

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, however many existing detection methods suffer from 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 and where possible remove safe mines to the zones to the outside of the arena to make the area safe. If possible, teams should also identify the location of 'dangerous' mines so that they can be avoided.

The Challenge

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

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

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)
- If possible the mine should be moved to outside the search zone (the white box), so it can be made safe

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 inside the white box before each competition run. Teams should see the tables for exact dimensions of the start box and elevated areas.

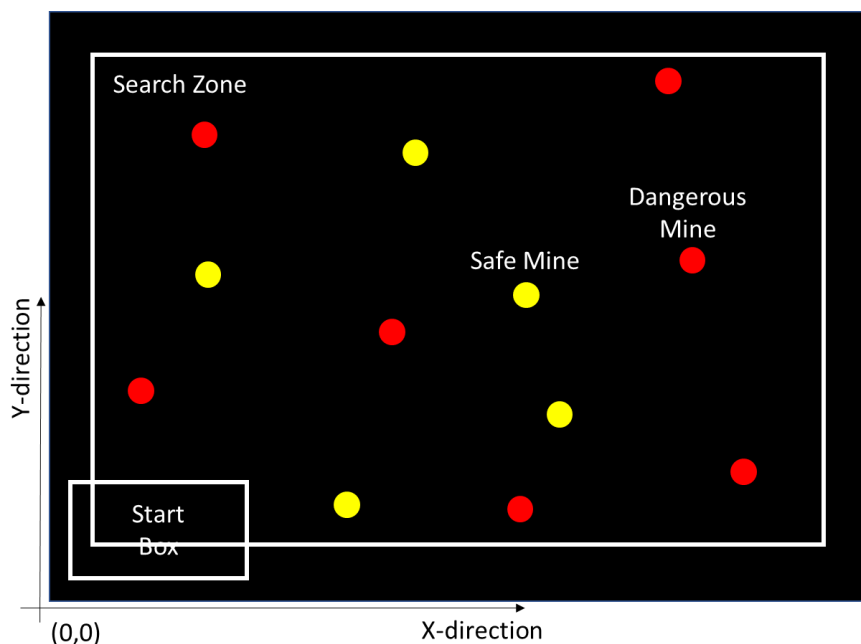


Figure 1 - Layout of the competition arena.

Scoring

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

+10	Each detected safe mine
+20	Each detected mine removed from the area (i.e. moved to the outside, so no point of the mine is inside the 'safe zone')
+10	Each detected dangerous mine
+20	Each detected dangerous mine with correct co-ordinates
-3	Each missed dangerous mine which the robot passes over (i.e. a contact point of the robot comes into contact with a dangerous mine). No negative points allowed.
+10	Navigating out of the start box (moving such that no wheels touch the start box)
+30	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 (i.e. mines reset to random locations) every time this happens. The timer will not be reset.

The robot must start within (and fit within) the start box (400mm x 300mm).

The only interaction permitted is between the robot and the workstation. No information may be entered at the terminal during a run.

