DIRECTORATE GENERAL OF VOCATIONAL AND TECHNICAL EDUCATION

100 CENTURY OF EDUCATION

TÜBİTAK

TİKA

INTERNATIONAL MEB ROBOT COMPETITION

17th INTERNATIONAL MEB ROBOT COMPETITION

LINE FOLLOWER-DRAG ROBOT CATEGORIES RULES

2025

Education, Technology, Production from Roots to the Future

CONTENTS

CATEGORY RULES

1. INTRODUCTION

1.1. Objective

The Line-Following Drag Robot Category offers a dynamic platform designed to develop robot technologies and engineering skills. In this category, robots autonomously follow a white line on a black background and try to complete the track in the shortest time and with the least error. The aim of the competition is to develop participants' knowledge and skills in sensor technology, motor control, path-finding algorithms and autonomous system design. In this process, participants have the opportunity to test their technical competences by combining speed, accuracy and stability.

The Line Follower Drag Category offers a rich learning environment, especially in terms of sensor integration and control algorithms. Infrared or optical sensors are used for robots to accurately detect the line, and the data received from these sensors are processed by motor drive circuits to precisely control the movement of the robot. Advanced mechanisms such as PID control algorithms used in this process provide competitors with the experience of providing precise and stable motion control. In addition, since robots need to perform in a balanced performance between speed and accuracy, competitors learn to optimise algorithm design.

The technological importance of this category is that it contributes to a wide range of applications from autonomous vehicles to industrial robots. The path-finding algorithms underlying fast line-following robots are frequently used in automated transport systems used in the logistics industry and autonomous production lines in factories. In addition, these robots have an important role in the development of intelligent transport systems. Thanks to this competition, participants learn the basic principles of such systems in practice, reinforcing their theoretical knowledge and producing solutions to engineering problems they may encounter in real life.

The Line Follower Drag Category not only offers competitors a competition experience, but also provides an educational environment that prepares them for the technologies of the

future. The knowledge and skills gained in this category make significant contributions not only to the competition process, but also to the advances in the field of robotics, artificial intelligence and autonomous systems. Thus, the participants are able to direct their engineering careers by contributing to their personal development and shed light on the future of technology.

2. ROBOT SPECIFICATION

2.1. Dimensions and Weight Limitations

2.1.1.Maximum weight and dimensions of robot:

In order for robots to compete in this category;

- Robots must fit comfortably in a 150 x 250 mm box.
- The height of the robots cannot exceed 50 mm.
- There is no weight limit for robots.

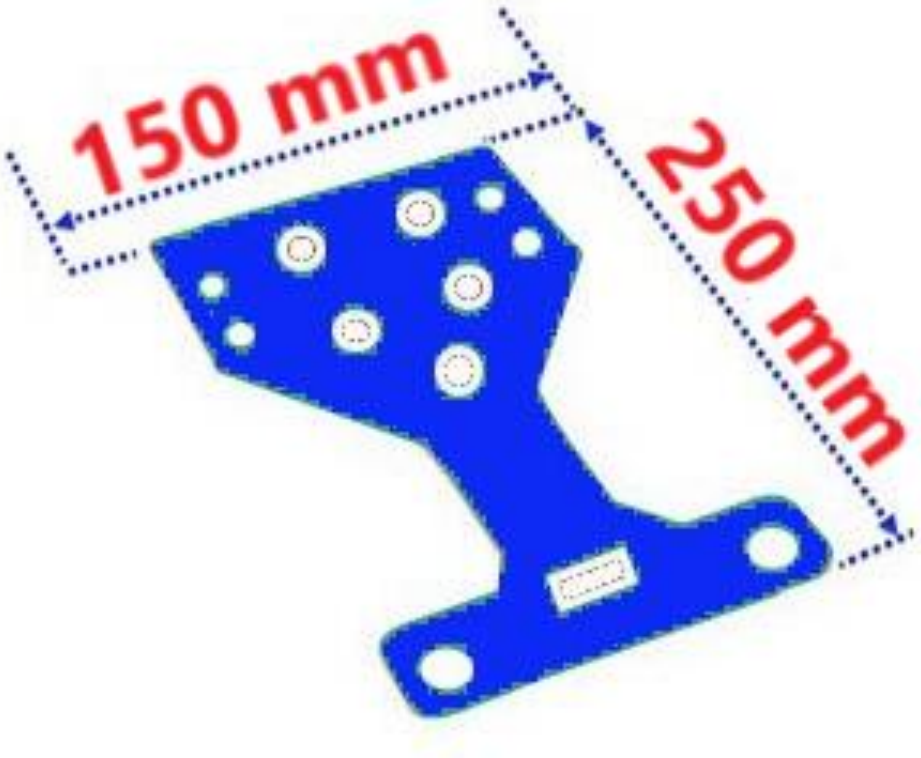

Figure 1 *Robot dimensions*

3. GAME FORMAT AND EVOLUATION

3.1. Application

Competition applications are made according to the process and principles specified in the Application Guide. Robots that meet the conditions specified in the Application Guide will be able to participate in the competitions.

3.1.1.Robot production report

It is the report documenting that the robot to be participated in the competition by the applying student and the counsellor is designed by them and the production process. The report will be uploaded to the system by selecting the relevant robot name from the production reports section under the management menu after entering the username and password information to robot.meb.gov.tr

Report content:

- Materials used in the construction of the robot,
- Explaining the construction process of the robot,
- The language used in programming the robot,
- The total cost of the robot,
- It should include photos of the robot's production stage, its final form, the robot name and the school's logo.

3.2. Racing stages and Evaluation

3.2.1.Racing Stages:

Qualifying Races

- Robots compete in groups of 4.
- Groups and track information are determined by computer draw.
- As a result of the draw, it is determined which robot will compete on which track (1st track, 2nd track, 3rd track, 4th track).
- The competition starts with the opening of the automatic door and ends with the robots crossing the finish line.

- As a result of the ranking competitions, all robots are ranked according to the times they took in the competition and the 64 robots with the best time qualify for the qualifying competitions.

Elimination races

- The 64 robots from the ranking competitions are divided into 4 bags according to the time ranking. Competition groups of 4 are formed with one robot from each bag. Groups and track information are determined by computer.
- Groups compete among themselves. The 1st robot from each group passes to the next round. Time is not taken into consideration.
- After all competitions, 4 more competitions are held among 16 robots who deserve to go to the next round. The first 4 robots in these competitions compete in the final competition.
- As a result of the final competition, the ranking robots are determined.

3.2.2. Evaluation and Scoring

- It is essential to complete the track in competitions.
- In the ranking competition, the times of the robots are recorded. In qualifying competitions, it is essential to finish 1st, time is not taken into consideration.

3.3. Description of Tasks and Success Criteria

- For the start of the competition, the competitors in the group will place their robots on their own track in front of the starting line in working order.
- After the referee's signal, the competitors must place their robot in front of the automatic door within 30 seconds.
- Robots are expected to start and complete the competition on their own track when the automatic door opens after the referee's signal and the competition starts.
- After the referee's signal, the automatic door is opened and the robot starting the race is expected to complete the track within 60 seconds. Over 60 seconds, even if the track is completed, the criterion for moving to the next round is not met.

- During the qualifying competitions, if a robot leaves its own lane and collides with the other robot or robots and throws them off the track, the robot or robots travelling on their own track will compete again. In case of a collision in the qualifying competitions, the decision of the referees will prevail. If the collided robot or robots do not leave the track, they continue to compete.
- There is no break, maintenance or repair time.
- No permanent trace or marking can be left on the road and no damage can be done.
- Robots can use an energy source such as a battery or battery group. Liquid or flammable energy sources cannot be used.
- Competitors can change tyre wheels or batteries on the robots after the first competition. They cannot make any other changes on the robot.
- When electronic circuit elements need to be replaced, the same type of elements can be replaced in the same place.
- During the competitions, objections made due to illuminated marquees, cameras, cameras and lighting around the track will be deemed invalid.

3.4. Disqualifying

- Robots that do not comply with the Fast Line Following Robot size standards are disqualified.
- The robot that leaves the lane and goes out is disqualified. No right to continue.
- The robot of the team that cannot place the robot in front of the automatic door within 30 seconds after the referee's signal is disqualified.
- After the referee signal, the automatic door is opened and the robots that cannot start or pass to the wrong track when the competition starts are disqualified.
- The robot that starts the race by opening the automatic door after the referee signal is disqualified if it cannot complete the track within 60 seconds.
- The robot or robots that complete the competition on the wrong track are disqualified.
- Robots that damage the track and automatic door are disqualified.

- The robot is disqualified in all physical appearance changes such as changing the robot body.
- The robot will be disqualified if the QR code pasted on the registration desk during the competitions is removed, replaced, pasted on removable materials and the QR code is damaged.
- Robots that do not match the competitor robot photos at the referee table are disqualified.
- The QR code must not be damaged during the replacement of the permitted elements. Otherwise, the robot will be disqualified.
- Robots must be wireless and autonomous. Wifi, Bluetooth and RF modules cannot be present on the robot
- The Competition Organising Committee has the right to change the rules when it deems necessary.

3.5. Safety measurements

- The QR code given at the registration desk during the competitions must be affixed to the robot body. It should not be pasted on removable materials.
- The energy sources of the robots must have passed safety tests against short circuit and overheating.
- Sockets and extension cables provided in the competition area should be used carefully, and any danger should be prevented by paying attention to the cable arrangement.

4. COMPETITION AREA

- The roads are in the form of white lines on a black background.
- The competition track consists of an area of 7320 x 10980 mm formed by arranging 12 of 1830x3660 mm chipboards in the form of 3 x 4.
- The competition floor used is made of 1560 mm wide and 5 mm thick black matt decota material. The joints of the parts forming the road were covered with black matt foil. There is no empty space between the decota and chipboard in the starting section.

Except for this section, there is a 200 mm free space between decota and chipboard on the whole track.

- White lines will be made of 20±2 mm thick white matt foil. The distance to be covered for a robot is approximately 34.7 metres.
- There are four lanes with a width of 390 mm that each line following robot can use.
- There are Start and Finish lines on the competition track.
- The start line is 400 mm from the beginning of the track. At the end of this line, there is a 200 mm high white coloured automatic gate.
- The opening mechanism of the automatic door is 10 mm above the ground.
- The finish line will be made of reflective tape directly below the sensor group that will detect the robots.
- The sensor group, which will measure the times of the line following robots, is mounted 200 mm above the competition track for each robot on each track.
- After the reflector under the sensor group, there is a 1780 mm long stopping area made of 5mm thick white decota.
- On the road lines, 300 mm before the start of the bends with a radius of 300 mm; there are marking lines perpendicular to the road line on the left side according to the direction of movement of the robot, 60 mm long and 20±2 mm thick from the centre of the road line.
- Changes can be made in the track dimensions during the construction phase in a way not to disturb the general structure.

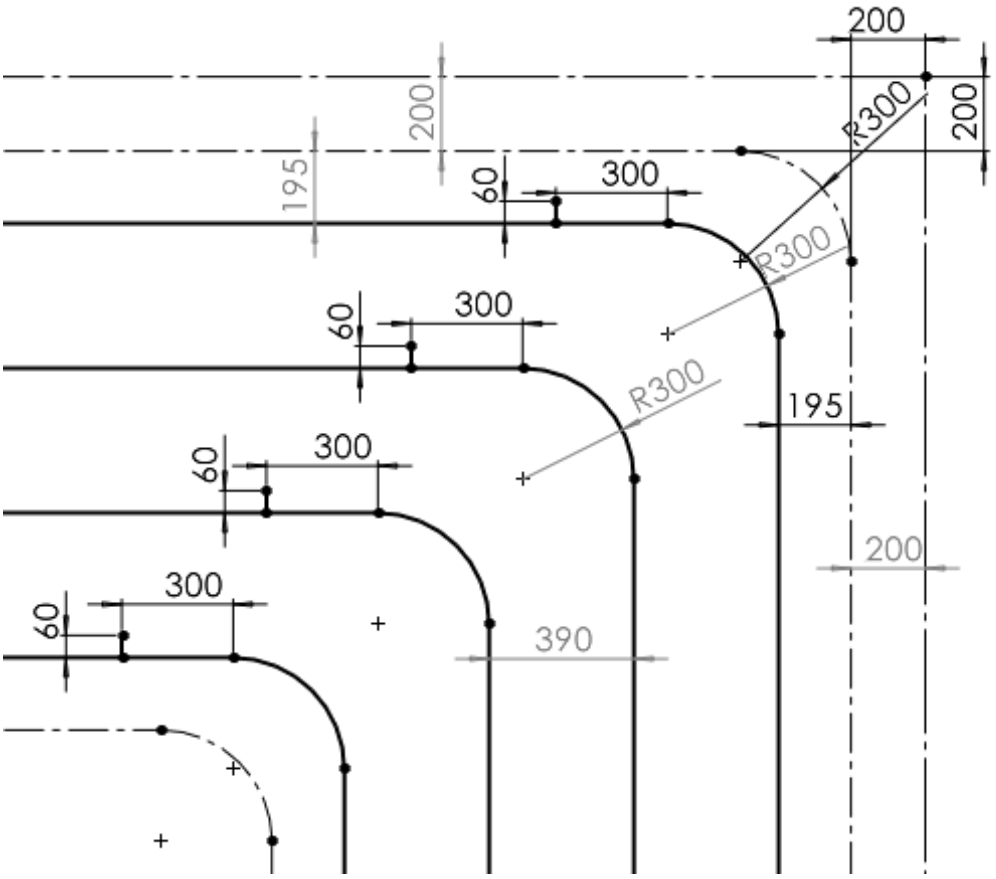

Figure 2 *Distance between lanes and radius dimensions of curves*

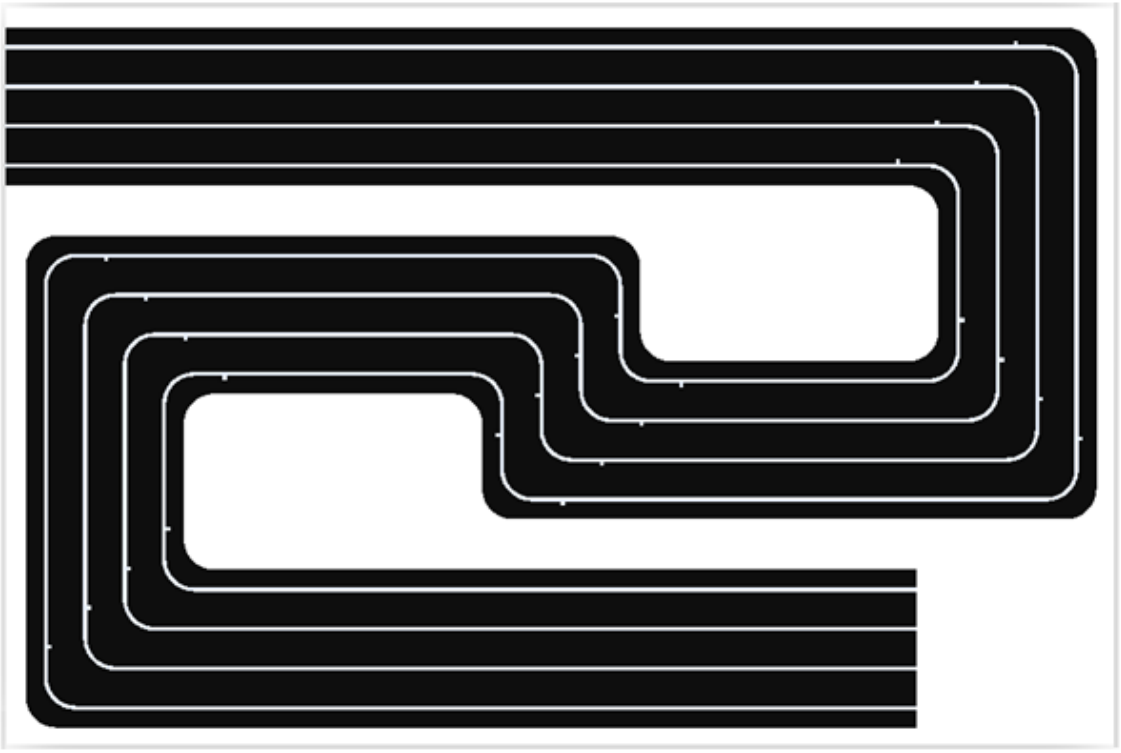

Figure 3 *Top view of runway*

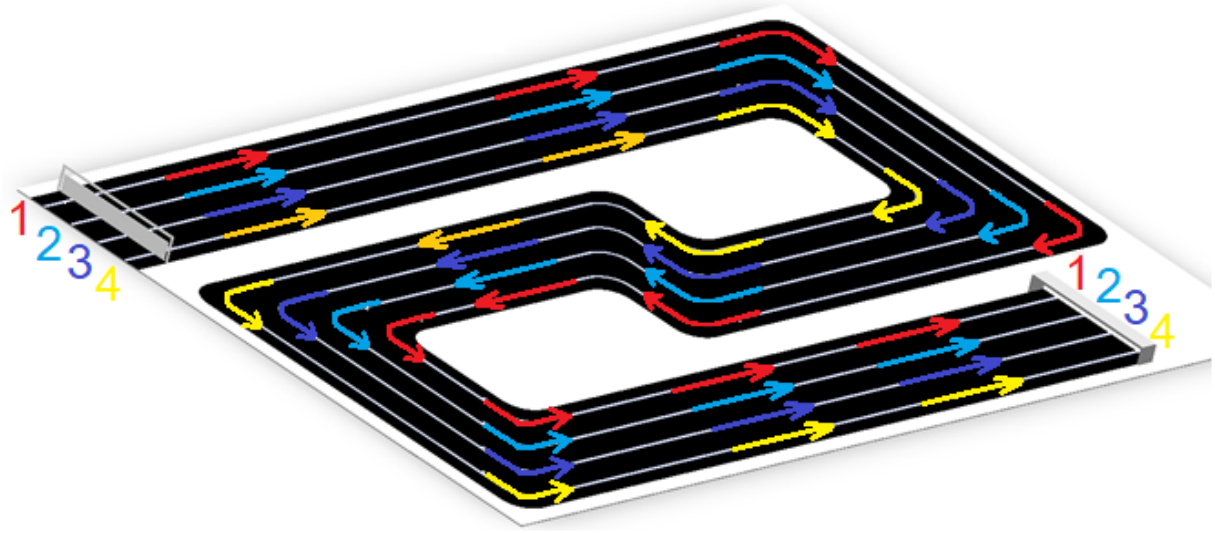

Figure 4 *3D view of runway*

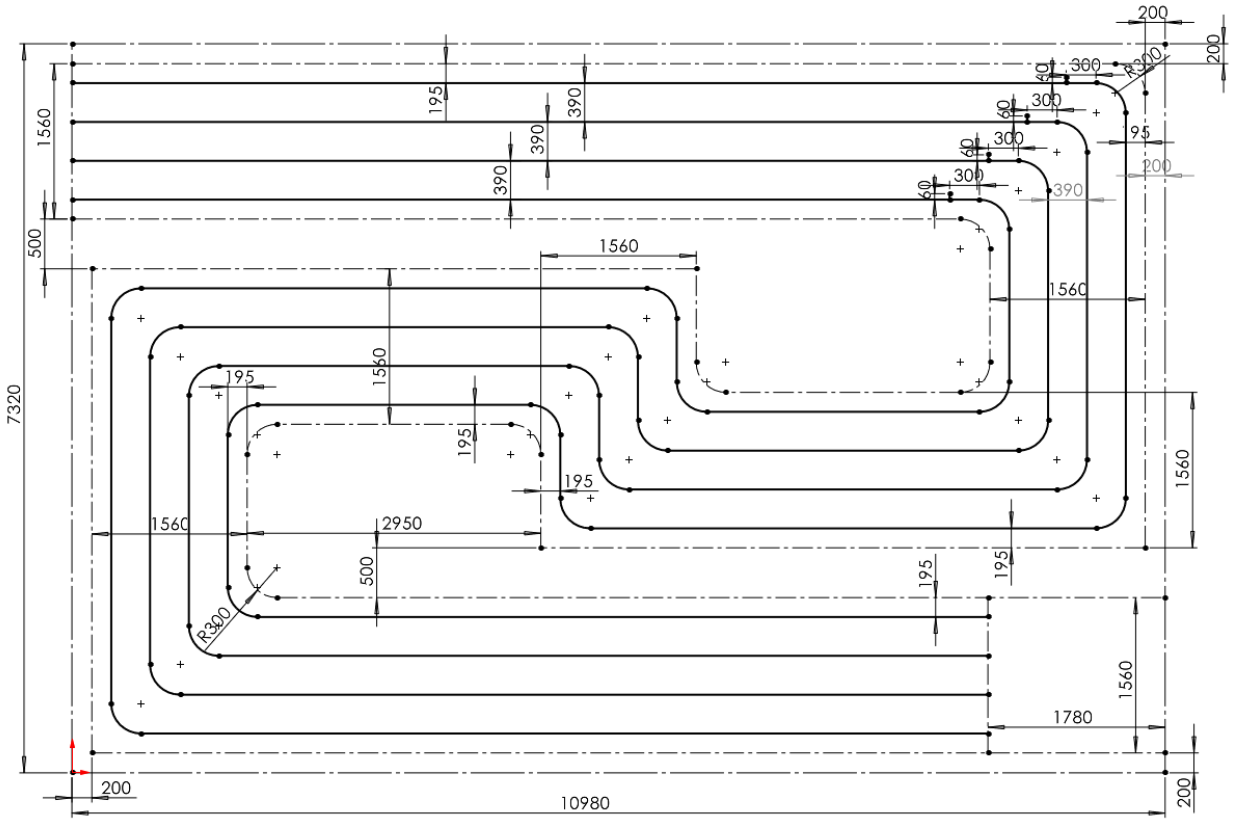

Figure 5 *Runway dimensions*

5. CONTACT

The general rules regarding the competition applications and Line Follower Drag Category are included in the 'Application Guide'. The Application Guide must be read before making an application.

Competitors should ask their questions by selecting their categories from the information menu after logging into the robot.meb.gov.tr system. Questions other than category messages will not be answered and no responsibility will be accepted.