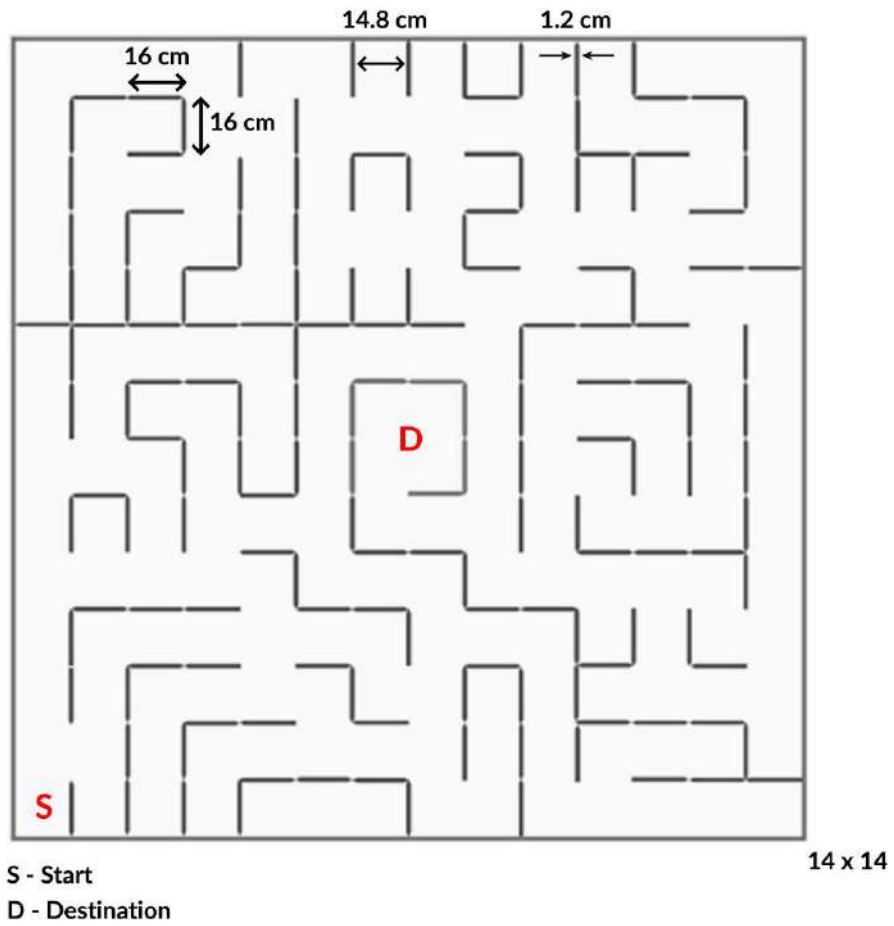

Figure 1: A sample maze

ROBOT'S SPECIFICATIONS

1. The micromouse must be completely self-contained, fully autonomous and must receive no outside assistance.

2. The method of propulsion is at the discretion of the builder, provided that the power source is non-polluting internal combustion engines would be disqualified on this count.

3. Although the superstructure of the micromouse may 'bulge' above the top of the maze walls, the micromouse must be subjected to the following size constraints – a width of **14.5 cm and length of 14.5 cm**. There is **no height limit.**

4. The method of wall sensing is at the discretion of the builder; however, the micromouse must not exert a force on any wall likely to cause damage.

5. If the judges consider that a micromouse has a high risk of damaging or sullying the maze, they will not permit it to run. Nothing may be deposited in the maze. The micromouse must negotiate the maze; it must not jump over, climb, scratch, damage or destroy the walls of the maze.

INITIAL QUALIFICATION

1. The micromouse must not exceed the given dimensions – a width of **14.5 cm and length of 14.5 cm**.

2. No RF modules can be used.

3. Battery voltage should be less than 24V.

4. The robot should not damage the arena and judges have the full authority to terminate the run in such cases.

5. No parts of the robot can remain in the maze during the drive and there should be no oil leakages.

6. Manual switches are not allowed to change the status of the navigation algorithm.

7. Basic navigation algorithms are not allowed (priority for the left and priority for the right etc.)

TEAM FORMATION

1. Create a team with a maximum of **five members**. Solo entries are also accepted.

2. All the team members should be from the same university/ institute.

3. Make up your team's name.

4. Design your promotional material for the team.

UNIVERSITY CATEGORY COORDINATOR

- Mr. Anuradha Kumarasinghe
  Department of Electrical and Electronic Engineering,
  Faculty of Engineering,
  SLIIT- Malabe Campus

  077 368 7578
  anuradha.s@sliit.lk

Please do not hesitate to contact us if further information or assistance is needed.

Deadline for applications: 15.07.2023

Registration link: https://bit.ly/unicategory