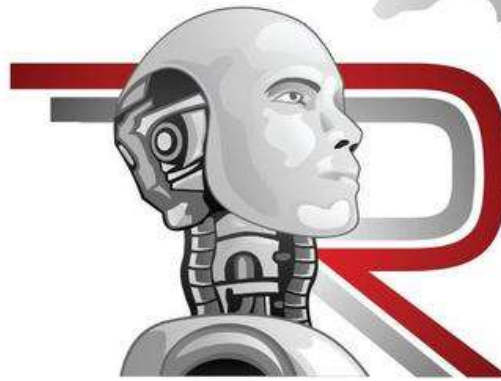


RoboRAVE
Australia



Mouse Labyrinth

Revision 3 - Updated 17/04/2024.

2024 Official Game Manual
RoboRAVE Australia

Our motto: *"Today's Play, Tomorrow's Pay."*



Revision History		
Revision	Date	Description/Changes
1	27/01/2024	2024 Challenges Released
2	04/03/2024	Graphics updated. All field dimensions confirmed.
3	17/04/2024	Team limit increased to 5.

Contents

1.0 Overview	3
1.1 What is Mouse Labyrinth?	3
1.2 Who can compete in a team?	3
1.3 What are the requirements for the robot?	3
2.0 Operating the Game	4
2.1 How does an official game run?	4
2.2 What are the rules in an official game?	4
3.0 Competition Field	5
3.1 How is the field constructed?	5
3.2 What obstacles will the robot face?	5
3.3 What can help my robot navigate the field?	6
4.0 Points and Scoring	7
4.1 What points are earned entering the maze?	7
4.2 What points are earned leaving the maze?	7
4.3 What exclusive rules does the UP division follow?	8
5.0 Finals	9
5.1 How are the top teams selected?	9
5.2 How do the finals work?	9

1.0 Overview

1.1 What is Mouse Labyrinth?

Mouse Labyrinth is RoboRAVE's unique approach to maze-solving competitions. Teams must create an autonomous robot capable of navigating through a randomly generated maze as quickly as possible while maintaining a higher degree of accuracy compared to other challenges. Each maze varies in complexity, with increased difficulty in higher-level divisions. This challenge tests competitors' engineering and programming skills in an exciting and dynamic environment.

The mazes feature various twists, turns, and dead ends, posing a significant challenge. Robots must be small and agile to manoeuvre through these obstacles. For an added challenge, teams in the university division cannot have any contact with the maze walls! As an added task, robots can retrieve a cheese block from the maze's end, which awards bonus points. The competition is open to Middle School, High School, and University/Professional divisions, each with tailored difficulty levels to suit the competitors' skill sets.

For competitors seeking fewer challenging alternatives, the a-MAZE-ing and Line Follow – SPRINT challenges are available. These challenges offer a similar maze-solving experience but with less complexity and are suitable for younger participants or those new to robotics competitions.

1.2 Who can compete in a team?

Mouse Labyrinth is offered to students in the following divisions:

- 1) Middle School (MS) – Ages 11-13
- 2) High School (HS) – Ages 14-18
- 3) University/Professional (UP) – Ages 19+

The division a team enters is dependent on the oldest team member in that team at the time of registration. Teams can choose to enter a higher age division but cannot enter a lower one.

Teams should consist of 1-5 competitors. Teams with more than 5 members will not be allowed to compete in the competition or will be forced to register additional teams to compete.

1.3 What are the requirements for the robot?

Robots must fit all of the following criteria to be eligible to compete:

- 1) The total cost of the robot does not exceed \$1,500 USD.
- 2) Robots can be made from any platform and material.
- 3) Multiple sensors, motors, and processing units can be used.
- 4) The robot is completely autonomous and does not use any remote-control features.
 - a. Devices such as remotes or tethers cannot be used to control the robot.
 - b. Programs can be run from an external device (e.g., laptop) at Home as long the device isn't operated while the robot is not at Home.
- 5) The robot must be able to demonstrate a maze-solving algorithm in its program.
 - a. Codes that use pre-determined paths to solve a maze are not permitted.
 - b. An algorithm should apply to more than one variation of a maze.
- 6) The robot must fit within the maze and be shorter than the height of the maze walls at all times during the competition.
 - a. The robot is not permitted to extend past the maze walls at any point.
 - b. Photos, scans, or other sensor information unique to the maze cannot be gathered prior to the start of a game.

2.0 Operating the Game

2.1 How does an official game run?

Entering the Maze:

- 1) Robots will start anywhere inside the Start Unit and can leave once the timer starts. The robot can only be interacted with while it is at Home or in the Start Unit.
- 2) The team will receive points as the robot travels until it reaches the Cheese Unit.
- 3) If the robot is unsuccessful, it can attempt another run. However, the timer will continue until the game finishes.

Leaving the Maze:

- 1) Once the robot has entered the Cheese Unit, it can begin travelling back out of the maze. Robots may be carrying or pushing the cheese block.
- 2) The team will receive points as the robot travels until it reaches the Start Unit.
- 3) The timer stops once the team first enters the Start unit unless the team wishes to attempt another run.
- 4) If the robot needs to be returned to the start, the cheese block will be returned to the cheese unit and the robot will need to enter the maze again.

2.2 What are the rules in an official game?

The following rules are enforced during official competition games by the referee:

- 1) The referee will ensure the team and robot are compliant with the rules in 1.2 and 1.3. If the referee believes any of the eligibility criteria are not met, the Head Referee will be brought in to determine further actions.
 - a. A team or robot that does not meet the eligibility criteria will usually not be allowed to compete and be required to make changes based on the Head Referee's decision.
- 2) The game lasts for up to 3 minutes timed by the referee and is the only time the robot can score points. It is played on a predetermined field that complies with the rules in 3.0. The field is revealed on the day of the competition.
- 3) Robots are placed anywhere inside the Start Unit at the start of the game or any time when they re-enter the maze after being returned Home.
- 4) The score for the game is the best run the robot achieved during the game.
- 5) There are several reasons a robot may be returned to the Home.
 - a. If a competitor touches the robot or the field outside of Home or the Start Unit.
 - i. Referees can choose to end the match if the field interference has a significant benefit to the robot's performance.
 - b. With the referee's permission, competitors can return the robot Home for any reason.
 - c. The cheese block will be returned to the Cheese Unit if it is moved.
- 6) Only competitors can operate and manipulate the robot during the game. Remember, "Players Play, Coaches Coach, Parents Cheer".

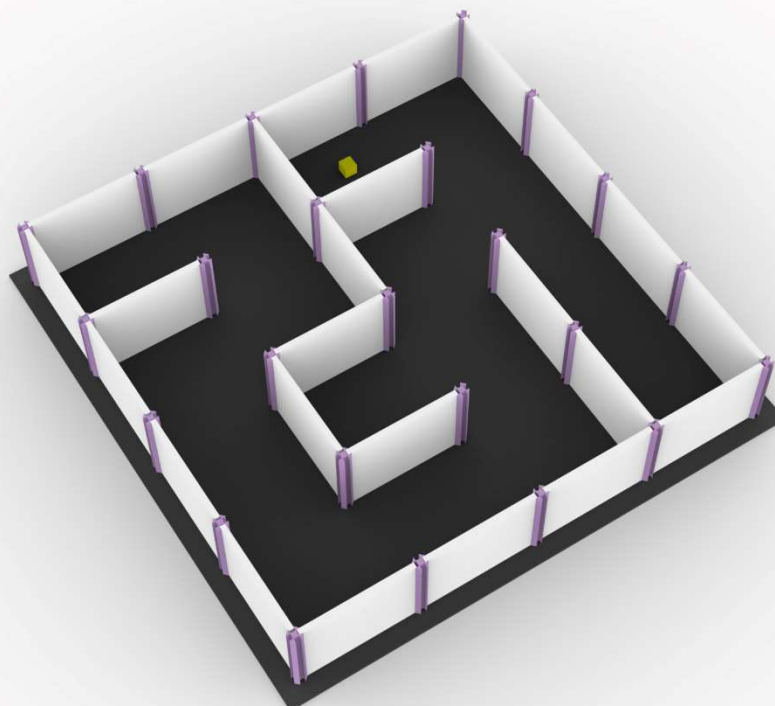
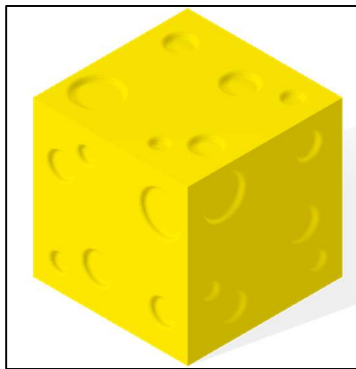
3.0 Competition Field

3.1 How is the field constructed?

All official Mouse Labyrinth fields will fit the following description:

- 1) The base/floor of the maze will consist of a black 1.22m square.
- 2) 25 x-rail posts constitute the corners of each maze unit, spaced out 26.6cm creating a 5x5 square grid with an ~10cm gap around the field.
- 3) The wall segments consist of white MDF panels 26.5cm long, 20cm high, and 1.2cm thick.
- 4) All wall segments will connect to the outside continuous wall, with no free-standing walls.
- 5) The Start Unit is designated with an 15cm white X centred in the middle of the unit. Both the Start Unit and Cheese Unit are not limited to any units when designing the maze layout. Home is everywhere outside of the field.
- 6) The distance between any two points in a unit (e.g., two posts or walls) in the maze always be 25cm or more.
- 7) The Cheese Unit will contain a 3cm cube of yellow plastic cheese placed in approximately the centre of the unit. (UP) A unique Cheese Identifier will be placed on one of the interior walls.

Standard Cheese, Cheese Identifier, and field design example for Mouse Labyrinth.

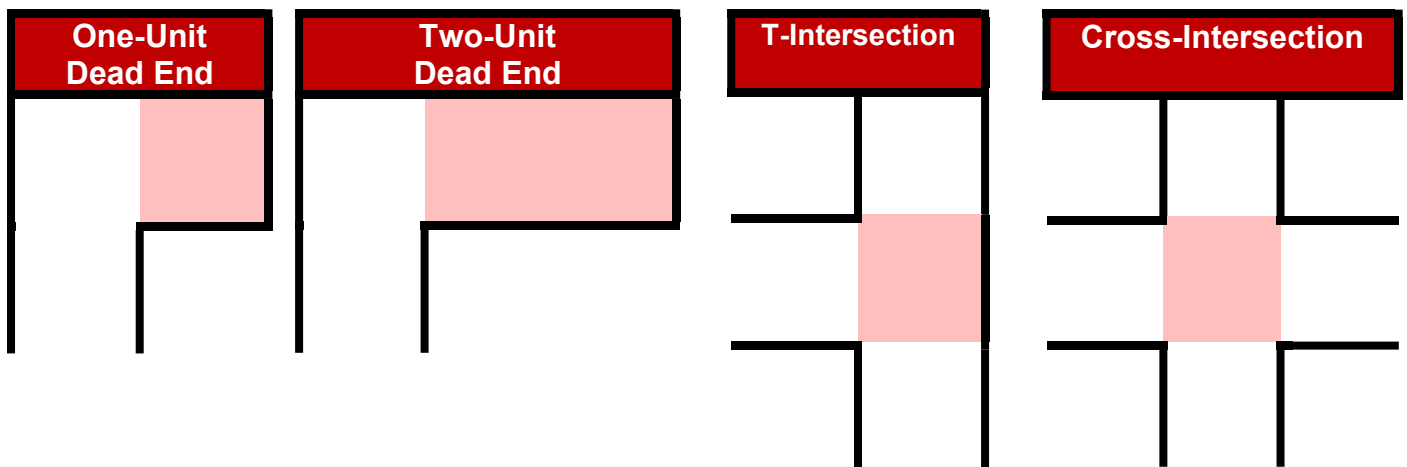


3.2 What obstacles will the robot face?

In Mouse Labyrinth there are several types of obstacles robots must overcome in each division, these include:

- 1) One-unit Dead Ends – A one-unit long dead-end that does not lead to the cheese.
- 2) Two-unit Dead Ends – A two-unit long dead-end that does not lead to the cheese.
- 3) T Intersection – A unit where there are three pathways. A robot entering a unit will have two directions to pick from.
- 4) Cross Intersection – A unit with four pathways. A robot entering will have three directions to pick from.

The number of obstacles varies in each division, with an increased number in higher divisions. The position of the Start Unit and Cheese Unit will also become increasingly difficult and may have more than one entrance or exit in higher divisions.



3.3 What can help my robot navigate the field?

There are also some helpful indicators in the field depending on the division, including:

MS and HS Divisions:

- 1) A 2cm thick green line of insulation tape marks the entrance to the Cheese Unit.
- 2) A 2cm thick red line of insulation tape marks the entrance to a T-intersection or Cross-Intersection.

Both lines of tape will span the distance between the two posts that separate the units.

UP Division:

- 1) A unique identifier image will be placed on one of the walls in the Cheese Unit. It consists of a large image of a cheese block and will stick centre on the wall. Refer to the RoboRAVE website for a link to the printable version of the identifier. The identifier will be a 15cm square in size.

4.0 Points and Scoring

Challenge:	Maximum Points per Mission		
	MS	HS	UP
4.1.1 Travelling	2p per unit	2p per unit	2p per unit*
4.1.2 Reaching the Cheese	10p	10p	10p
4.2.1 Returning	1p per unit	1p per unit	1p per unit*
4.2.2 Home Run	10p	10p	10p
4.2.3 Home Cheese	30p	30p	30p
4.2.4 Clean Cheese	20p	20p	20p
4.2.5 Time	1p per second	1p per second	1p per second
Total Maximum Points	70p + units + time	70p + units + time	70p + units* + time

4.1 What points are earned entering the maze?

Points are only awarded the first time a specific task is completed.

- 1) **Travelling (2p/unit)** – For every unit along the solution path that the robot enters for the first time earns 2 points.
 - a. The solution path is the shortest route between the Start Unit and the Cheese Unit, but not including them.
 - b. The unit is entered when any part of the robot passes the posts between the units.
- 2) **Reaching the Cheese (10p)** – Entering the Cheese Unit awards 10 points.
 - a. The unit is entered when any part of the robot passes the posts between the units.

4.2 What points are earned leaving the maze?

The points for Leaving the Maze cannot be earned until the robot has entered the Cheese Unit. Points are only awarded the first time a specific task is completed in a game.

- 1) **Returning (1p/unit)** – For every unit along the solution path that the robot enters for the first time travelling back to the Start Unit earns 1 point.
 - a. The solution path is the shortest route between the Cheese Unit and the Start Unit, but not including them.
 - b. The unit is entered when any part of the robot passes the posts between the units.
- 2) **Home Run (10p)** – If the robot returns to the Start Unit, it earns 10 points.
 - a. The robot has returned when any part of the robot is over the Start Unit.
 - b. Points are not awarded if the robot is manually returned.
- 3) **Home Cheese (30p)** – Returning the cheese block to the Start Unit earns 30 points.
 - a. The points for returning the cheese are earned if the cheese is touching, overhangs, or passes into the Start Unit.
 - b. Points are still awarded to the robot even if the cheese touches the ground or walls of the maze.
 - c. The robot must be in contact with the cheese during its return Home.
- 4) **Clean Cheese (20p)** – Successfully possessing the cheese in the Start Unit at the end of the game earns 20 points.
 - a. To possess the cheese, the robot cannot touch the ground or a wall of the maze at any point after the robot leaves the Cheese Unit.
 - b. The cheese must be fully supported by only the robot.

- 5) **Time (1p/s)** – Every second left on the timer at the end of the game is worth 1 point.
- a. Time points only apply to robots who have achieved the points for Returning.

4.3 What exclusive rules does the UP-division follow?

- 1) **Deadly Walls** – If the robot touches any wall or post, it does not earn the points for the unit the contact point lies in.
- a. Any part of the robot touching the wall invokes the penalty for that run only.
 - b. After losing the points, the robot can touch the wall any additional number of times in the same unit with no penalty.

5.0 Finals

5.1 How are the top teams selected?

The finals are used at the official competition to determine the top teams in a division. They put the best of the best live against each other to find the best team and robot. The teams for the Mouse Labyrinth Finals are determined as follows:

- 1) Teams will complete official timed games on the day. The number of games on the day is determined by the Event Director but will be a minimum of three.
 - a. An official game is any game operated by a referee with a recorded score.
- 2) The best game from the day for each team will be the only one considered for the finals.
- 3) The teams with the top 8 or 16 best games in each division will be brought forward to the finals.
 - a. If there is a draw between two teams, then both teams will progress.
- 4) If the divisions were collapsed due to low team numbers, each division should run its finals as if they weren't collapsed.
 - a. Teams from different divisions should not compete against each other in the finals.
 - b. Depending on the size of the division, they may result in an automatic victory.

5.2 How do the finals work?

The finals for Mouse Labyrinth are operated under the following rules:

- 1) The top teams in each division compete against each other in an additional set of games. Each team will have one opportunity to do their best run to get into the Grand Final.
- 2) The score achieved in the finals determines the team's final ranking, excluding the top 3 teams, who instead progress to the Grand Final.
- 3) The top 3 teams will compete in one last set of matches to determine 1st, 2nd, and 3rd place, awarded in order of highest points scored in the Grand Final.
- 4) All three positions will receive awards for recognition of their achievements.