

IDP Task: Michaelmas M2

Motivation

Detecting mines and IEDs is a major — and deadly — challenge, and one which robotics is particularly suited to. Mines and IEDs pose a major military and humanitarian threat but existing detection methods, suffer from many shortcomings. Robotic technologies offer safer alternatives to detecting and identifying IEDs, with significant future impact. There are three key elements to detection: search and exploration, detection and identification.

In this task, you will develop a robot to efficiently and effectively search around an arena, identify both 'safe' and 'dangerous' mines. Teams should identify the location of these mines and record the location of these.

The Challenge

The robot arena is a painted black surface, with elevated and ramped regions. Mines (safe and dangerous) will be placed randomly on the surface.

- Dangerous mines are red (cylinder diameter 6cm, height 5mm)
- Safe mines are yellow (cylinder diameter 6cm, height 5mm)

Each team has 8 minutes to find detect as many dangerous mines as possible, and, if possible report back the location of the mines. The mines should be correctly identified by:

To identify safe yellow mines, the robot should:

- Stop for at least 3 seconds, within a 5cm of the mine
- Give a LED signal to identify that this is a safe mine (e.g. a yellow LED)
- Provide the x,y co-ordinate of the mine detected (to within +/- 10cm accuracy)

To identify dangerous red mines, the robot should:

- Stop for at least 3 seconds, within a 5cm of the mine
- Give a LED signal to identify that this is a dangerous mine (e.g. a Red LED)
- Provide the x,y co-ordinate of the mine detected (to within +/- 10cm accuracy)

An approximate plan view of the arena is shown in Figure 1. The mines will be placed randomly before each competition run. Teams should see the tables for exact dimensions of the start box and elevated areas.

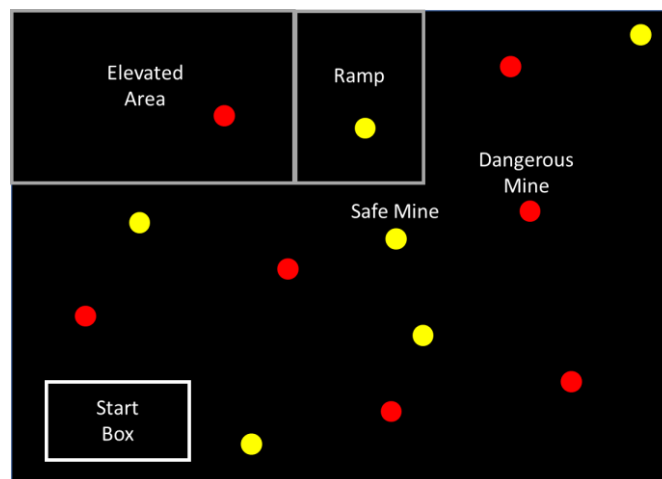


Figure 1 - Layout of the competition arena.

Once each mine has been detected/identified it will be removed manually from the table, after the robot has moved away from it.

Scoring

In 8 minutes, teams should try and obtain as many points as possible:

+5	Each detected safe mine
+7	Each detected safe mine with correct co-ordinates
+10	Each detected safe mine
+12	Each detected safe mine with correct co-ordinates
-8	Each missed dangerous mine which the robot passes over (i.e. with the footprint of the robot passes over having not been previously identified)
+10	Navigating out of the start box (where none of the wheels touch the start box)
+15	Navigating to the top of the ramp area (raised area)
+10	Finish in the start box (where any point of the robot is touching inside the start box)

Teams may restart their robot as many times as they wish. However, their score will be reset to zero and the arena reset every time this happens.

The robot must start within (and fit within) the start box.