

COLONIZER

INTRODUCTION

The year is 2035, and ISRO has devised a mission to explore the Solar System of TRAPPIST-1, which contains several earth-like planets. The principal probe that ISRO sent must visit all seven planets, but alas! it can only carry a limited amount of fuel. Depending on the orbital positions of the planets, you must devise the shortest way to explore all planets. Explore the deep reaches of space and search for the presence of extraterrestrial life in the event Colonizer!

PROBLEM STATEMENT

Build an image processing robot that has to find the shortest route in terms of distance for visiting every Planet(Circle) exactly once. Video feed of the arena will be provided through an overhead camera.

GENERAL RULES

1. Total time allowed for run will be **8 mins**.
2. Maximum of 2 timeouts are permitted, with each not exceeding 2 mins. Each timeout will attract penalty.
3. 2 mins penalty would be imposed on restart.
4. Maximum number of participants allowed is 5 per team. The members from different colleges can form a team.
5. The team cannot touch the bot during the course of run.
6. Bot has to remain within the arena throughout the run.
7. Hard-Coded Bots are not allowed for the competition.
8. The participants will be provided with 220V, 50 Hz AC power supply, and any other power supply they require has to be arranged by themselves by the participants.
9. Rules are subjected to change.
10. Decision of Team NSSC will be final and binding under all circumstances.

Round One

There are 7 different circular planets of different colours. There would be an overhead camera which will provide video feed to the bot.

The team has to decide the starting point on their own and place the bot. After that, the bot has to find the shortest route to visit all the planets. At every stoppage(planet) the bot has to blink an LED corresponding to the colour of the planets. There should be 3 LED's which could represent 1 to 7 in binary on the bot. Following is the LED binary code of 3bits corresponding to each color. Red [rgb (255,0,0)]: 001; Blue [rgb (0,0,255)]: 010; Green [rgb (0,255,0)]: 011; Light Gray [rgb (211,211,211)]: 100; Purple [rgb (128,0,128)]: 101; Sky Blue [rgb (135,206,235)]: 110; Saddle Brown [rgb (139,69,19)]: 111.

Judging Parameters

Scoring points

1. 200 points will be awarded as bonus at the start of the run.
2. 20 points for stopping at a planet (once for each planet)
3. 30 points will be awarded if bot blinks corresponding lights.
4. 50 points if the bot completes the run visiting each planet once.
5. 100 points if the bot takes the shortest path possible.

Penalties

1. 20 points will be deducted if it blinks light of different colour.
2. 30 points will be deducted if it blinks light anywhere except at the planets.
3. 50 points will be deducted points will be deducted if the bot visits any planet twice.
4. 50 points will be deducted for timeout.
5. 100 points will be deducted for restart.
6. $2*(d-d_0)$ points will be deducted where d (in cm) is the distance travelled by the bot and d_0 (in cm) the shortest distance.
7. $1*(t-t_0)$ points will be deducted where t (in min) is the time taken by the bot and t_0 (time in minutes) is the minimum time taken to traverse.

ARENA SPECIFICATION

1. The Arena will be a square of 3m side.
2. The planets will be circles of 15cm diameter each.

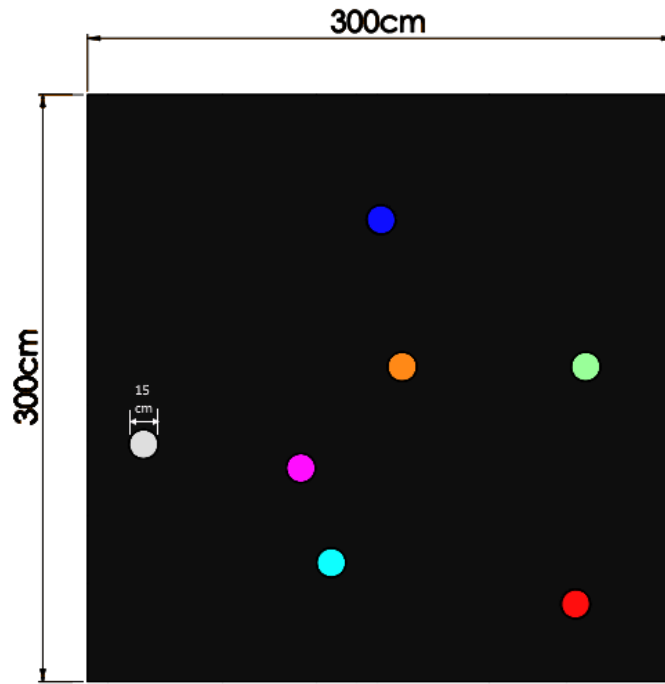


Fig: C01: Top View: Sample Arena Round One

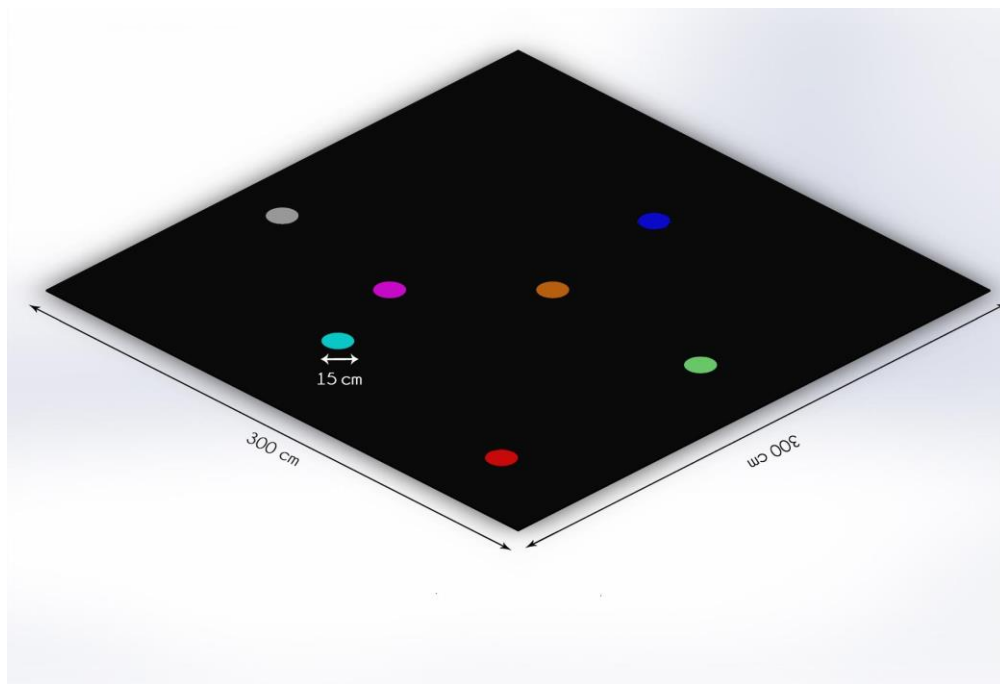


Fig: C02: Isometric View: Sample arena Round On

Round Two

There are 7 different planets(circular) of different colours and comets and asteroids (triangular obstacles). There would be an overhead camera which will provide video feed to the bot.

The team has to decide the starting point on their own and place the bot. After that, the bot has to find the shortest route to visit all the planets/galaxies avoiding all the obstacles. At every stoppage(planet) the bot has to blink 3 LEDs corresponding to the Nth planet visited in binary format, e.g. 6th planet will be represented as 110.

Judging Parameters

Scoring points

1. 200 points will be awarded as bonus at the start of the run.
2. 20 points for stopping at a planet (once for each planet)
3. 30 points will be awarded if bot blinks corresponding lights.
4. 50 points if the bot completes the run visiting each planet once.
5. 100 points if the bot takes the shortest path possible.

Penalties

1. 20 points will be deducted if it blinks light of different colour.
2. 30 points will be deducted if it blinks light anywhere except at the planets.
3. 50 points will be deducted if the bot visits any planet twice.
4. 30 points will be deducted if the bot fails to avoid an obstacle.
5. 50 points will be deducted for timeout.
6. 100 points will be deducted for restart.
7. $2*(d-d_0)$ points will be deducted where d (in cm) is the distance travelled by the bot and d_0 (in cm) the shortest distance (planet to planet).
8. $1*(t-t_0)$ points will be deducted where t is the time taken by the bot and t_0 is the minimum time taken to traverse.

ARENA SPECIFICATION

1. Arena will be a square of 3m side.
2. The planets will be circles of 15cm diameter each.
3. The triangles (asteroids in round 2) will be equilateral with 10cm side.

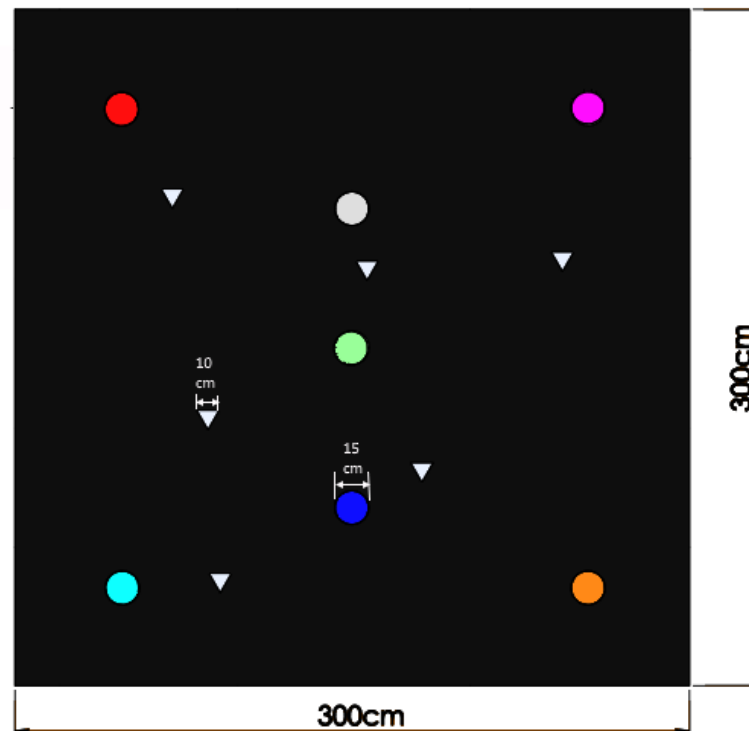


Fig: C03: Top View: Sample arena Round Two

BOT SPECIFICATION

1. Maximum dimension allowed for lander is 30*30*30 cm [$l*b*h^*$].
2. In case the team is using a non-electric power supply, the team must get it approved from the organizers beforehand via email. Organizers will not be responsible for inconvenience if approval is not sought.
3. The wires for the power supply should be at least 15 meters long.
4. In all cases, any on-board power supply devices like batteries are to be included in the maximum dimension limit.
5. Potential difference between any two points on the bot should not exceed 24 volts.
6. The bot dimensions would be subject to tolerance of 5%.
7. The rules are subject to change.
8. In case of disputes, the decision of team NSSC is final and binding.

CERTIFICATION POLICY

1. Top 3 teams will be awarded by Certificate of Excellence for the event.
2. Prize money worth 30,000 INR will be distributed to the winner teams.
3. The winner team has to complete the task, if they fail to complete the task then they will be not eligible for Certificate of Excellence.
4. Participation Certificate will be awarded to the teams who are registered at the event arena with bot approved by the event manager.