

TrackBotGP

Competition rules (2025 Robotics@ISEP Open version)

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Homepage: https://www.isep.ipp.pt/Page/ViewPage/openrobotica_iv

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I. General Information

The aim of the TrackBotGP competition is to promote robotics and engineering education within a framework of competition based on principles of fair play. In addition, the aim is to make it easy and inexpensive to create the competition tracks, so that they can be implemented even in institutions with fewer resources.

Although the target audience for this competition is students from ISEP - Instituto Superior de Engenharia do Porto, the competition is open to participants from other higher education institutions, vocational schools, primary and secondary schools and individual participants.

This version of the rules (2025 Robotics@ISEP Open version) is the final version of the rules that will be applicable during the 2025 Robotics@ISEP Open.

Any questions regarding this competition should be sent to mss@isep.ipp.pt.

II. Competition specification

1. The competition involves developing a robot that is capable of driving around a track inspired by a Formula 1 circuit, by lapping it three times in the shortest possible time, starting the race independently after a traffic light is switched on, making a pit stop at the end of the second lap and stopping after completing the required number of laps and crossing the finish line.
2. There is no limit to the number of teams taking part in the competition, and each team can be made up of a maximum of 4 members.
3. It is not permitted for two or more teams to take part in the competition with identical robots. If the jury finds that there are two or more identical robots, they will be disqualified.
 - a) Identical robots are robots that have a similar structure (hardware) and use similar algorithms (software);
 - b) It is up to the panel of judges (see Section VI) to assess whether two or more robots are identical.
4. Before the start of the competitions, a technical check will be carried out on the robots of the participating teams in order to:
 - a) Ensure that the specifications of the robots, in terms of dimensions, are met and have a LED signalling system,
 - b) Check if there are two or more robots that are identical in terms of hardware and/or software.
 - c) The panel of judges may request access to the electrical diagram and list of hardware components. In this case, participants must show these elements, under penalty of disqualification.
 - d) The panel of judges may ask for access to the source code running on the robot's control systems. In this case, participants must show the code, under penalty of disqualification.
5. The competition consists of a set of four rounds, in which all the participating teams compete against each other in each round, organised as follows:

- a) Round 1, with a weight of 10 % in the final classification;
 - b) Round 2, with a weight of 20 % in the final classification;
 - c) Round 3, with a weight of 30 % in the final classification; and,
 - d) Round 4, with a weight of 40 % in the final classification.
6. The circuits to be used per round are as follows:
- a) Round 1: Monza circuit (see Figure 4);
 - b) Round 2: Monza circuit (see Figure 4);
 - c) Round 3: Portimão circuit (see Figure 5); and,
 - d) Round 4: Suzuka circuit (see Figure 6).
7. In each round, the robot must give three laps around to the circuit, being able to start and stop autonomously. After the second lap it should make a pit stop.
- a) The robot must start autonomously when the traffic light is switched on.
 - b) The pit stop consists of leaving the main track before the finish line, entering the pit lane, stopping for at least 3 seconds and returning to the track at the respective entrance.

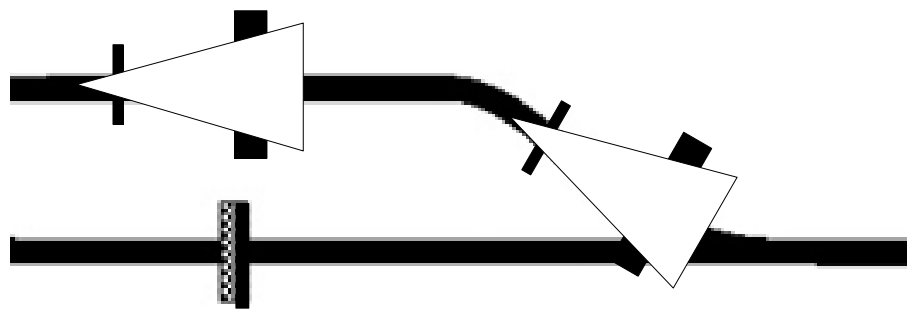


Figure 1: Pit stop

- c) The autonomous stop should be made when the robot detects the third crossing of the finish line, and after passing through the finish line it must stop before the end of the finishing straight.
 - d) The robots have a maximum time of 2 minutes per lap, to complete each track, in each round.
 - e) If a robot does not complete all 3 laps of the track, for each incomplete lap it will be given a time per race lap of 2 minutes and 10 seconds.
8. Each race starts with a light signal emitted by the “traffic light” (see point IV-3).
- a) At start-up, no part of the robot may cross the transverse line that marks the start of the circuit, except for the sensor used to detect the traffic light change, as shown in Figure 2.



Figure 2: Valid (left) and invalid (right) position of the robots on the starting line

9. Each race is scored as follows:
- a) A weighted average is made (taking into account the weights assigned to each round of the competition) of the time taken by the robot to complete the circuit in each round;
 - b) The ranking results from ordering the robots according to the weighted average referred to in the previous point, from the lowest value (first place) to the highest value (last place);
 - c) The robot is considered to have finished the race when its front part has crossed the line that marks the end of the track, as shown in Figure 3 (left), and must stop after the finish line, as depicted in Figure 3 (right).



Figure 2: Robot didn't cross (left) and crossed (right) the finish line

- d) the following penalties apply if a robot goes off track:
- i)* if the robot does so and returns to the track at a place ahead of where it left the track, but where the distance on the track between these two points is less than 20 cm, it will be given a 15-second penalty in the race time;
 - ii)* if the robot does so and returns to the track at a place ahead of where it left the track, but where the distance on the track between these two points is more than 20 cm and less than 40 cm, it will be given a 30-second penalty in the race time.
 - iii)* if the robot does so and returns to the track at a place ahead of where it left the track, but where the distance on the track between these two points is greater than 40 cm, it will be given a 60-second penalty in the race time.
 - iv)* if the robot does not make the pit stop, it will be given a 30-second penalty in the race time.
 - v)* if the robot does not stop after the third pass of the finish line, it will be given a 15-second penalty in the race time.
- e) in the event of a tie between two or more robots in the final ranking, the robot's fastest lap time on the Round 4 track will be used as the tie-breaking criterion. If the tie remains, the robot's fastest lap time on the Round 3 track, then Round 2 and finally Round 1 will be used as the tie-breaking criterion successively. The robot with the fastest lap time will be the one with the best ranking.
10. In addition, the time taken to complete each lap, for each robot, in each round, will be recorded. This record will be used to determine the track record and the record for the edition of the competition.

11. The organization does not provide the test track; however, participants can test their robots before the start of the competition, and in between races, according to a schedule to be set by the event organizers.
12. During practice times, participants must manage access to the track in a collaborative manner and based on fair-play rules.
13. The organization provides each registered team with a table, one chair per team member registered for the event and access to an electricity point.

III. Robot specifications

1. Robots can have any shape, as long as their dimensions do not exceed the following values:
 - a) 250 mm in length;
 - b) 200 mm in width;
 - c) 200 mm in height, except for the traffic light change detection system.
2. The robots must be electrically driven.
3. The robots must have an RGB LED that makes it possible to visually identify their status according to the following colour code:

Robot Status	RGB LED colour
Ready to go	Green
Crossing the finish line	Blinks colour 3 times
Laps 1, 2 3	Blue
Enters the pit lane	Yellow
Pit stop	Orange
End of race	White (flashing)

4. Robots must be autonomous.
 - a) Communication with the robot, or any type of teleoperation or remote control, is strictly forbidden during tests and competitions.
5. A robot may not intentionally endanger the life or physical integrity of participants in the competition.
6. A robot may not destroy objects within its reach as a result of intentional or improper operation.

IV. Track specifications

1. The tracks where the competition will take place, which are shown in Figures 4, 5 and 6, will be installed on a site with hard ground and, to the best of the organization's capabilities, flat and free from irregularities.

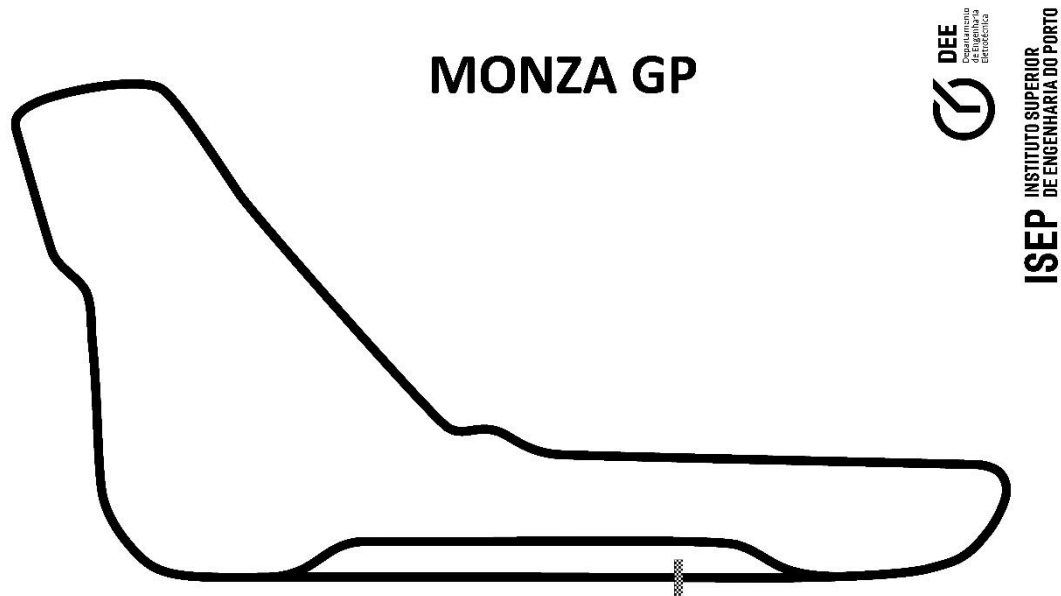


Figure 4: Track corresponding to the Monza circuit (Italy)

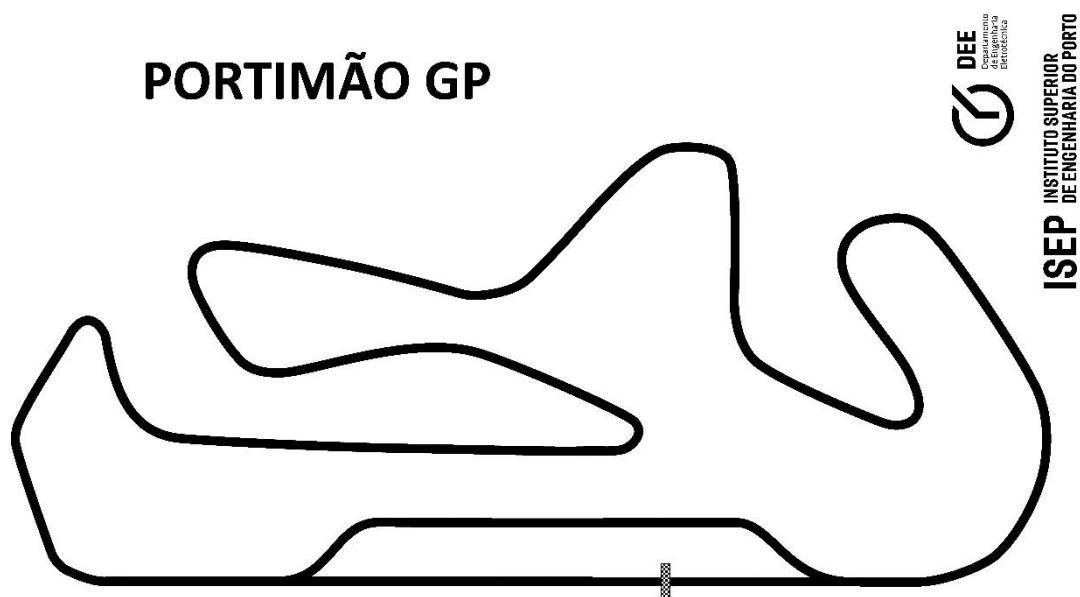


Figure 5: Track corresponding to the Portimão circuit (Portugal)

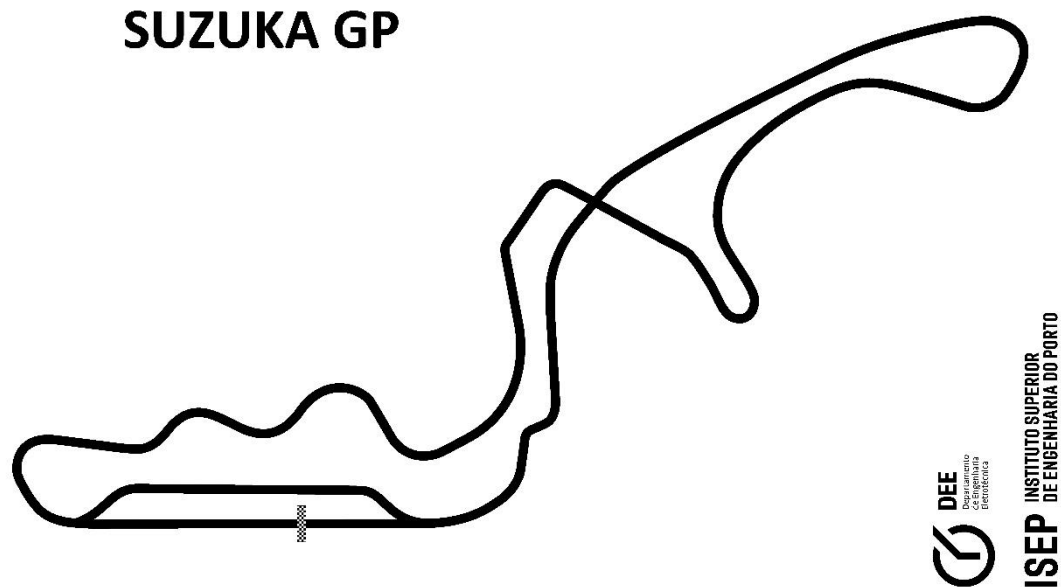


Figure 6: Track corresponding to the Suzuka circuit (Japan)

2. The track will be marked with a black strip, about 20 mm wide.
3. At the start of the track there is a “traffic light”, mounted on the underside of a gantry (as shown in Figure 7), which will light up signalling the start of the race.

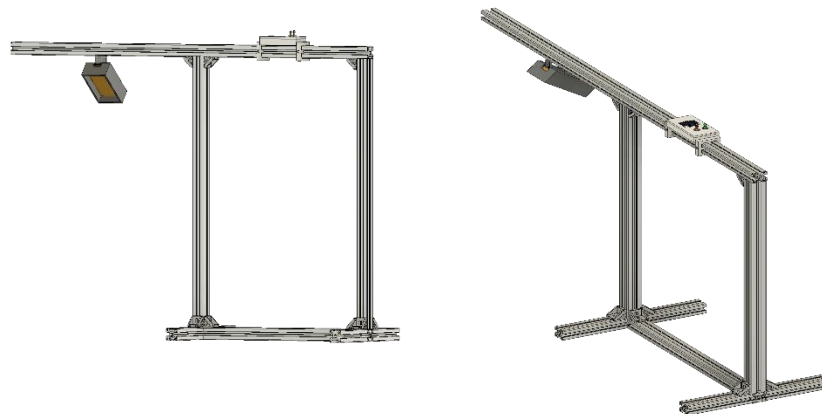


Figure 7: Approximate dimensions of the gantry that supports the “traffic light” signalling the start of the race (left), and photo of it (right)

- a) The traffic light will be implemented using a LED board.
- b) The traffic light will switch on a white light to signal the start of the race.

V. Specification of anomalous situations

1. The robots must be started autonomously after the start “traffic light” is switched on.
 - a) Once the button to switch on the traffic light is pressed, participants are not allowed to touch the robot again.
 - b) Failure to comply with the previous point will result in the team that does so being penalized 60 seconds in the race time.
2. If the robot starts before the start signal (commits a false start), the race is not interrupted or repeated.
 - a) A false start is only considered if the robot starts before the traffic light is switched on and after the button to start the countdown has been pressed.
 - b) In this case, a 30-second time penalty will be given to the team that does so.
3. If a robot fails to show up at the start of the race, or fails to start at the start signal, it will be given a time penalty of 7 minutes (420 s).

VI. Panel of judges

1. The competition is conducted under the supervision of an odd-numbered panel of judges, preferably chosen from among the competition organisers.
2. Any doubts regarding the interpretation of these rules will be decided by the panel of judges.
3. The panel of judges is responsible for carrying out technical verifications of the robots to check that they comply with the maximum permissible dimensions (see points II - 3 and III - 1.), recording the timings and, on the basis of these values, determining the robots' score in each race (as set out in point II - 9.), ranking the teams (as set out in points II - 4. and section V.) and ensuring that the participants comply with the rules set out in this document for the competition.
4. In the event of non-compliance with the rules of the competition, or a lack of fair play by one or more members of a team, the panel of judges has the right to impose a penalty in the form of subtracting points from the offending team.
5. In the case of behaviour by team members that affects moral standards, good manners, human dignity, religious sentiments or the safety of participants, the panel of judges has the right to impose a penalty in the form of the subtraction of points from the offending team or, in cases considered more serious, may even decide to disqualify the team.
6. The decisions of the panel of judges are final and cannot be appealed against.

Disclosure of personal data

1. The registration of a robot in this competition implies that the team members agree to the collection and publication of basic information about the robot and the team members, namely the name of the robot, the name of the team and its members, the name of the team members' institution, and allows the collection of photos and videos at the competition venue and attached areas and their dissemination by the event organizers and any partners, without the need to inform the teams.