2020 STEAM CUP

TurtleBot3 (TB3) AutoRace v. 2019.11

Participant (age)	Team Formation	Game Method	Robot Condition	Robot Type
Above Highschool	2~4 person per team	Ranking game	Pre- Assemble	Remote Type

1. Category Summary

- Develop Autonomous Driving Code with mobile platform (TB3). Use ROS and evaluate participant driving ability and mission solving skills.

* ROS : Robot Operating System

2. Robot Standard

A. Robot Specification

i. Teams must use the TurtleBot3 (TB3) Burger and develop your own autonomous driving algorithms in order to complete each missions.

* Robot size and Customize Condition

① ROBOT (TurtleBot3) size, weight and robot parts are freely allowed to change as long as it does not affect the mission and race.
(*Controller and DYNAMIXEL are restricted to OpenCR and XL430)

B. Restriction

i. There are no restrictions on the size, weight, and additional modification of the robot, but if any possibility of damaging the stadium by user's TB3, referee may restrict the teams to remove some parts of hardware.

ii. All mission must be perform by autonomous operation.

iii. All robots must drive autonomously.

3. Regulation

A. Competition Rules

i. Each Team will be given one driving chance and ranked according to its result.

ii. If participants touch their robot or PC during the race, 5 points are deducted per each touch.

iii. If a robot stops more than 30 seconds, the team will be automatically disqualified the competition.

iv. Race time will be given maximum of 10 minutes for each team.
(5 minutes for preparation and 5 minutes for mission time)

B. Judging Standard

i. Mission Score

Traffic Light	T-Intersection	Construction site	Parking	Level Crossing	Tunnel	Time score
20 point	20 point	20 point	20 point	20 point	20 point	20 point

ii. Rank is determined based on mission score, time score and penalty points.

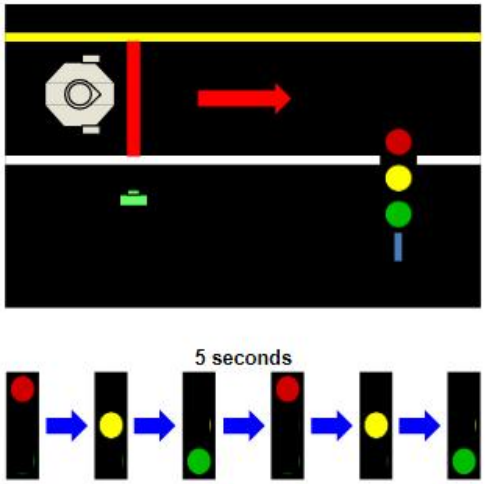
iii. Tie score will be ranked by following instruction :

1) Number of mission trial
2) Penalty Points
3) Time Records

4. Evaluation

A. Mission Configuration

i. Traffic Light Mission



1. Robot must recognize the color of the traffic light and automatically start without any external control.

2. Traffic light mission and light order.

   Traffic Light order:

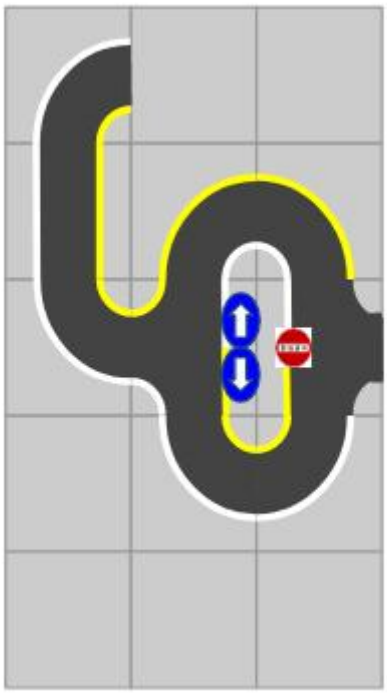
   Red -> Yellow -> Green

   * Green light will be turned on for 5 seconds.

3. Your mission time (5 minutes) will automatically start from the moment of green traffic light turns on.

4. Robot has to pass the starting line while the green light is on. Otherwise, it will be considered as a mission failure.

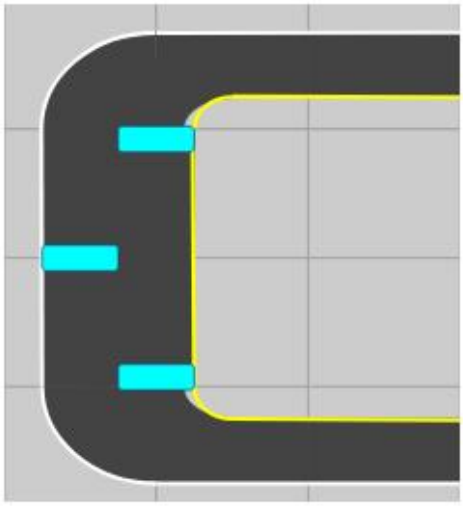
ii. T-Intersection Mission



1. Left/Right turn signs will be displayed randomly and robot must move to the indicated direction.

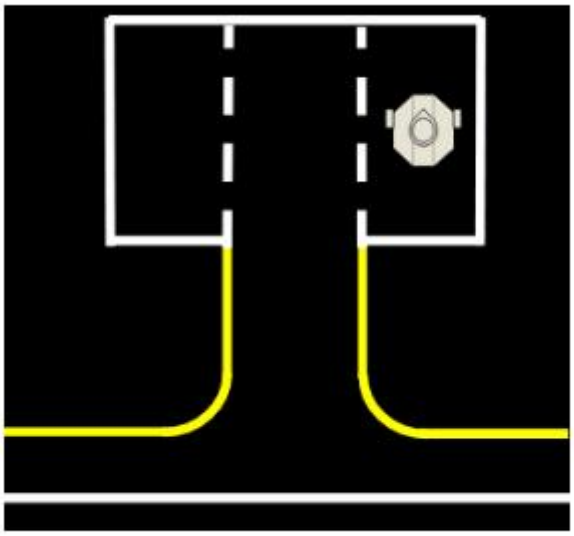
2. If the robot moves to the wrong direction, it is considered as a mission failure.

iii. Construction Site Mission



1. Avoid and pass all obstacles from the mission site.
2. All obstacles are fixed on the track.
3. During the mission, touching the robot or PC will be considered as a mission failure. Score will be also deducting for each touch.

iv. Parking Mission



1. Mission is to enter the empty parking slot and escape from the spot.
2. If Robot enter into the parking lot where the dummy robot is parked, it will be considered as mission failure.

v. Level Crossing Mission

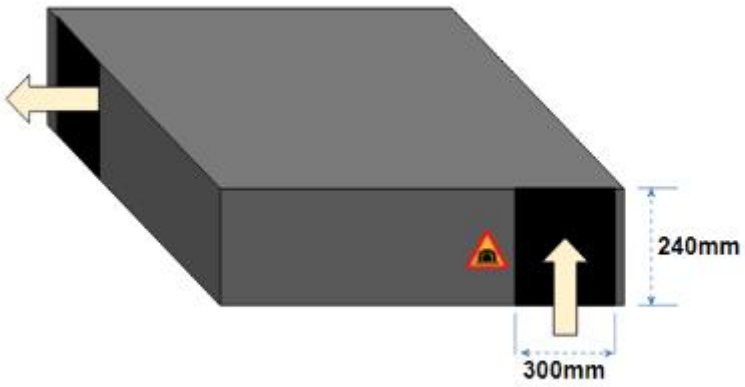
1. When sensor#1 is detected, the blocking bar will be automatically closed.
2. When sensor#2 is detected, the blocking bar will be open after a few seconds.

3. If sensor#3 is detected while the bar is closed, mission failure.

4. Sensor#3 is located 60mm apart from the bar

5. The location of sesor#3 is fixed and the others (#1, #2) can be set at any location

vi. Tunnel Mission



1. There is no light inside the tunnel and there are some obstacles (size and location are random)

2. The whole size of tunnel is 1.8m x 1.8m

3. The Entrance and Exit (Width 300mm x Height 240mm)

4. Color of internal and outside : Black Foamex

5. Mission complete if the robot escapes the tunnel, Failure if unable to escape the tunnel

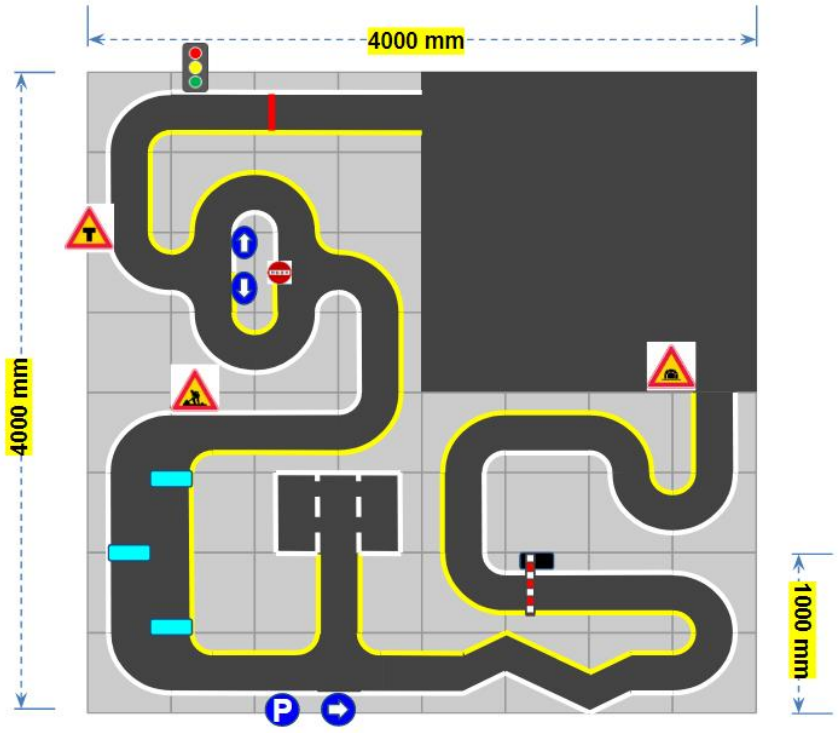
5. Autorace Track Regulation

A. Track Specification

1. Track size 4m x 4m

TB3 Auto Race Map

1	Traffic Mission
2	Intersection
3	Obstacles
4	Parking
5	Stop Bar
6	Tunnel



2. The network environment may not be smooth depending on the local circumstance, so each team should prepare the network.

3. This track may have some steps and gaps due to its assembly.