



## PIXELATE

### Task:

It's 2030. Humans have caused irreparable damage to earth. Zendors, a superior alien race decides to save earth from destruction but only if we pass a test of worthiness. They have offered us a chance to prove our competence. A representative is to be chosen who will be sucked into an unknown game in a virtual world. Ms. Marvel steps up for the job. The surprise comes down hard on her as the game turns out to be "*LUDO*". She knows she is very unlucky and the dice rarely turns in her favour. She is in desperate need of your help to win the game. You need to showcase your fantastic image processing skills to build an **autonomous robot**. The weird Zendors only have three rules in this twisted game of Ludo.

1. Move in a **clockwise** path.
2. Jump to the **closest** matching position each time.
3. Complete a **full** round through the maze.

*Play as if your life depends on it because today it is.*

### Arena:

- The dimension of the arena will be 225 cm x 225 cm divided in a 9 x 9 grid.
- Each block of the grid is therefore 25 cm x 25 cm



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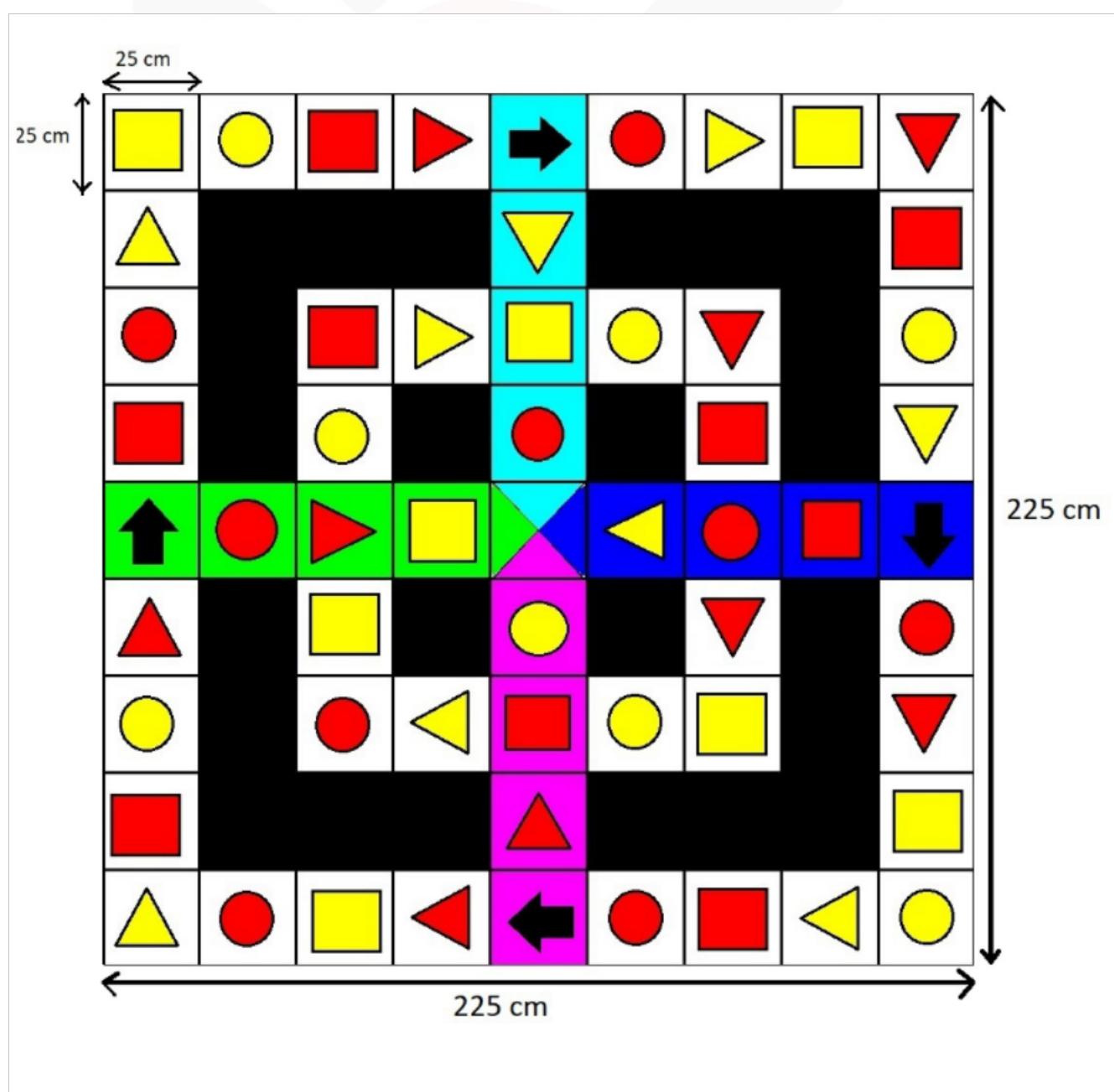


THE ANNUAL TECHNO-MANAGEMENT FEST, IIT (BHU) VARANASI

# TECHNEX '19

8-10 MARCH, 2019

CELEBRATING CENTENARY





## Arena Description:

- There are 2 paths (inner and outer square) and there are 4 connecting paths of different colours joining them.
- Bot can change from outer path to inner path or vice versa. Bot is allowed to move in the **clockwise direction** only. The portion of the arena in black colour is **restricted** for the movement of the bot.
- There will be 3 shapes (**square, circle and triangle**) of 2 different colours, distinguishing each block in 6 different ways. All shape colours might change but they will be distinguishable easily. The position of shapes in the final area will not be the same as the indicative pictures
- A dice having these shapes and colors on the respective 6 sides will be provided to the team.
- On the outermost path there will be 4 arrows at the end of connecting paths pointing in clockwise direction. These arrows mark the **Starting Zone** where the bot will be placed initially on any one of the arrows.
- The centre of the arena is the **home zone**.
- The bot has to traverse the arena, complete a full round and finish at the home zone.
- A video feed from the overhead camera will be provided to the team. The team's computer should autonomously instruct their bot throughout the arena using this feed



## Gameplay:

### Qualifying Round:

Perform first 3 steps of Game Procedure (one dice roll).

### Final Round:

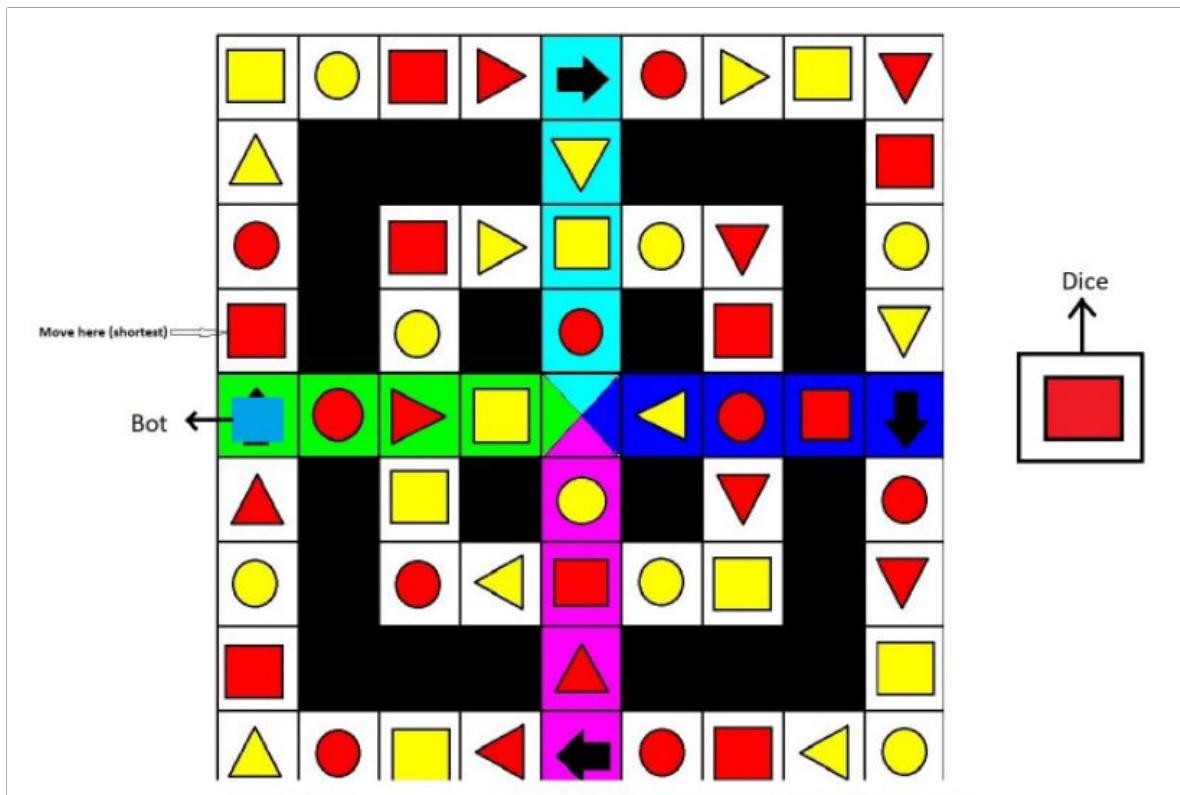
Carry out the full task as specified by the game procedure.

## Game Procedure:

1. The bot is placed at one of the **Starting Zones**.
2. Team will roll the dice provided and manually input the shape and colour appeared on the dice in the bot's code.
3. The bot must then find the **closest** block which it can reach following a **clockwise** path. If two positions with the required color and shape are at the same distance from the bot then the bot may choose either.
4. An led on the bot must clearly indicate when it is moving and when it stops.
5. As soon as the bot stops moving and waits for input, the team can throw the dice again.
6. This continues till bot has completed a full round around the centre. Then it should move to **home** via the connecting paths that it started on.
7. On reaching **home** the bot should signal that it has finished the task.



### Example 1:

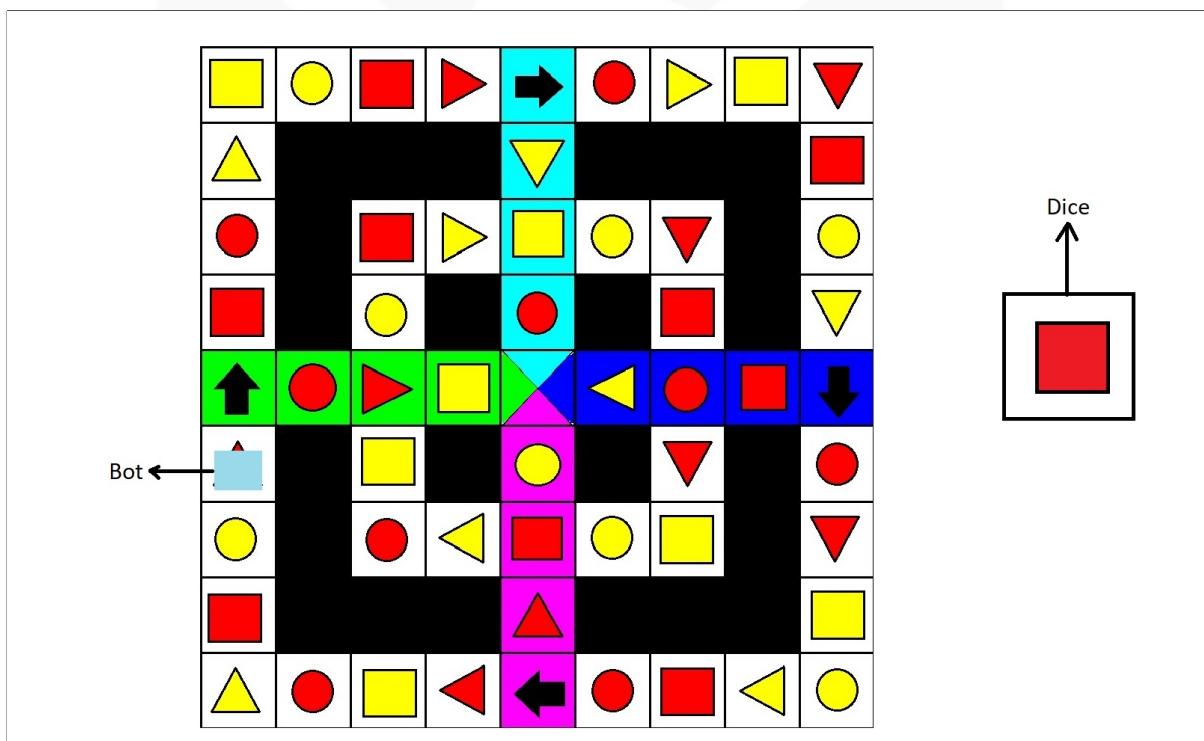


Here the bot starts on the green starting zone. The dice shows a red square. So for this turn the bot should move to the closest red square. That is the marked square. Note that in the first dice throw the bot should move forwards only.



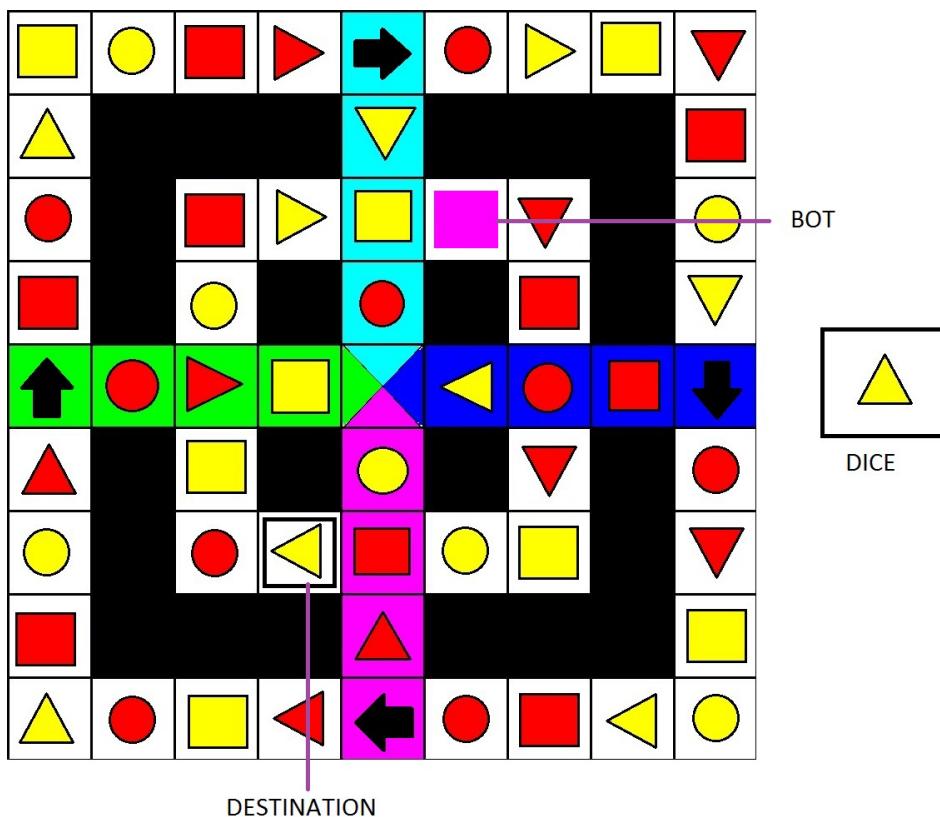
## Example 2:

Suppose you have completed one round and you get the follow shape on the die:



Since the path towards home does not have this shape you have to not perform any move and wait for the next input.

**Note:** The bot is supposed to wait if the input shape and colour is not found on the steps towards home.



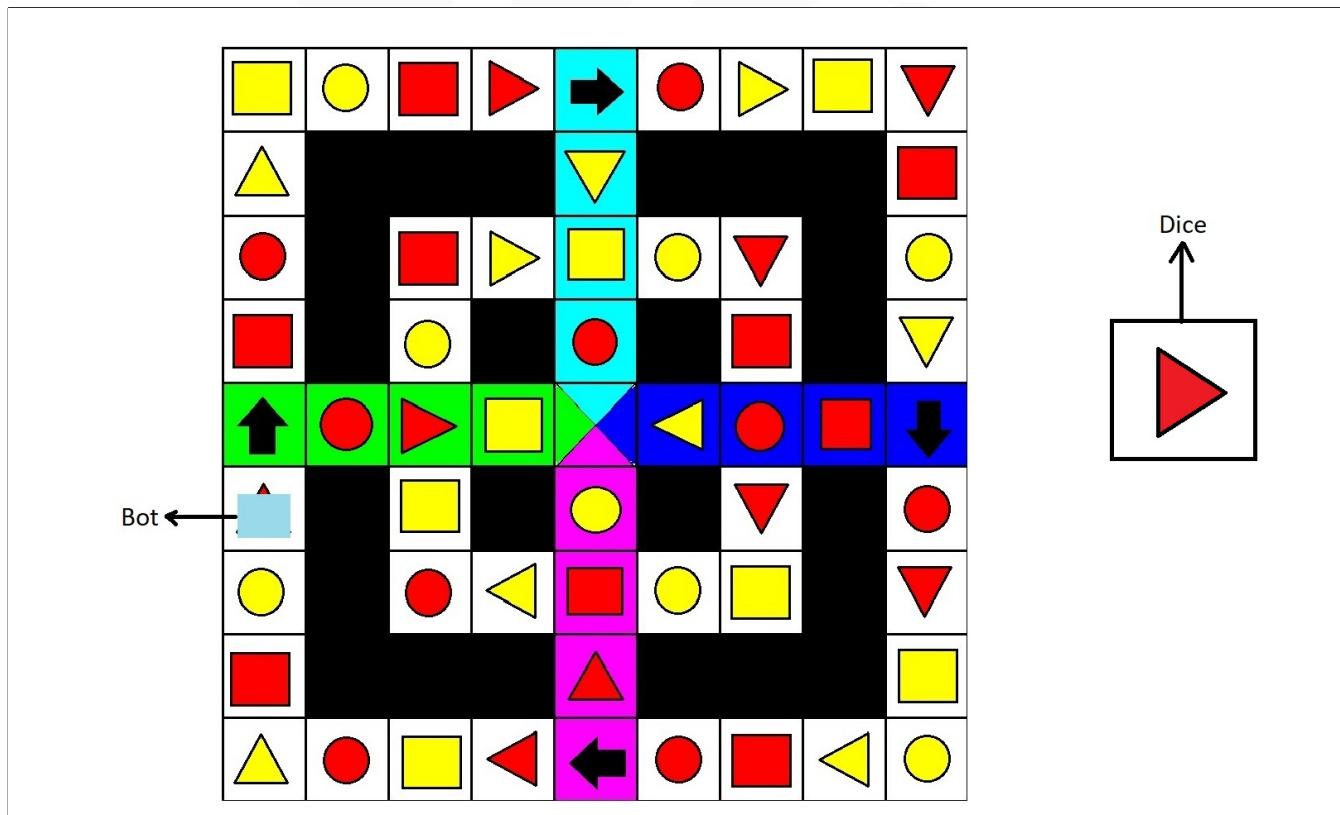
### Example 3:

Even though bot is closer to the yellow triangle to the top right, it should go to the destination at the bottom left. This is because the rules are closest matching shape that can be reached with a clockwise path



Example 4:

Now suppose on the next throw you get the following shape.



Now since the shape is present on the line towards home the bot must move on the connecting path towards home. Then it will wait till it gets a yellow square and will move to the home zone. This is the victory condition.



## Scoring

### Awards:

- Points will be awarded to the team on the basis of (number of blocks traversed correctly \*100)/time required to traverse (the above constant here 100, can be changed during the time of event).
- 100 points will be awarded to the team on completion of problem statement successfully

### Penalties:

- In case the bot moves to any incorrect position, which is not according to appeared dice position, 20 points will be deducted from the total score.
- In case the bot does not move to the nearest specified block (goes to the farther correct block), 20 points will be deducted from the total score.
- In case the bot moves anticlockwise, 40 points will be deducted from the total score for each turn.
- If the bot directly moves to the home block or crosses it without traversing the whole arena according to the rules, 100 points will be deducted from the score.



## Event Rules:

- The robot should work purely on image processing-based principles. Each team will be given 20 minutes for calibration and 40 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 robot 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 200 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 robot.

**Note:** The actual colours on the arena may be slightly different from the ones specified, due to ambient light and texture of materials.



## 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 robot should fit within a box of 20 cm X 20cm x 15 cm.
- The Potential Difference between any two points on the robot 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>



## 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.



## 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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