# PIXELATE

Task:

Construct an autonomous robot (Space Rover) that uses feed from an overhead camera and apply image processing techniques to accomplish various tasks on an arena.

The Rover needs to detect various elements, process them and make its way to Base Camp region and further deliver the Spaceships to different Stations in a specific order provided by the Priority Zone.

Arena:

- The dimension of the arena will be 240 cm x 240 cm.
- The arena will have Spaceships as blocks of 10 cm^3.
- The black triangle indicated are gate which is an equilateral triangle with side 10cm.
- This image is for information purpose only. All the positions/shapes except the Priority Zone are subject to change in the main event.

10 cm

10 cm

10 cm

10 cm

10 cm
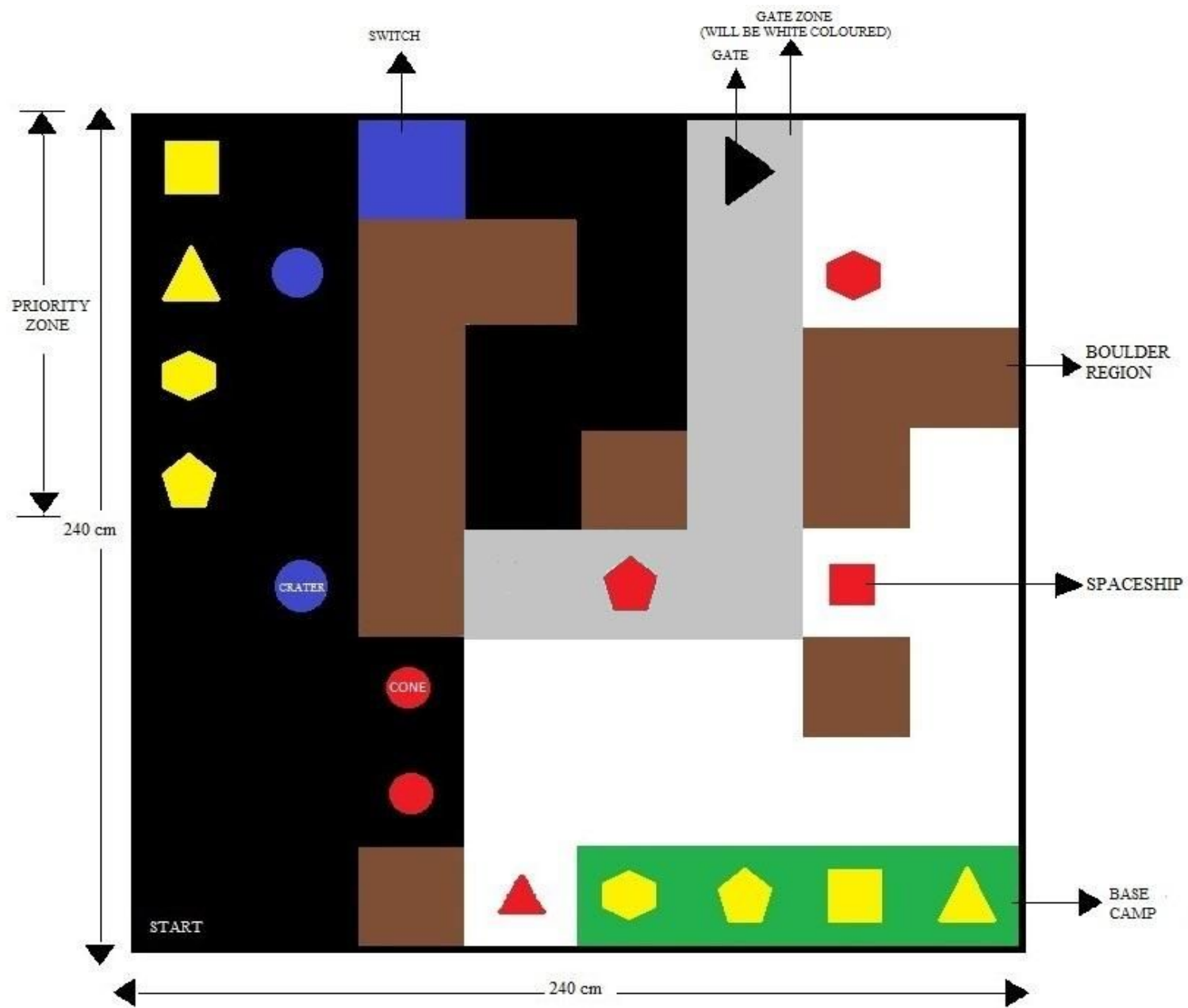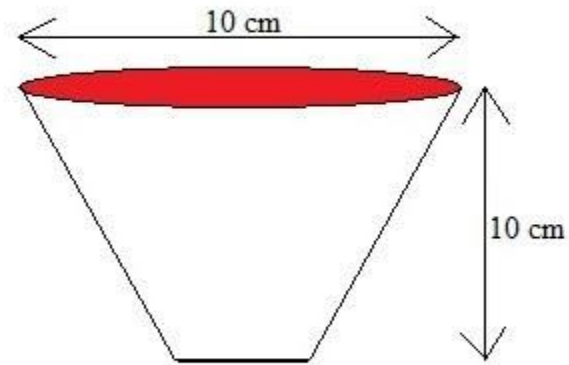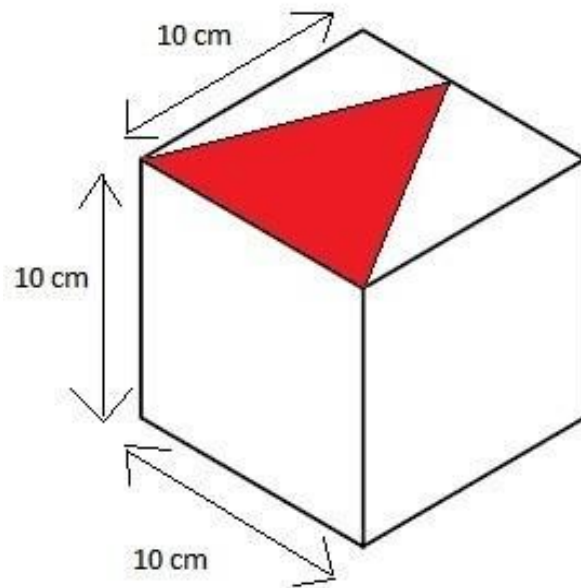
- Example of Red Triangular Spaceship and Crater-filling-Cone will be present on arena.
- The shapes of spaceships are subject to change and will only be revealed in the final round.

Arena Description:

<u>Priority Zone-</u> Gives the priority order in which the Spaceships are needed to be delivered to the corresponding Base Camp Station.

<u>Base Camp-</u> Contains the stations where the Spaceships are needed to be delivered.

<u>Spaceships-</u> Placed in the arena. Have the remaining resources in order as shown by the Priority Zone.

<u>Switch-</u> Rover needs to wait here until the Gate is visible.

<u>Gate Zone-</u> After the rover waits on the Switch for some time, Gate will appear anywhere in this zone. (Will be white colored).

<u>Gate-</u> The only possible passage from the black sub-arena to the white sub-arena (Initially invisible).

<u>Crater-</u> Conical voids which needs to be filled with the help of cones available in order to make the path.

<u>Boulder Region-</u> The landscape where rover cannot travel.

Gameplay

Qualifying round:

The Rover needs to correctly identify all the elements on the arena and place the ==first spaceship or cone==.

Final round:

Along with the tasks performed in the qualifying round, the rover needs to carry out the additional tasks as specified in the game procedure.

Game Procedure:

- The problem is divided into 2 major tasks:
    - Filling craters with cones.
    - Delivering the spaceships to the corresponding space-stations.
- The rover will initiate from the START position (common to all participants) and it needs identify the locations of the Blue craters (that are present in its path to the switch) and the Red cones.
- The rover needs then fill all the craters in the path by placing cones inside the crater and then glow Blue LED for 2 seconds. The rover can travel over a crater only if the crater is filled.
- As soon as all the craters are filled, the rover needs to locate a gate to enter the white sub-arena. To locate the gate, the rover needs move to the Switch (indicated by a blue square) and wait on it until a black triangular gate appears. (Only one Gate will appear anywhere in the Gate Region).
- As soon as the Gate is located, the rover should glow a Green LED for 3 seconds and then enter the white sub-arena through the gate. Once the rover has entered the white sub-arena, it cannot move out.
- In the white sub-arena, the rover needs to deliver the Spaceships to the corresponding Station in the Base Camp Region following the priority order.
- The delivery of Spaceships should be done according to the order (top to bottom) specified in the Priority Zone.

- After delivering all the Spaceships, the rover needs to stop and glow a Red LED for 2 seconds, indicating the end of the tasks.
- Traversal of the bot on Priority Zone and Boulder Region is strictly prohibited.

Rules

Eligibility:

All students with a valid identity card of their respective educational institutions are eligible to participate in the event.

Team specification:

A team may consist of maximum of 5 members. Members of a team can be from different educational institutions.

Robot specifications and fabrication:

- The rover should fit within a box of 25 cm X 25 cm x 25 cm.
- The weight of the rover should be less than 2.5 kg. The rover should be capable of moving a 10 cm^3 cubic block (made of Thermocol) and a Cone of specified dimensions.
- The Potential Difference between any two points on the rover must not exceed 24 V DC.
- Teams are allowed to use readymade microcontroller circuits and gear assemblies. Use of Lego kits is prohibited.

Camera Specifications:

The camera will be a C270h model of Logitech.

You can find the specifications of the camera here:

http://www.logitech.com/en-in/product/hd-webcam-c270h

Rules for the event:

- The robot should work purely on image processing based principles.
- Each team will be given 15 minutes for calibration and 15 minutes for the final run (this does not include the time for qualifying round).
- Only two participants are allowed near the arena at all times.
- The participants must bring their own laptops, adapters and batteries.
- The rover should be started by a single click or single command issued by participant.
- Only 3 restarts are allowed in the final round with a penalty of 60 points.
- The final codes must be submitted to the event coordinator.
- The arena would be setup in ambient lighting conditions. A sample pic of the arena would be made available prior to the event.
- It will be the participant's responsibility if there is any data misinterpretation of image of the arena taken by the overhead camera due to obstruction by the body of the rover.
- **Note:** The actual colours on the arena may be slightly different from the ones specified, due to ambient light and texture of materials.

General rules:

- Each team can have a maximum of **5** participants.

- Each member should carry a valid Student ID Card.

- Team should report at the arena 30 minutes before the start of the event.

- The robot should, in no way, cause any damage to the arena. Any kind of damage will lead to immediate disqualification.

- Participants should not dismantle their robots before the completion of the whole competition as the devices might need to be verified by the organizers at a later stage to ensure that the participants have not violated any of the rules.

- The organizers reserve the right to change the rules as they deem fit. Change in rules, if any, will be highlighted on the website and notified to the registered participants.

- The decision of the organizers shall be final and binding.

Scoring

- Awards

- 30 points will be awarded to the team for each cone that the rover grabs.
- 50 points will be awarded to the team for placing each cone in the crater.
- 20 points will be awarded for glowing the correct LED.
- In the white sub-arena, if the rover correctly grabs the spaceship according to the priority order indicated, then 50 points will be awarded to the team.
- 80 points will be awarded if the rover places the spaceship in the correct station.

- ## Penalties
  - In case the rover grabs a spaceship, which is not according to the priority indicated, 30 points will be deducted from the total score.
  - If the rover places the spaceship at the wrong station, 50 points will be deducted from the score.
  - 30 points will be deducted if the rover moves into the boulder region, crater or touches any obstacle.
  - 50 points will be deducted if rover does not enter through the specific gate.
  - Power-Up: The team can skip the black sub-arena and start from the switch by paying a penalty of 100 points. Although proper implementation of task after this power up (if taken) is expected from the team.

Certification Policy:

- The top three teams will be awarded a certificate of excellence.
- All teams qualifying the first round will be awarded a certificate of participation.

- Disqualified teams will not be considered for any certificates.

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