ROBO CARNIVAL 2019

PATH FINDER

RULEBOOK

discovering new degrees of freedom

BUET ROBOTICS SOCIETY

An autonomous line follower robot will have to follow a path which will consist of several challenges i.e. overlapping paths, zigzag line, sharp turns, line gap, triangular section etc. It will also need to solve some unique problems. For solving each of the challenges, the robot will be awarded points. The robot that gains maximum points will be declared the winner of the competition.

Team Specification :

1. A team should not consist of more than 6 members.

2. Team members should be of the same university but they can be from any level/term.

3. Only one member per team is allowed inside the arena during run.

4. College students can participate.

Robot Specification :

1. Robot must be an autonomous ground wheeled line follower robot.

2. Robot's dimension must not exceed 20cm X 20cm X 20cm.

3. The robot should run by on-board power supply, not exceeding 24 volts.

4. Ready-made chassis will not be allowed.

5. The robot must have one kill switch to turn off the power.

6. During the run the bot can neither be split into several parts nor can be reprogrammed.

7. Accidental detachment of an electronic or mechanical component can be reattached during the run by the participant, but no new or additional component is allowed to be introduced to the bot in this duration. Any time advantage will not be given.

8. No additional component will be provided by the authority, so the participants should bring extra components for emergency (if any) on their own.

9. Any damage to the arena by the robot will result in immediate disqualification of the team.

10. Any communication cannot be done during race.

11. The authority possesses full privilege of changing and adjusting the rules and disqualifying a robot violating rules stated above.

Arena Specification :

1. Line width = 3cm.

2. Line color : Black line on white surface.

3. Starting point dimension = 30cm X 30cm.

4. Track may contain overlapping paths, sharp turns, zigzag line, triangle, moving obstacle, circle, seesaw etc.

5. Minimum angle of sharp turns is 30° and maximum angle is 135°.

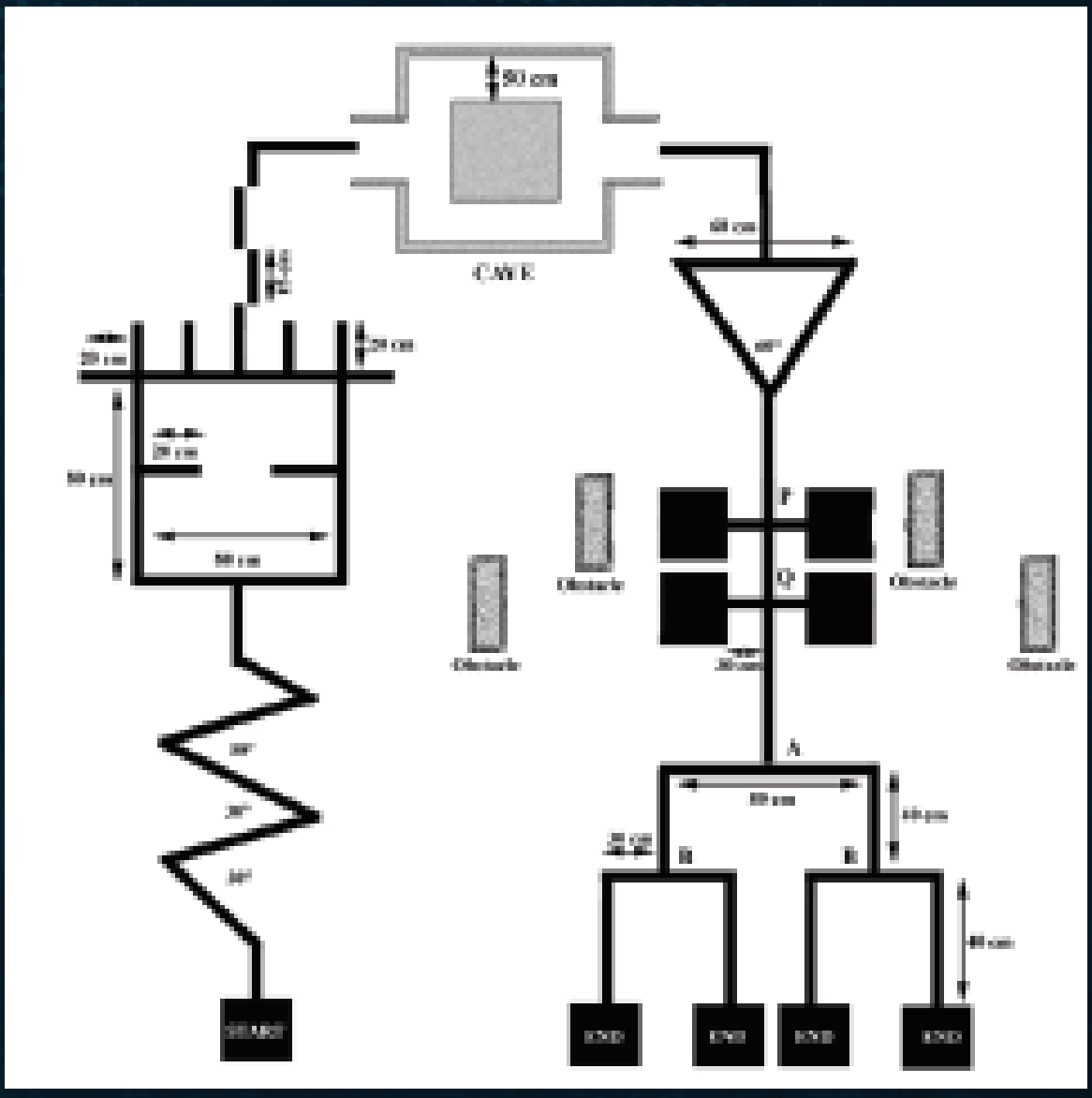
6. Position of checkpoints maybe anywhere on the track.

7. Angles of the triangle = 60°.

8. Common finishing point will be denoted by a 30cm X 30cm black box.

9. Position of checkpoints in the path will not be disclosed earlier.

Example Track :



Game Play :

1. Total time allotted for a bot to complete the track is 5 minutes.

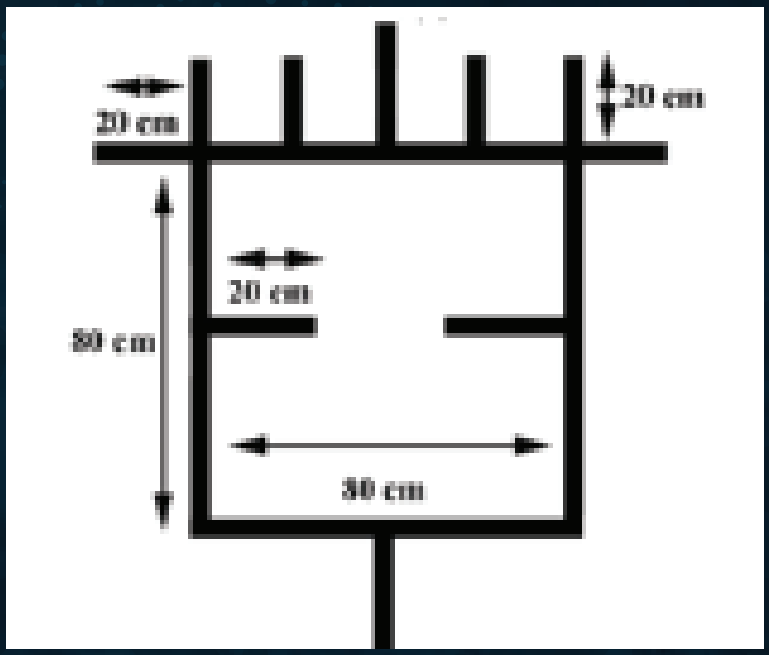
2. Two minutes of calibration time will be given before race.

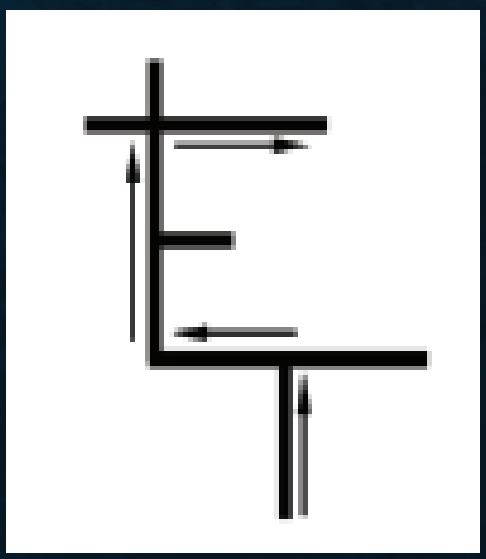
3. A team can take at most 5 restarts during run. Each restart will cause a penalty.

4. There will be two rounds in the competition. In the first round the teams will look to complete a simple track and earn points. A certain number of teams will qualify for the final round on the basis of collected points. Track for the final round will consist of similar challenges from that of the first round with certain variations.

5. In some portion(s) of the track, if the bot is able to take shorter routes, it will be able to save significant

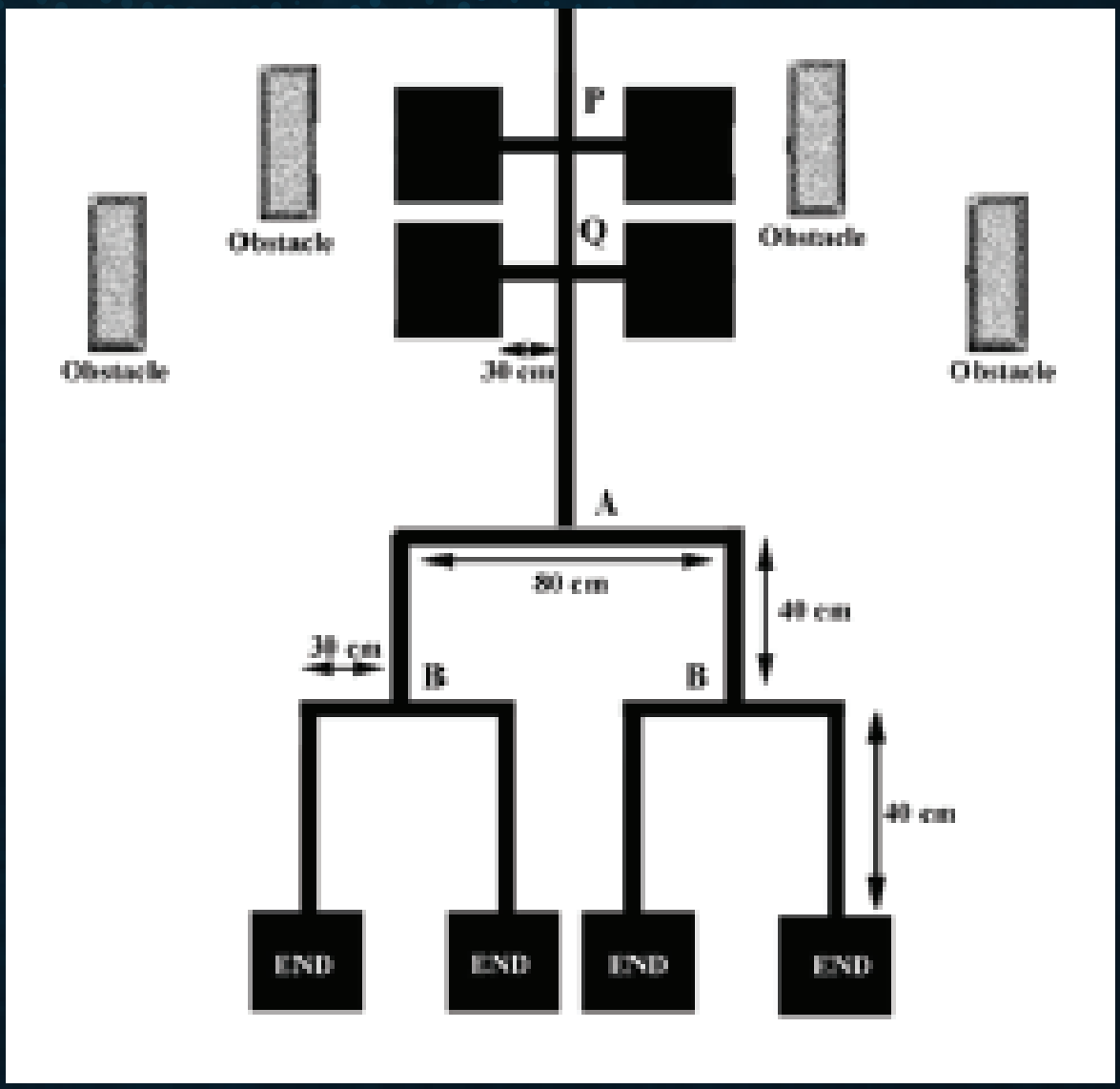
amount of time. There will be enough signs in the track to help the bot identify such shortcuts. The challenge for the participant is to program his robot in such a way that it can take the shorter routes and stay ahead in time. Following is such a portion where taking shorter routes will result in taking less time to finish the track.





There may exist certain variations of this challenge. But they can be solved in a similar fashion. It should be mentioned, however, that participant can choose to take the longer route and still finish the track (Hint: The bot needs to shift its directional priorities).

6. There will be no cave present in the first round.
7.



This is the signature problem of this year's track. In this problem, the bot needs to store some data and then evaluate the data to take directions at successive intersections.

Description of the Problem:

Step 1:

a) The bot has to turn left or right at junction P based on its preference and stop at the black square. Then the bot will measure the distance from the obstacle.

b) The obstacle will either be at 20 cm or 40 cm from the middle of the black square.

c) After measuring the distance, the bot will have to return to junction P and proceed towards junction Q.

d) After reaching junction Q, the bot will have to follow step 1 and similarly read the distance of the obstacle from the black square. Then the bot will return to junction Q and proceed towards A.

Step 2:

As the bot reaches junctions A and B consequently, it will need to make a decision on whether it should take left or right at each of the junctions. These decisions must be made by evaluating the data received at junctions P and Q and they are as follows:

a) If the bot measures the distance of the obstacle to be 20 cm from the black squares after both junctions P and Q, the bot will always have to take left at all future junctions when possible.

b) If the bot measures the distance of the obstacle to be 40 cm from the black squares after both junctions P and Q, the bot will always have to take right at all future junctions when possible.

c) If the bot measures different distances of the obstacle from the black squares after junctions P and Q, the bot will have to toggle its direction at every successive junction. That is, if it took right in the

previous junction, then it must take left in the next junction and then take right again in the following junction and so-on until it reaches the end point. The following points are crucial:

- Direction at the first junction: The bot must take left at the first junction (A) if it measures the distance of the obstacle to be 20 cm at the black square after junction P and must take right at the first junction (A) if it measures 40 cm at the black square after junction P.

- Desired path unavailable: If the desired path is not available to the bot but the remaining two paths are available, it must always take the forward path.

- Number of junctions: There is no maximum limit for the number of junctions.

- Number of Obstacles: 2

- The distances of the obstacles will be shifted according to the authorities' choice prior to the run of each bot.
- There will be checkpoints at each intersection.
- Variations of the portion shown to demonstrate the problem will be present in the main tracks. They will have to be solved in similar fashion.

To make sure you have understood the problem clearly, you can solve the portion on the example track and cross-check your answer from the table below:

Distance of obstacle from the black square after junction P (cm)	Distance of obstacle from the black square after junction Q(cm)	Direction at junction A	Direction at junction B
20	20	L	L
20	40	L	R

40	20	R	L
40	40	R	R

Scoring :

Activity	Point
1. Passing each checkpoint	+100
2.Missing any checkpoint/ Taking wrong route in the final portion	-200
3. Restart	-50
4. Stopping at end point	+50
5.Time bonus for track completed in 'T' seconds	300-T
6. Touching cave walls	-100

* The tracks presented in the event will not have any new challenges other than those presented in the example track. Although, it should be mentioned here that the tracks may consist of variations of these challenges. In other words, the participants should be able to solve the variations presented in the main track using the same logics implemented to complete the example track.

** The sequence of the challenges as can be seen in the example track may or may not be replicated in the tracks presented in the main event.