



SLIIT

Discover Your Future



10th Annual SLIIT

Robot Competition

**University Competition
Technical Specification**

Organized
By

Department of Electrical and Computer Engineering
Faculty of Engineering
Sri Lanka Institute of Information Technology

Introduction

SLIIT ROBOFEST, as 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 technical specifications outlined in this document. Key features of the terrain and the tasks to be performed are also delineated in this document. Based on the design and performance of the robots, an impartial panel of judges will adjudicate the competition. The decision of the judges will be the final decision.

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 robofest@slit.lk or phone 0715618988.

The competition task

The objective for the contestant is to impart to the micro-mouse 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. The competitors must be prepared to start **within 5 minute** after the call if not the run is lost.
2. The robot has 5 minutes to complete the path. During this time, it can try to find more than one path. Maximum number of runs are limited to 10.
3. The time taken to travel from the **start square to the destination square is called the 'run'** time. Travelling from the destination square back to the start square is **not** considered a 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 are considered '**touched**' 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 lead to terminate the present run.

4. The total time on the maze (maze or search time), which is 5 minutes shall be measured from the time the mouse is first activated. The time for each run (run time) shall be measured from the moment the mouse leaves the start square until it enters the destination square. The run time will start when front edge of the mouse crosses the start square and stops when the front edge of the mouse crosses the finish square.
5. Every time the mouse leaves the start square, a new run begins. If the mouse has not entered the destination square, the previous run is aborted. 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.
6. If the mouse 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 own way back to the start. When the mouse 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**.
7. Competitors can carry out either a “**Search Run**“ or a “**Fast Run**” where in search run robot can trace all the paths from the starting square to the destination square followed by a speed run in which robot moves through the optimum path determined by the search run.
8. After the search run a team is allowed to take up to 10 attempts to reach the destination square.
9. Each mouse is allowed a maximum of **5 minutes** to perform in the platform. The judges have the discretion to request a mouse to retire early if by its lack of progress, it has become boring, or if by erratic behavior it is endangering the state of the maze.
10. The scoring of a micromouse shall be obtained by computing a time score for each run as follows:

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

T- Best Run time in seconds- The best successful run time by reaching the destination.

No marks will be given if the micro-mouse not able to reach the center.

S - Number of maximum visited cells

R - Number of restart penalties

P - Total number of touch penalties

11. The time taken to negotiate the maze shall be measured either manually **by the contest officials, or by infra-red sensors set at the start and destination.**
12. The mouse handler is given **2 minute**, from the moment the mouse is taken out of the cage, to make any adjustments (if any) to the mouse sensors. However, no selection of strategies must be made and **no information on the maze configuration entered or captured into the memory or no software modifications are allowed during the contest.**
13. The maze or search time clock will commence after the expiry of the **2-minute** time limit even if the handler is still making adjustments to the sensors.
14. Maximum 5 minute time for calibration
15. Only if a mouse 'gets into trouble' the handler can ask the judge's permission to terminate the run and restart the mouse at the beginning. The handler cannot restart the mouse when it has taken a wrong turning, decision will be taken by the judges. **For each restart, a time penalty of 20 seconds will be added.**
16. If any part of a mouse 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 mouse must be erased before re-starting. Slight manipulations of sensors will probably be condoned, but operation of speed or strategy controls expressly forbidden without a memory erasure. It is assumed that the mouse will have software stored in EPROMs. However, at the judges' discretion, but not in normal circumstances, mouse 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 convince the judges that the original software has been reloaded.
17. Under normal circumstances, no part of the mouse may be transferred to another mouse. 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 are the same mouse and must perform within a single 5 minutes' allocation. The memory must be cleared with the change of controller.
18. A contestant may 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 not allowed). The judges shall arbitrate.
19. If no successful run has been made, the judge will make a qualitative assessment of the mouse's performance, based on distance achieved, 'purposefulness' versus random behavior and quality of control.

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 infra-red light and the coating on the floor shall absorb it.

WARNING: 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. 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 a mouse 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 **1.2cm x 1.2cm x 5cm 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 2cm**, whichever is less. Assembly joints on the maze floor shall not involve steps of greater **than 0.5mm**. 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.
8. Only 2 persons from a team can involve 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.
9. You will be given a sample maze to carry out any test runs or any calibrations on the day before competition.

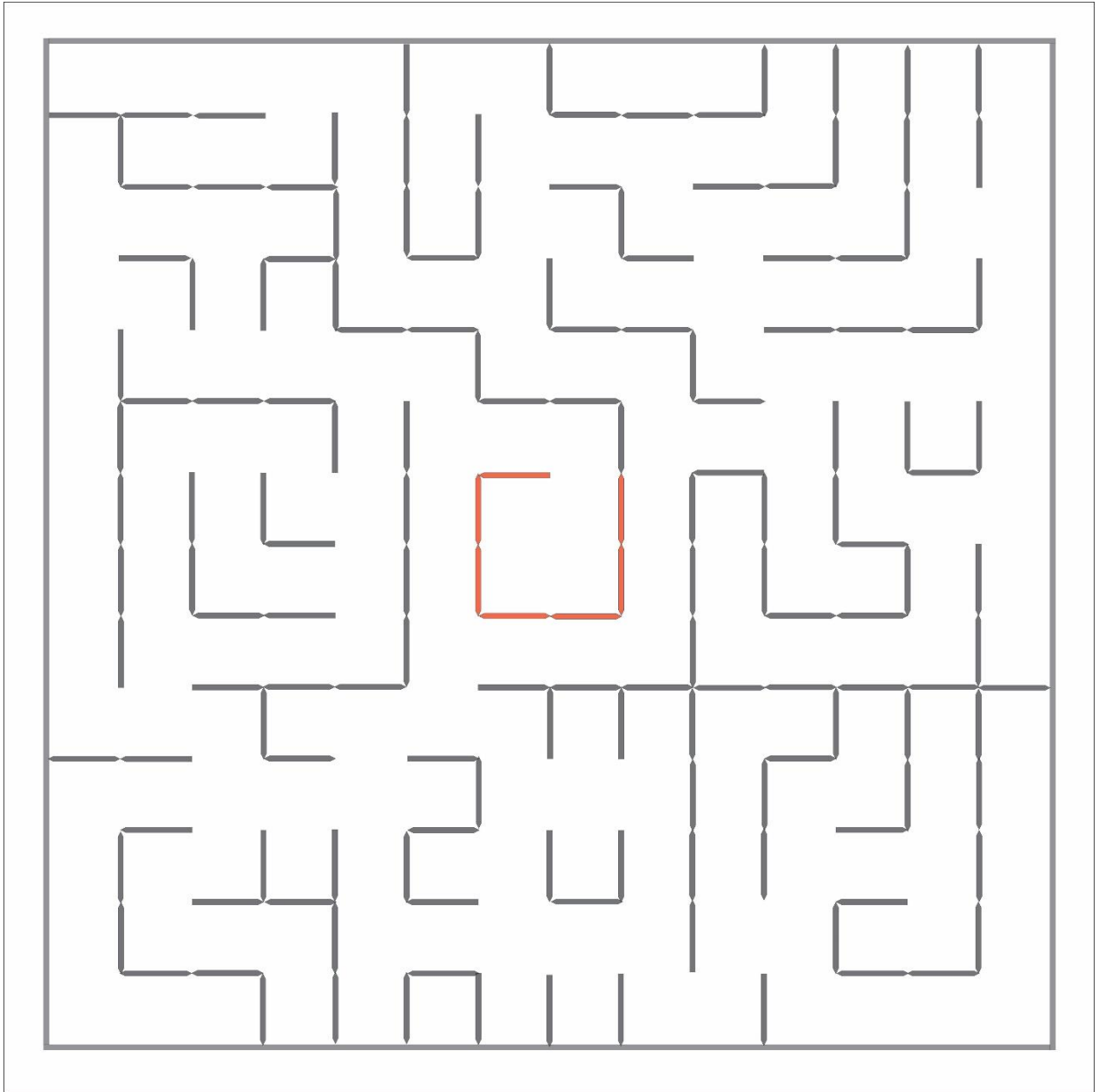


Figure 1: Maze Example

- If the robot is reached to center and not able to reach back to start position one team member can position robot at start point and it will lead to restart penalty.

Robot's Specifications

1. Mouse must be completely self-contained 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 probably be disqualified on this count.
3. Although the superstructure of the mouse may 'bulge' above the top of the maze walls, mouse must be subject to the following size constraints - width **14.5 cm**, length **14.5 cm**. There is **no height limit**.
4. The method of wall sensing is at the discretion of the builder; however, the mouse must not exert a force on any wall likely to cause damage.
5. If the judges, consider that a mouse has a high risk of damaging or sully the maze they will not permit it to run. Nothing may be deposited in the maze. The mouse must negotiate the maze; it must not jump over, climb, scratch, damage or destroy the walls of the maze.

Initial qualification

1. Size within limit (Wooden square should be move without touching the robot)
2. No RF modules
3. Battery voltage should be less than 24V.
4. Robot shouldn't damage the arena and judges have the full authority to terminate the run in such cases.
5. No loosing parts.
6. No leaking oils or any substances.
7. Manual switches are not allowed to change the status of navigation algorithm.
8. Basic navigation algorithms are not allowed (Priority for the Left etc.)