

The Rule of 19TH FIRA Roboworld Cup (Malaysia Open) 2026

“Autonomous Car Simulation Challenge: Race Track”

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TASK

Each team shall consist of 2 students only.

1. Both players of each team **MUST BE PRESENT** at the designated station on time.
2. If a team was **NOT READY AND PRESENT** at the station within **5 minutes** of callout of their turn, the team will forfeit that round.
3. Each team will have 20 minutes and a maximum of 3 tries. (**This is subject to change based on the number of participations in this challenge**)
4. Any violation will result in forfeit for the stage.
5. The Car needs to **race autonomously** to complete the track within a given time.
6. The competition consists of preliminary and final stages.
7. **The Stages**
 - a. Based on the scores obtained in the preliminary stage, some teams will advance to the final stage. (**This is subject to change based on the number of participations in this challenge**).
 - b. In the final stage, there may be obstacles on the street, (**Subject to change**)
 - c. The scores will be reset to zero in the final stage.
8. After finishing each stage, team leader must confirm the score sheet.

RULES

1. The Car must operate in autonomous mode.
2. Each team will only have one chance in each stage.
3. A specific time to complete the track will be given. This time may vary for each stage.
4. There may or may not be obstacles on the street, and if the car hits them, the round will be considered as finished.
5. The Car must automatically pass the checkpoints placed on the road.
 - i. The finish line is considered a checkpoint.
 - ii. The Car will start from the starting line and must pass the checkpoints to the end of the track. More checkpoint passed in a shorter period of time, the greater the score will be.
 - iii. The car must be entirely **ON THE ROAD** and in the **RIGHT LANE** while passing a checkpoint; otherwise, the checkpoint will be considered a miss.
 - iv. In the final stage, if the car hits the obstacle, the round will be considered as finished
6. **Score**
 - i. Score will be calculated based on the total time (T_{total}) and the number of checkpoints gained (cp).
 - ii. Total time is the sum of the time taken for the car to complete the track or pass some checkpoints.
 - iii. Any miss checkpoints will incur penalty which will be added to the total time as shown below.

Penalty Time	Penalty Definition
$+ 0.5 * \frac{T_{stage}}{\text{Number of all checkpoints}} (s)$	Skipped checkpoint (each)

- iv. The score is calculated using the following formula:

$$S_{AR} = (1 + \max \{ \frac{T_{stage} - T_{total}}{T_{stage}}, 0 \}) * 35 * cp$$

- v. The (T_{stage}) stage time is the amount of time each team has to do the race in each stage which will vary between preliminary and final stage.
- vi. For example, if a team is given 200 seconds and can finish the competition in 100 seconds and not lose any checkpoints (for example, if it scores 14 checkpoints), it will receive 735 points.

$$S_{AR} = (1 + \max \{ \frac{200 - 100}{200}, 0 \}) * 35 * 14$$

7. Winner will be determine based on score obtained.
8. In the event of a tie, the tiebreaker will be decided based on:
 - i. least skipped checkpoint.
 - ii. fastest time in the final stage.
9. The determination of the **Master Champion** for this category is based on the highest number of gold medals obtained. If two teams have the same number of gold medals, the Master Champion will be determined using the following formula:

$$S_T = S_{AR} + S_{AUD}$$

provided that the teams have **participated in both sub-categories**. Any team that does not participate in both sub-categories is **not eligible** for the determination of the Master Champion in this category.

Notes:

- The finish line is considered a checkpoint.
- The car must be entirely on the road and in the right lane while passing a checkpoint; otherwise, the checkpoint will be considered a miss.
- The scores of each part can not become negative.
- If the car hits an obstacle, the run is considered finished.
- After the judgment of the final stage and determining the top teams, they are required to send the codes and algorithms to the technical committee. After reviewing the codes and algorithms by the technical committee, the final teams will be determined.
- The round ends when the participant notifies the referee that the match is over or the car hits an obstacle.

GAME PLAY

1. Only the leader designated for each team will run the code at the assigned station.
2. Teams can open any number of terminals to run their code but cannot start the race until permitted.
3. Stopwatch will be used to take time.
4. Time will start when the leader pressed Enter to execute their python file that will move the Car.
5. The time will stop after the Car crossed the finish line or when the Car hit obstacle (the stage will be considered finished).

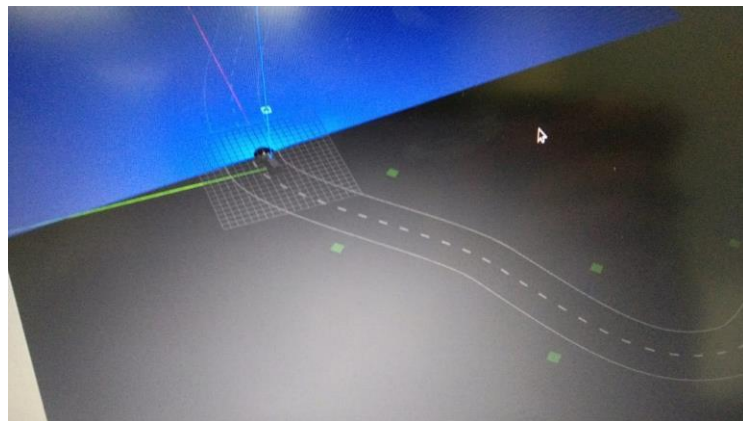
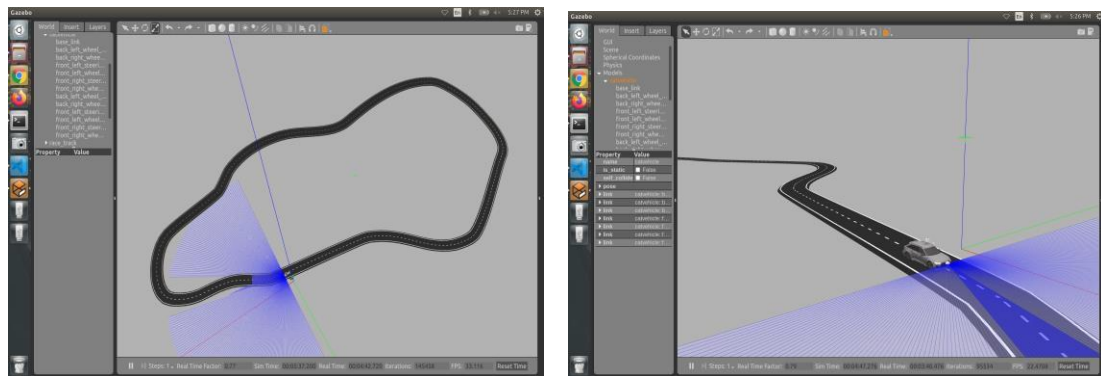


Figure 1: Different views of racetrack in gazebo simulator.

SIMULATOR

1. All the processes for car control are being handled by Robot operating system (ROS) and simulating the 3D environment of this challenge is designed and being handled by Gazebo simulator.
2. The simulator is accessible from <https://github.com/Fira-Autonomous-Cars/FIRA-Autonomous-Cars-Simulator> installation instructions will also be available there.
3. Minimum requirement:
 - CPU: Intel® Core™ i5-5257U CPU @ 2.70GHz
 - GPU: Intel® Iris 6100
 - RAM: 8 GB
 - Ubuntu 20.04
 - ROS Noetic
4. Launching the following command will start the gazebo simulator in the racetrack.

```
roslaunch avisengine_environment track_race_simple.launch
```

5. Participants get the front camera image from `/catvehicle/camera_front/image_raw_front/compressed` topic and must send steering and velocity through `/catvehicle/cmd_vel_safe`
6. The car can also be driven manually by launching the following command:

```
roslaunch catvehicle_tests cmdvel_unsafetest.launch
```

REFERENCES

- ^[1]“Latest Version of this FIRA Official document” [Online].
<https://docs.google.com/document/d/1JIDED3eSy1eIq4Jrc4L8M0LGSziAxxGFpkfxNDrqXAQ/edit?usp=sharing>
- ^[2]“FIRA Autonomous Cars Github organization profile” [Online].
<https://github.com/Fira-Autonomous-Cars>