IESL ROBOGAMES 2016

UNIVERSITY CATEGORY
TASK SPECIFICATION

Eligibility

- Participants are advised to form a team of up to 5 students. Any number of teams from a university can enroll in the competition.
- All the team members should be students of same university at the time of their participation in the competition.
- Each team should provide valid identification document from the university on the competition day to prove the eligibility to participate in the competition.

Robot Specifications

- Dimensions of the robot must not exceed 25 cm × 20 cm (length × width).
- Robot must be completely built by the team itself with their own design ideas.
- Robot should have a clearly indicated “ON/OFF” or “START” switch.
- Once the robot is switched on, it should be self-navigating. Wireless communication and remote controlled robots are not allowed in the competition.
- No off-the-shelf kits are allowed except processing boards (ie. Arduino or equivalent, Raspberry Pi, etc.), sensor modules and drive gears. If you have any doubt, contact the organizing team.
- After starting an attempt, the only interaction of the participants with the robot should be stopping if necessary.
- Robot can be wheeled or tracked and it should not cause any damage to the platform. Any robot with the potential threat of damaging the game platform will not be allowed to compete.
- Robots should work under any ambient light condition.
- Robot height does not have any restrictions.

Platform Specifications

- Dimensions of the platform will be **8ft x 8ft**. Please refer the view of platform.
- Surface of the platform will be matte finished. The **planet surface** will be white finished and **outside** will be black finished, there will be a white border for the ease of determining the boundary. Thickness of the white border lines will be **3 cm**.
- The platform will not be perfectly flat, so be ready to face little imperfections.

View of the platform

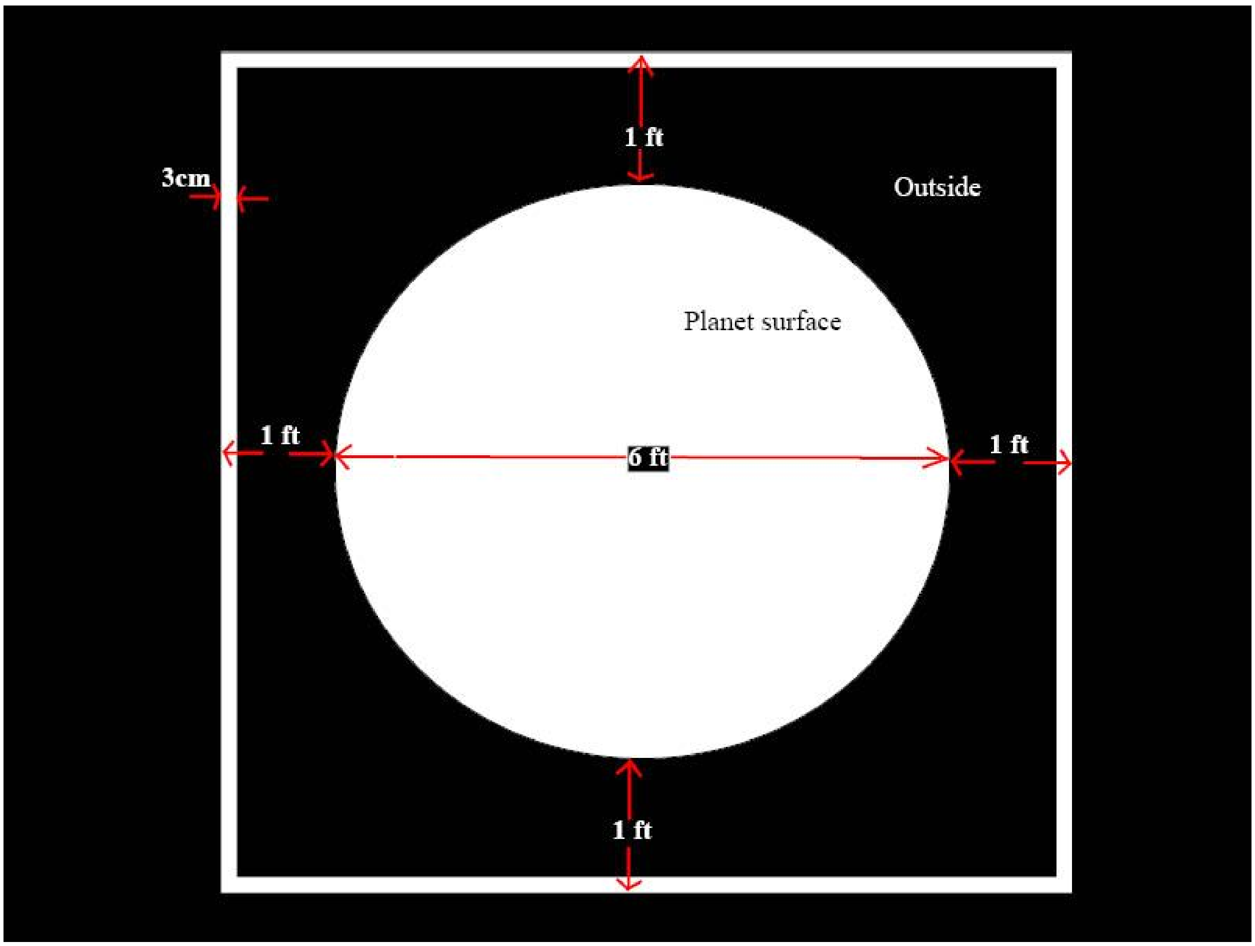


Figure 1: view of platform

Challenge

"This year's Robogames University Challenge will be to model an exploration robot which explores the crater areas and bring object in that area to the outside collection point. "

The white finished area let's call it **planet surface.** The planet surface will be a crater area, will not be flat, surface will have ascent and descent areas in order to give you a crater experience. The black finished area let's call it **outside area**, will be flat. Your robot will be placed at the **start position** in outside area (**whole of the robot should be confined to the box**). Robot should navigate autonomously and explore the planet surface area and bring the object to the outside area. For ease of finding the object there will be black lines on the surface as shown in the below image.

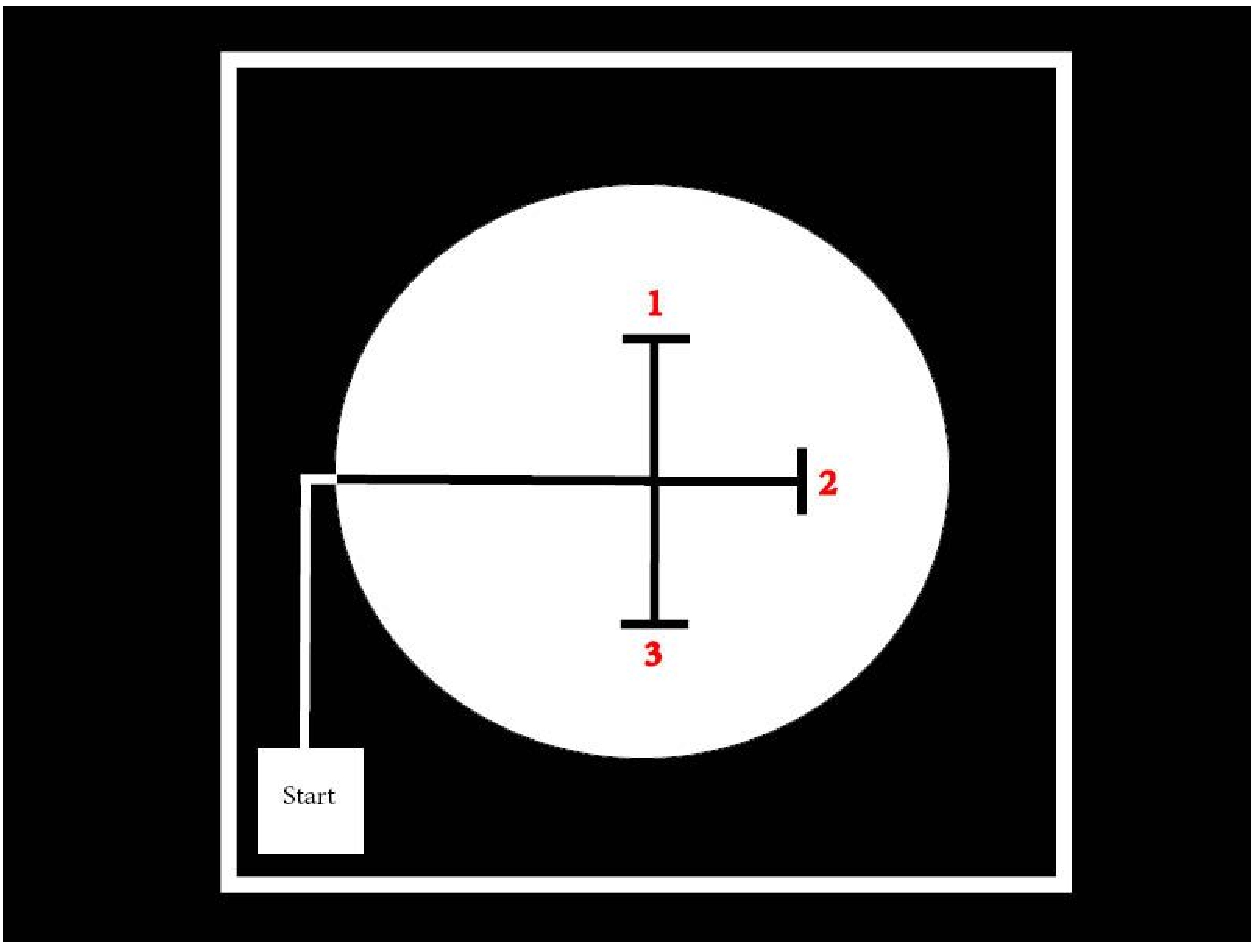


Figure 2: view of the black lines, start and end points

The object will be placed at any end point of the black line. Where the game coordinator may choose which end point from **1, 2 or 3**. Robot should grab the object and bring the object to the outside area through the black lines and place the object on the start position.

Arena Description

Arena Border

The border of the arena will be marked with a **3cm** thick white solid line finished with matte.

Planet Surface

Planet surface will be a crater area which will have a circle shape boundary. There will be ascents and descents on the surface which will give an experience of real crater. The boundary circle of the planet surface will have a constant radius of **3ft** from the center of the circle. (**design details of this area will be discussed in next pages**)

Outside area

Outside area will have dimensions as shown in the **Figure 1: view of platform**. This area will be flat, black and matte finished.

Black lines

black lines will be **3 cm wide** and length dimensions will be as per the below image(**Figure 3**).

White lines

white lines will be **3 cm wide.**

Start position

Start position will be **30cm x 30cm** (width x length). Take a look at the diagram for further clarification.

Object

The object will be a black cube matte finished. Which has the dimensions **5cmx5cmx5cm**. Cube will be very light, with less than 10 grams in weight. (**Figure 4**).

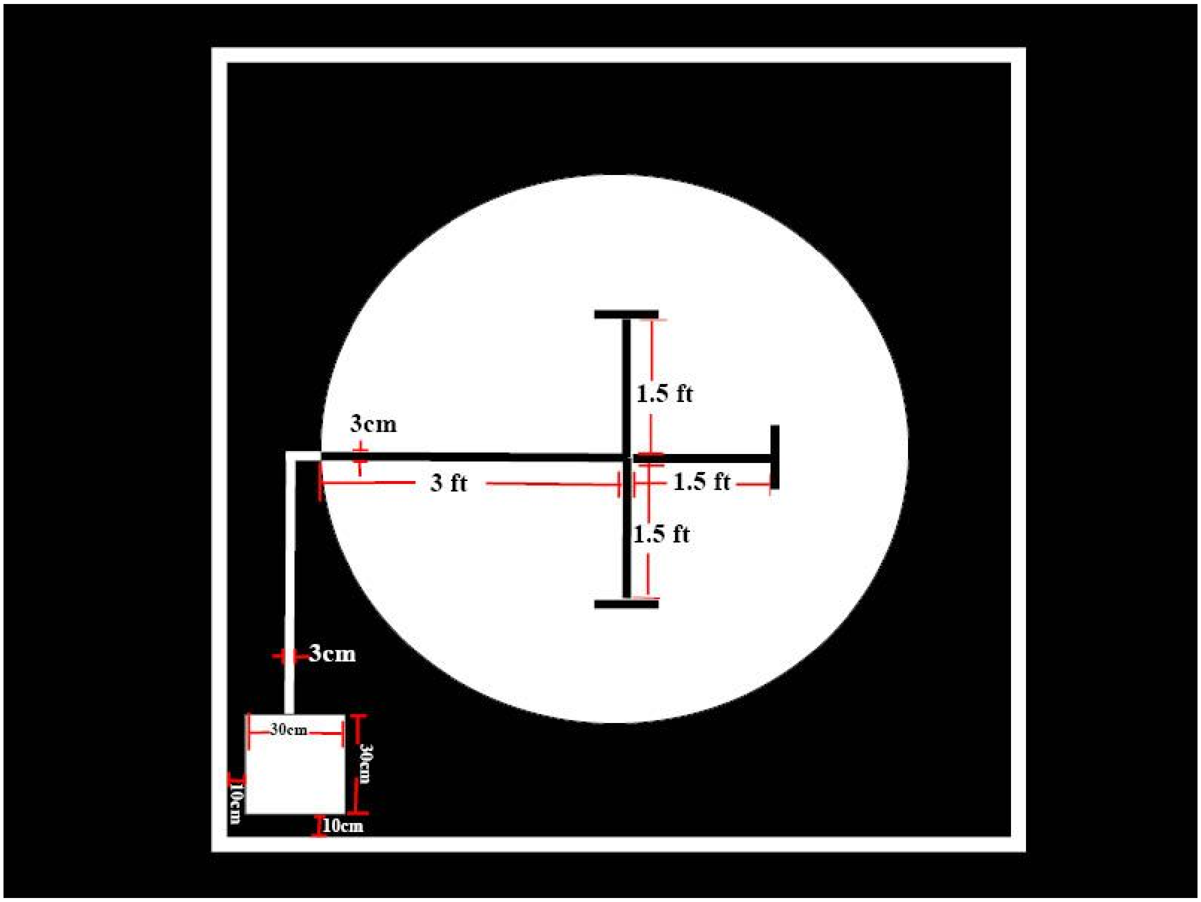


Figure 3 : view of black lines with dimensions

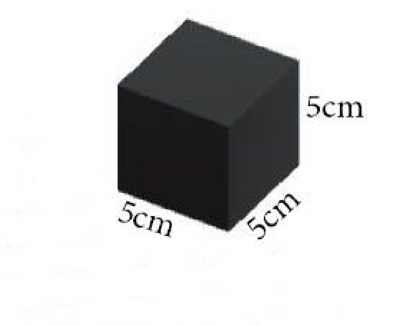


Figure 4 : black cube object

Task Procedure

STEP 1: Robot will be placed at the start position

The robot should be kept inside the start position - **white rectangle**. **whole of the robot should be confined to the box.** All the sensors of the robot should be inside the **white rectangle**.

STEP 2: Start the robot

On the command of the supervisor the robot's ON switch is triggered and it's put into full autonomous mode.

STEP 3: Find the entry point to the planet surface (beginning of black line)

The robot is expected to enter the planet surface from the guidance of black lines followed by white lines.

STEP 4: Explore the planet surface

The robot is expected to explore the planet surface by following the black lines.

STEP 5: Detect the object

The robot should detect object at any of the **endpoints 1,2 or 3.**

STEP 6: Place the object at the outside area white rectangle.

The robot is expected to bring the detected object to the outside area by following the black lines then white lines and release the object at the start position - **white rectangle**. Object need to be placed on white surface completely.

Start Point

- **white rectangle (Figure 2 - marked as start)** at the outside area.

End Point

- At the outside area after bringing the object and placing the object at the **white rectangle (Figure 2 - marked as start)**.

Timing Measurements

- The task will be timed from the time, the ON button of the robot is pressed to the time when the robot returns and place the object properly.
- Time taken to complete the task will be considered when giving marks.

Way of creating ascents and descents on the platform

We use **3cm x 3 cm x 0.635cm** (length x width x height) cuboid as shown in the image below. Which will be the minimum size of a cuboid. (**0.635cm = ¼ inch)**

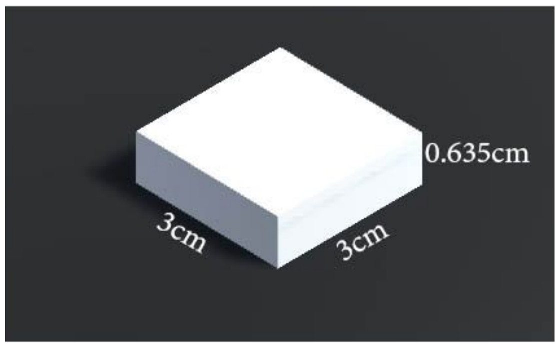


Figure 5 : view of a cuboid used to create the ascents and descents

Minimum size of a cell will have this dimensions and we can use **3*n cm x 3*n cm x 0.635cm** cuboids also where the height(**0.635cm**) **remains constant**. For example we may use 9cm x 9cm x **0.635cm** , 12cm x 12cm x **0.635cm** etc... Hope you got the point.

After that we will use these cuboids as our building blocks to create the platform for an example have look on the below image.

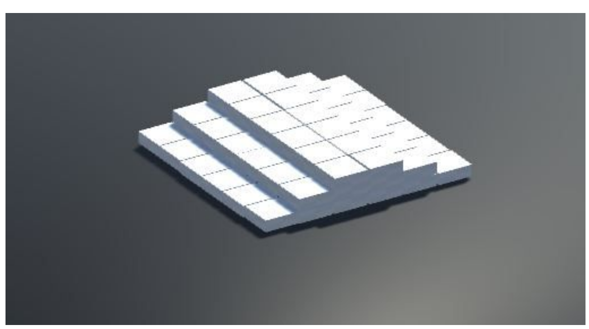
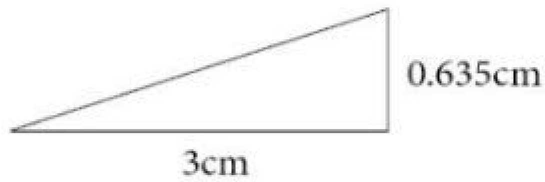
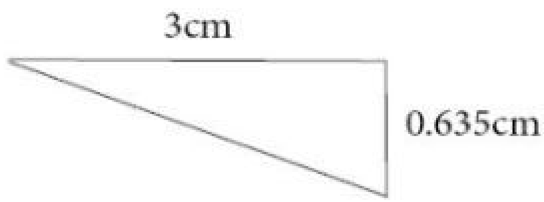


Figure 6: one possible arrangement of cuboids

We will make sure that every ascent or descent will happen with a minimum of **3 cm** distance on horizontal plane of platform. Max inclination/declination value: **0.635 cm inclination/declination for 3 cm**.



Maximum inclination that can happen for any direction.



Maximum declination that can happen for any direction.

Let's see some examples,

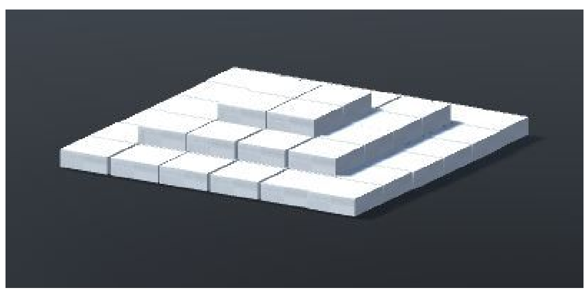


Figure 7: one possible arrangement of cuboids

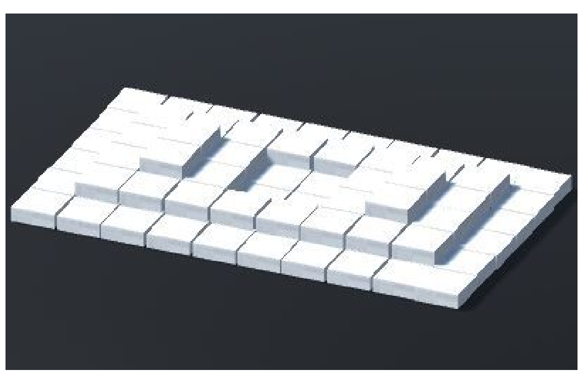


Figure 8: one possible arrangement of cuboids

How will the black line is represented?

We will use black boxes to represent black lines. Let's see how it will look like,

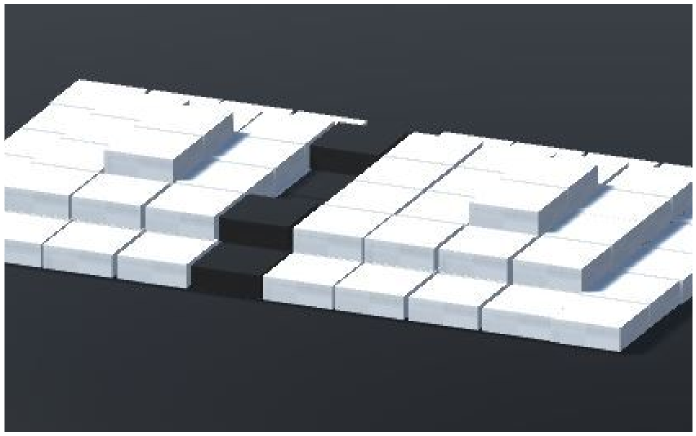


Figure 9: one possible arrangement of cuboids with black lines

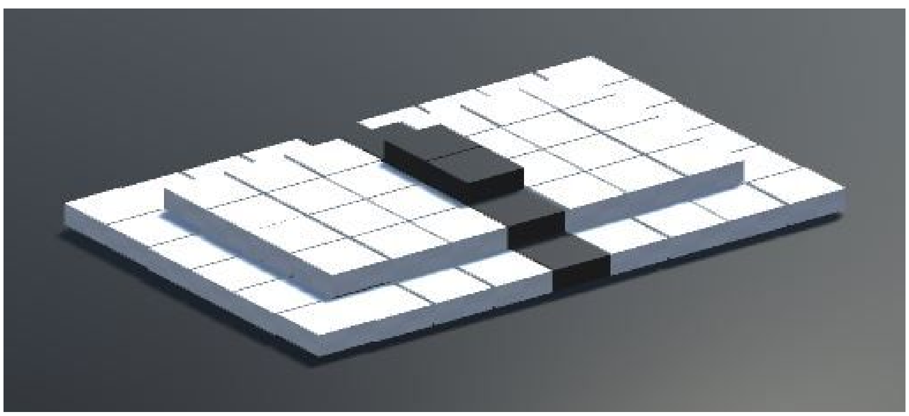


Figure 10: one possible arrangement of cuboids with black lines

Let's look for an example arina,

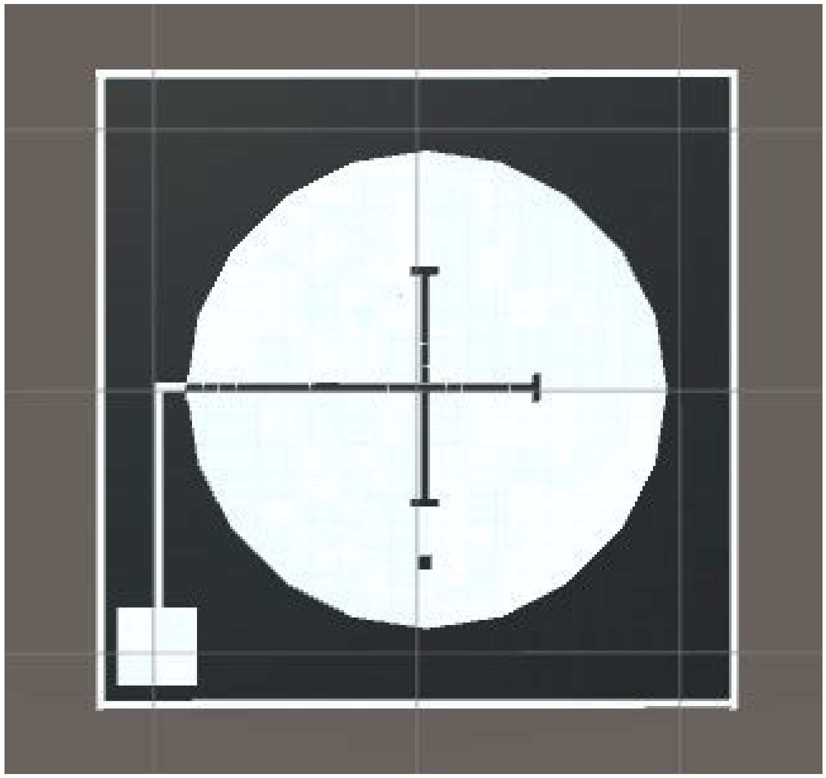


Figure 11: top view

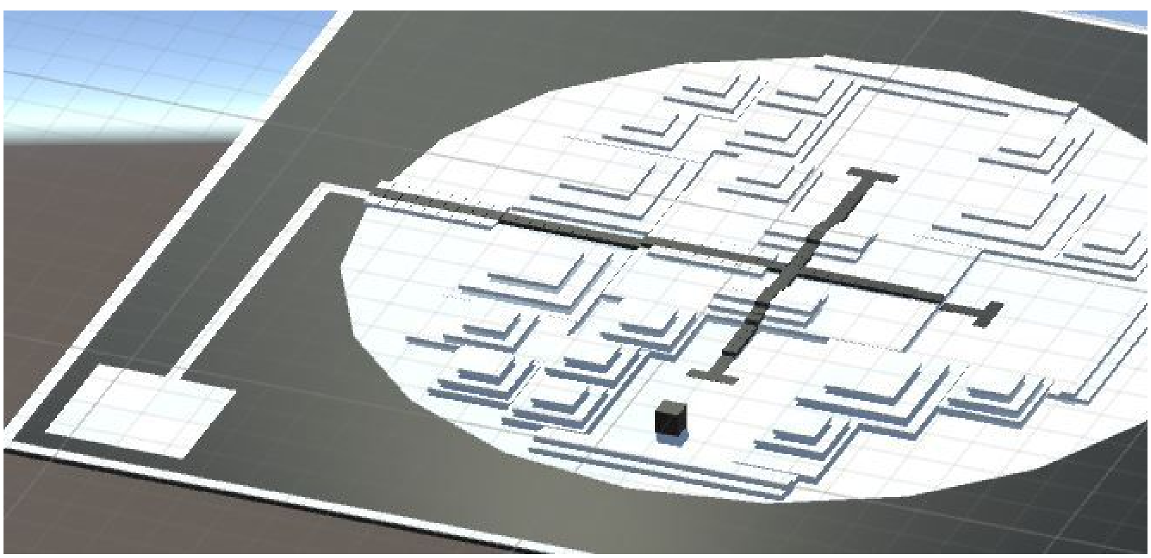


Figure 11: side view

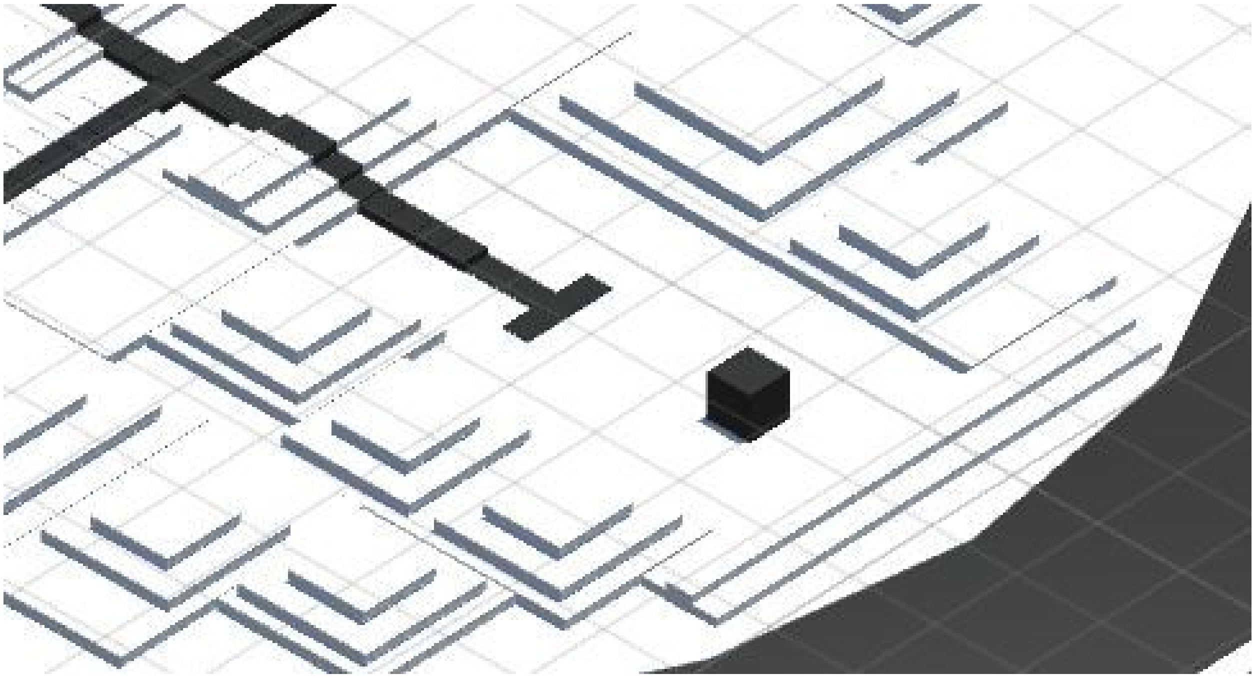


Figure 12: top view near a box

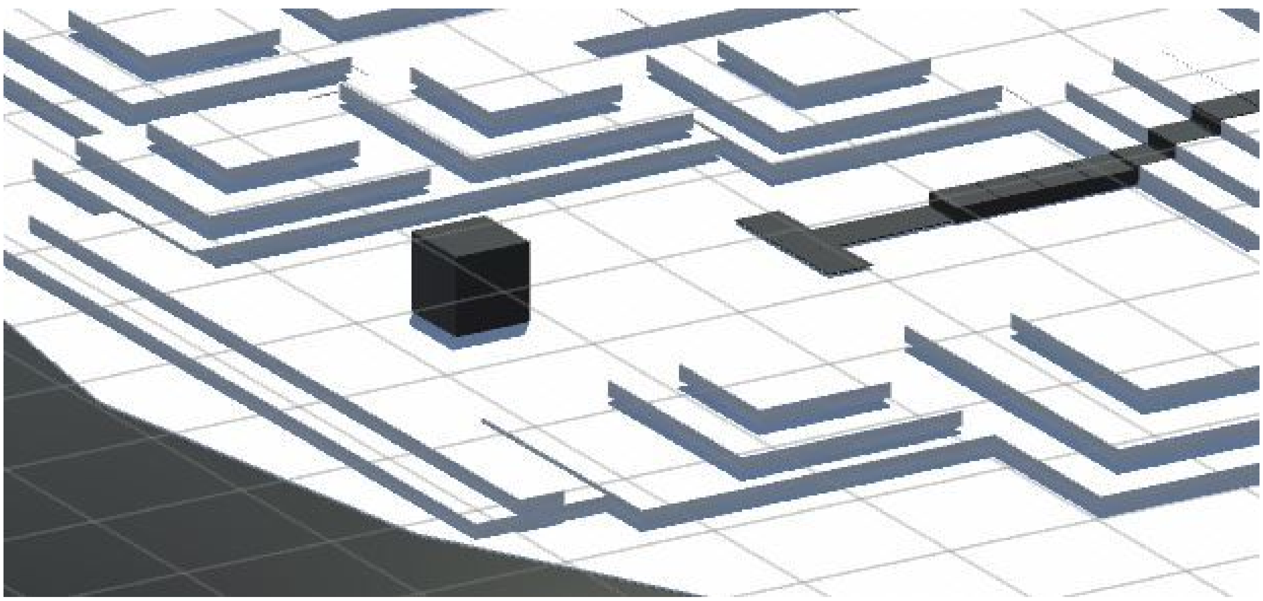


Figure 13: top view zoomed near a box

There will be enough space for a robot at an end point of a black line and the box which is a flat area to go and grab the box.