DIRECTORATE GENERAL OF VOCATIONAL AND TECHNICAL EDUCATION

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INTERNATIONAL MEB ROBOT COMPETITION

17. INTERNATIONAL MEB ROBOT CONTEST

LINE FOLLOWER BASIC CATEGORY RULES

2025

Education, Technology, Production from Roots to the Future

CONTENTS

LINE FOLLOWER BASIC CATEGORY RULES

1. INTRODUCTION

Line following robots are designed to autonomously follow a black line on a white background or a white line on a black background. In the industrial field, these autonomous line following robots are used to transport materials or products from one place to another. What needs to be done is to draw the road line that the robots will follow on the ground. The successful completion of the line-following robots depends on appropriate programming, the right hardware and effective speed control.

The aim of autonomous line-following robots in this category is to follow the white lines on the black track or the black lines on the white track and complete the path before the opponent in the shortest time and without error.

2. ROBOT SPECIFICATIONS

2.1 Robot Dimensions

The robots that will compete in the Basic Line Following Robot category must not exceed 220 mm in length, 180 mm in width and 65 mm in height. (including wheels)

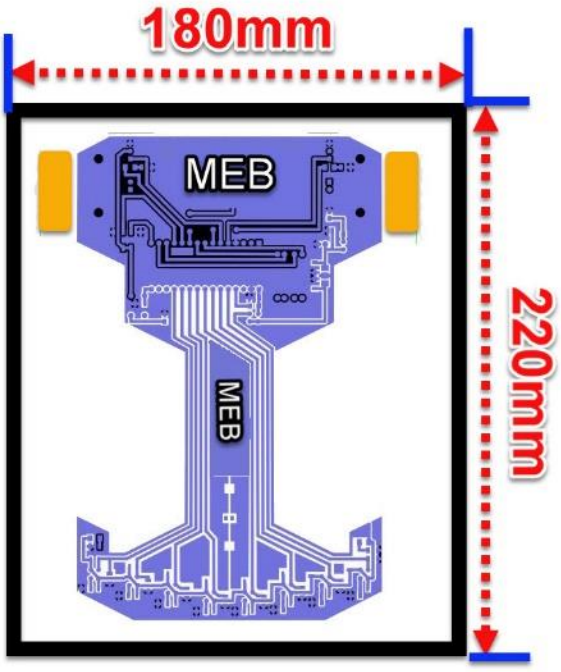


Figure 1. *Robot dimensions*

2.2 Equipments

- ***Control board:*** Any microcontroller or ready-made microcontroller boards (except those with Wifi and Bluetooth) can be used.
- ***Motor driver:*** Commercial Motor Shields (Motor Driver Modules) or motor drivers that you prepare with any electronic component can be used.
- ***DC motor:*** DC Motor with L reducer, 6-12V plastic gears is mandatory.
- ***Wheels:*** Wheels with a diameter not exceeding 65 mm and a thickness not exceeding 30 mm shall be used. Competitors may manufacture the wheels to be used with these specifications or may use ready-made wheels with these specifications.
- ***Sensor array board:*** Analog or digital one with max. 8 sensors can be used.
- Battery box and ball caster can be used if you wish.
- It is obligatory that robots must have 2 motors and 2 wheels.
- Using vacum or fan motor is forbitted.
- The operating voltage of the robots during the competition cannot exceed 16 volt.
- The maximum weight must be no more than 500g including the battery, but a tolerance of 5% in weight is acceptable.
- Batteries must be sealed, fixed, electrolyte type (gel cell, lithium, Lipo, NiCad or dry cells).. Robots can’t use liquid fuel.
- Robots must be wireless and autonomous. Wifi, Bluetooth and RF modules cannot be present on the robot.

3. COMPETITION AREA

- Lines are formed by white color with black ground or vice versa.
- Tracks is made of 5 mm thick black opaque PVC foam material. Joints between parts that made up the track are covered with black opaque foil.
- Lines on the black ground are made by using white opaque foil with 20±2 mm width
- Lines on the white ground are made by using black opaque foil with 20±2 mm width
- There are two bridges which has 1300 slope , 1000mm lenght and 360mm width
- The road on the bridge is covered with white foil and has a black road line 20±2 mm thick

- In the starting section of the road, 300 mm between the beginning of the decota and the starting line.
- There is an automatic door ahead of the starting line. Door opening section shall be white. Door dimensions are given in Figure 8.
- For both robots, there is a tunnel made of transparent mica material on the runway, illuminated with a blue LED strip. Tunnel dimensions are shown at figure 9.
- 10 mm high sensors are used at the edges of the finish line.
- There are two same tracks in the competition area. These tracks will be called 'Track 1' and 'Track 2' (depending on the number of participants, the number of tracks can be reduced to one).

3.1 Runway

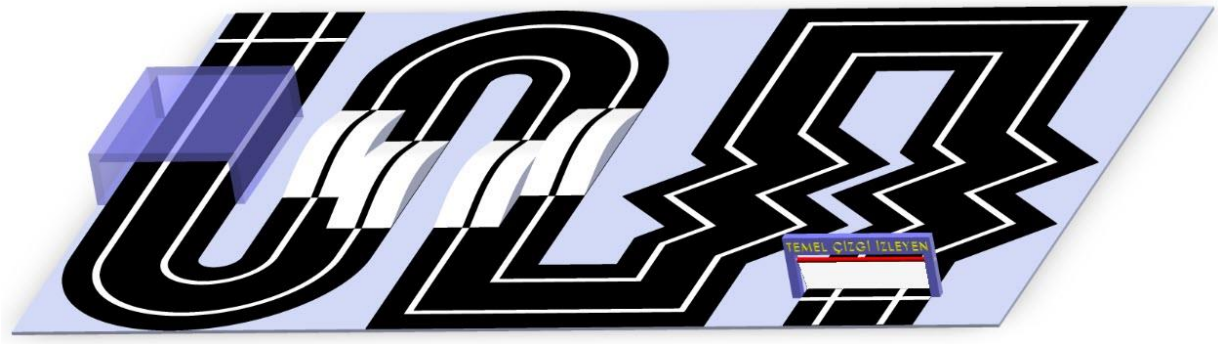


Figure 2. *3D View of Runway*

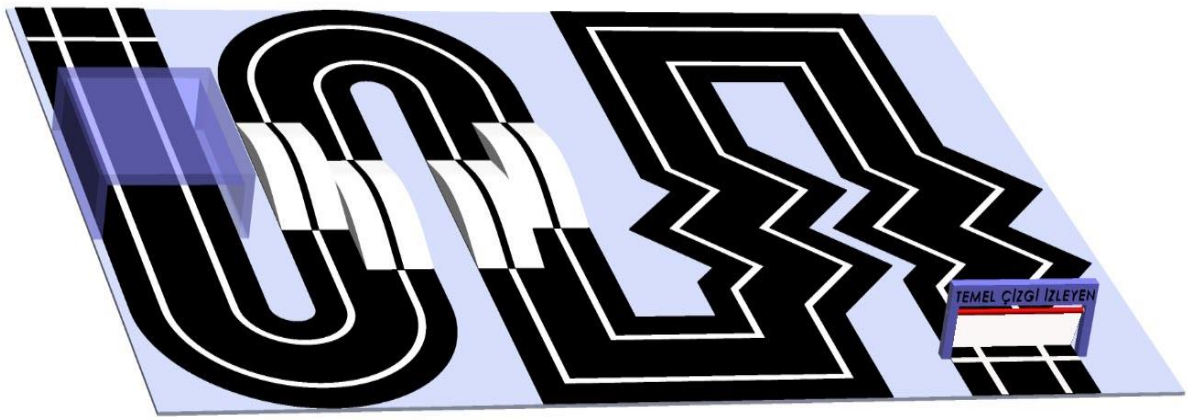


Figure 3. *3D View of Runway*

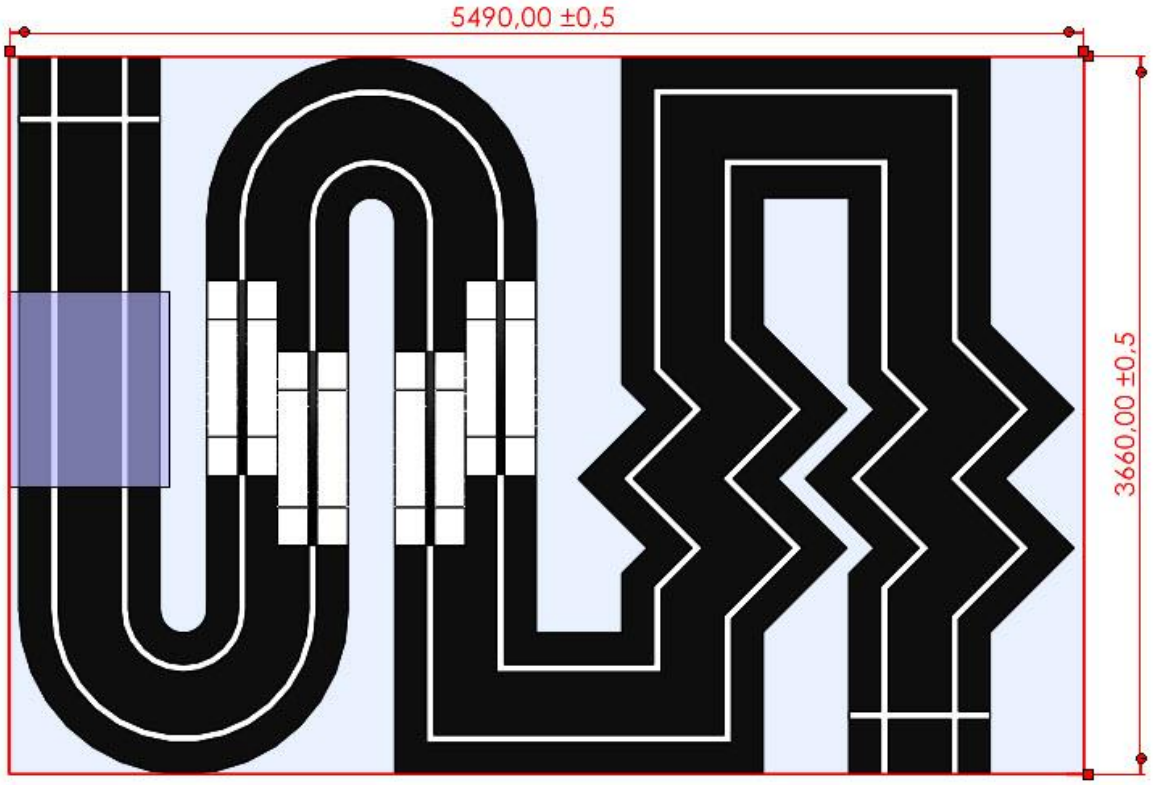


Figure 4. *Runway dimensions*

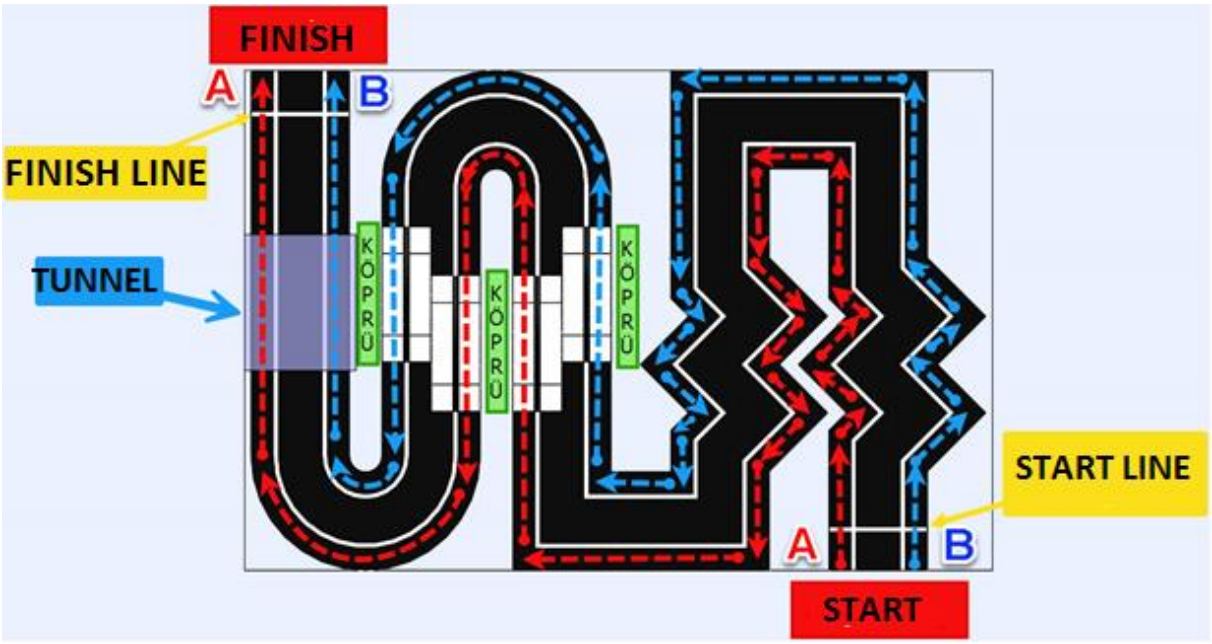
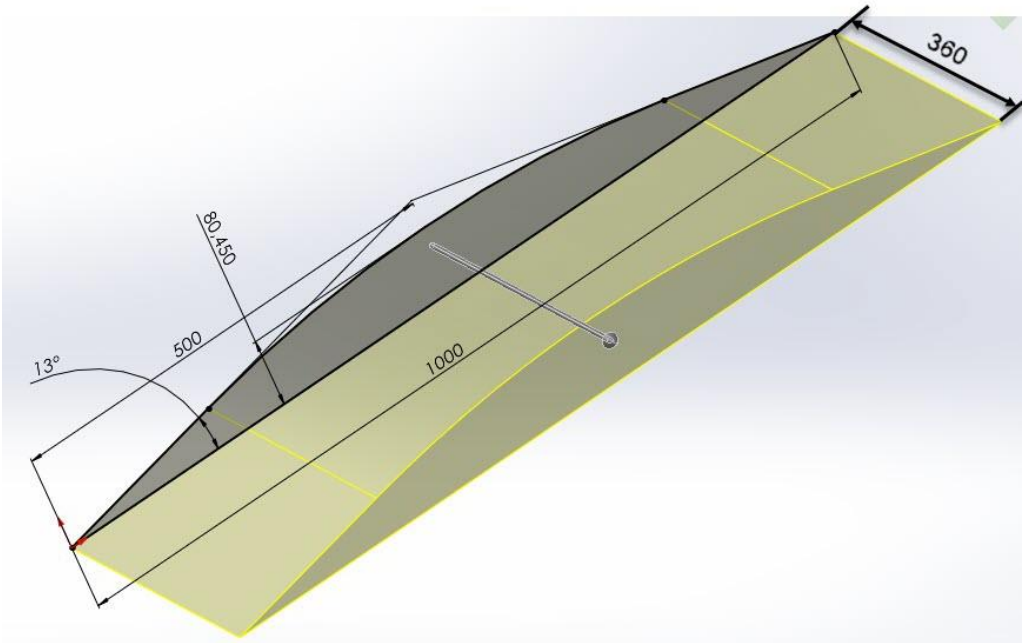


Figure 5. *Robot movement directions*



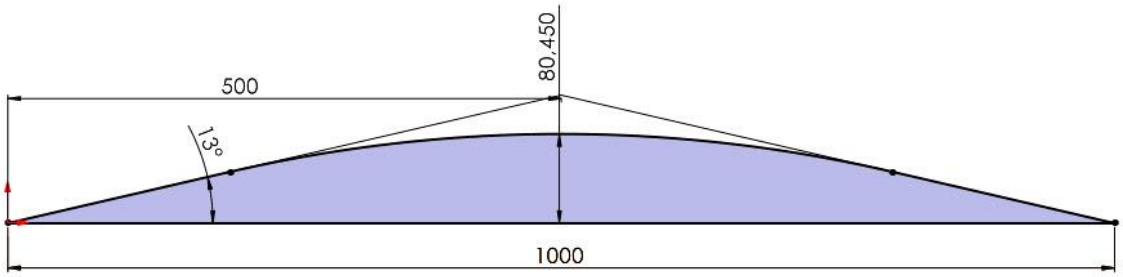


Figure 6. *Bridge*

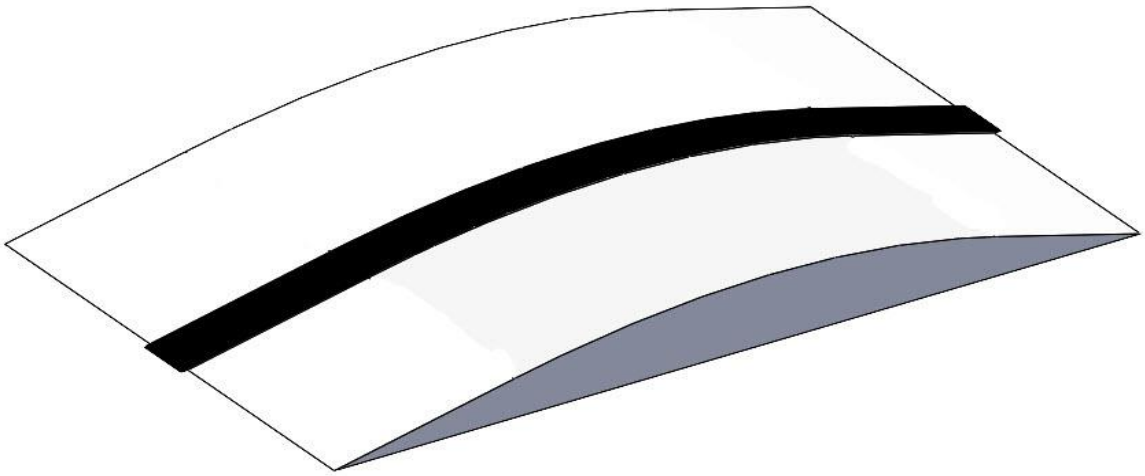


Figure 7. *Bridge 3D view*

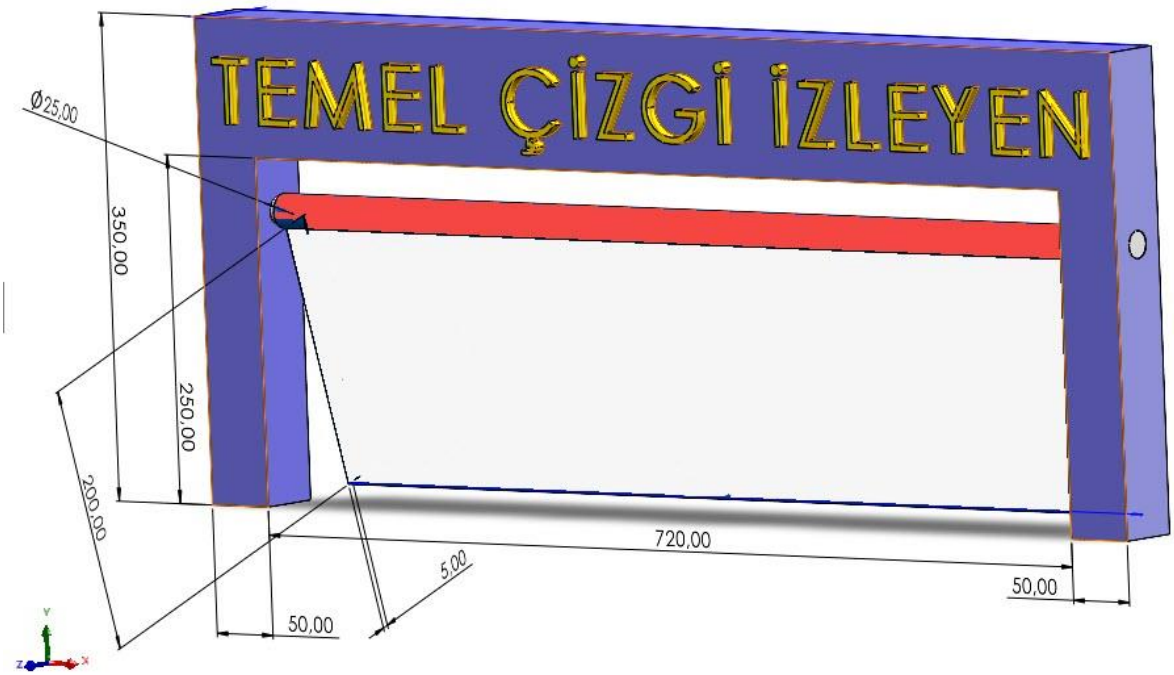


Figure 8. *Automatic gate 3D viw*

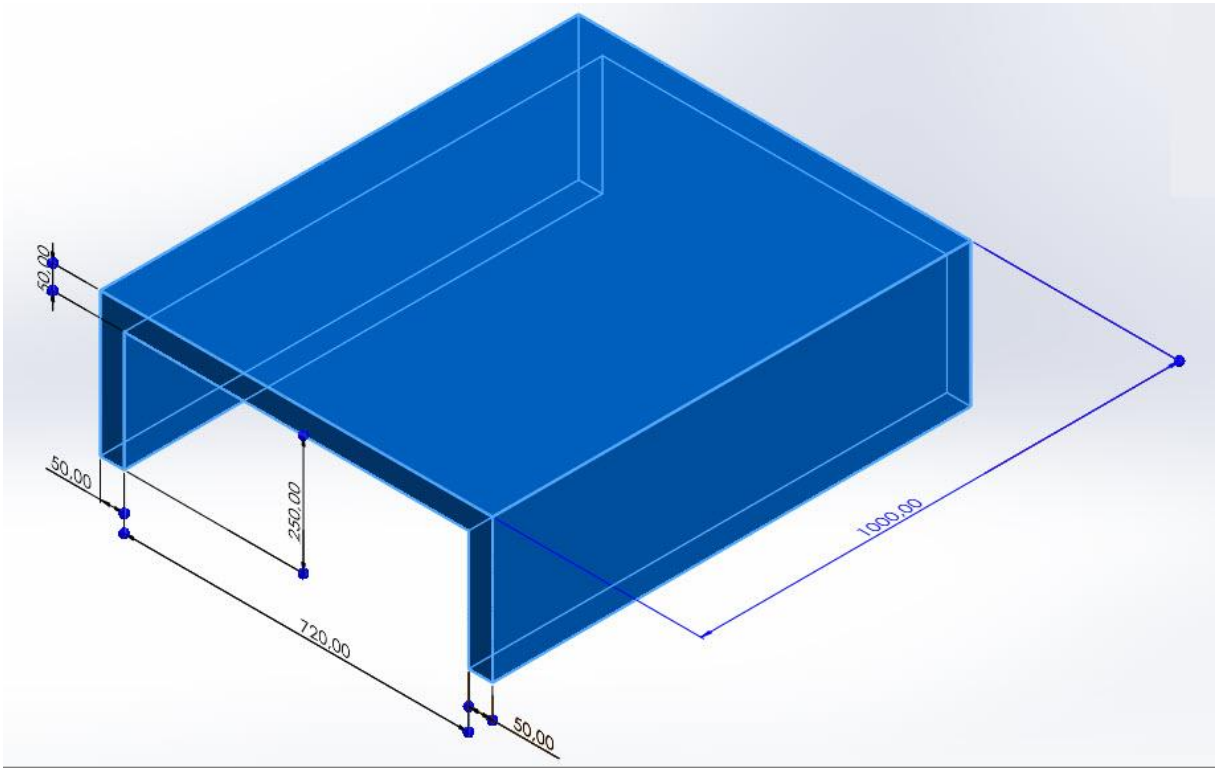


Figure 9. *Transparent Tunnel dimensions and 3D view*

4. GAME FORMAT

The robots that have passed the application stage and whose applications are accepted are competed in ranking rounds by computer draw. After the ranking rounds, the final competitions are continued with the first 64 robots and the top three robots are determined.

4.1 How to apply to the competitions:

- For the Line-Following Robot (Basic Level) Category, a production report will be required for robots applying to the competition via https://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,
  - Total cost of the robot,
  - It should include photographs showing the production and preparation stages of the robot, including the robot name and the logo of the organisation.

- The applications of the competitors who do not send the detailed report until the date specified in the application guide will not be accepted.
- The list of Basic Line Tracing Robots whose applications are accepted will be announced in the announcements section of https://robot.meb.gov.tr/

4.2 Qualifying races

1. In ranking competitions, each robot competes in pairs. Which track the robots will compete on is determined by computer draw (1st track A road-B road or 2nd track A road-B road).
2. Before the robots start the competition, their dimensions are tested in the test box. (The dimensions of the test box are 220 x 180 x 65 mm)
3. The weight of the robots passing the test box is measured. It is recorded by the judges. Weight measurement includes battery. If otherwise, the robot is disqualified

4. Robots take 1 lap on the track at the same time. The times of the robots that complete the track by following the line are recorded.
5. The time of the robots to finish the competition will be kept by the stopwatch on the track.
6. As soon as the door at the starting line is opened, the stopwatch will start counting. When the robots complete the track and pass the sensor on the finish line, the stopwatches will stop counting and end the competition.
7. A 10 second penalty point is given to the robot that cannot start after the door is opened. Competitors are entitled to 2 non-starts

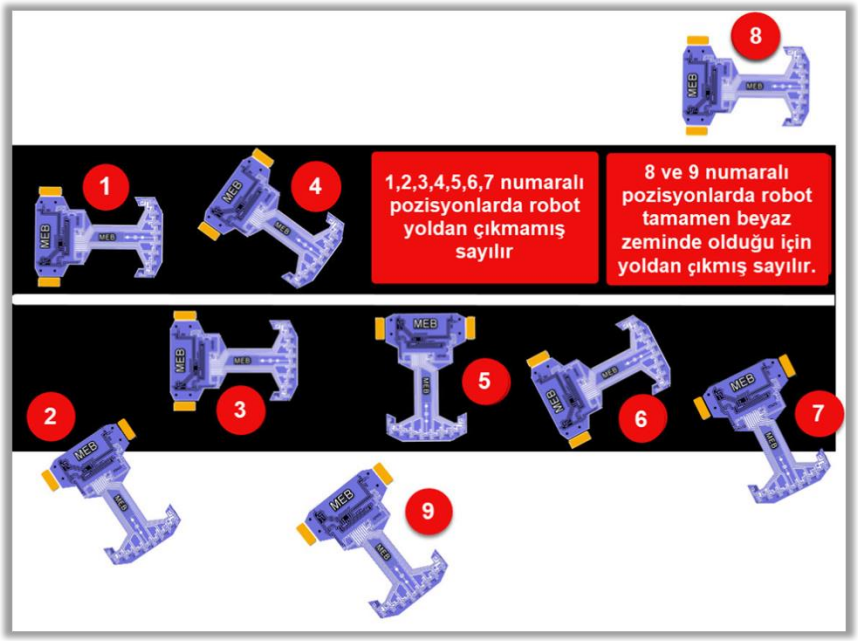


Figure 10: *Robot positions on the line*

8. It is compulsory for the robots to move on the track in the direction of movement indicated in Figure 5.
9. It is essential that the robots follow the line. The robot leaving the track means that the robot body leaves the black road and goes completely on the white ground. During the movement of the robot, if any part of the robot is on the black road, the robot continues the competition.
10. In case the robot goes off the road (the body of the robot is completely on the white ground from the black road), the robot is placed behind the starting line and the competition continues. 10 seconds off the road penalty is given. This situation is

applied to a competitor once. In case of going off the road for the second time, the robot is deemed not to have completed the track and is disqualified.

11. Competitor robots must pass the zigzag sections on the track by following the line. If the robot passes these sections directly without following the line, a penalty of 10 seconds is added to the competition time.
12. If the robot goes off the track for the second time (with the decision of the referee), the competition ends. The other robot is expected to complete the track and the finishing time is recorded.
13. During the competition, 30 seconds waiting time is given for robots that pause on the white or black line in any part of the track. Robots that continue to remain stationary are disqualified. It is forbidden for the competitor to intervene in cases where the robot remains immobilised.
14. The ranking times of the robots are obtained by adding the penalty times to the finishing times of the competition
15. Total time = [(Stopwatch time + sum of penalty times)].
16. At the end of the first competitions, a ranking is made by taking into account the total times obtained by the robots completing the track. The competitors among the first 64 robots in this ranking are eligible to participate in the final competitions.
17. Robots that leave their own track area during the competitions and enter the opponent's track area are disqualified.
18. During the competitions, the robot that leaves its own track area and enters the opponent's track area and hits the other robot is disqualified. It is restarted again to determine the time of the other robot.
19. In case of equality of the total time of the robots; the weight of the robots is checked, the lighter robot is considered the winner.
20. If the equality is not broken in the above cases, the total age of the competing students is taken into consideration. The robot of the team with the younger age total takes priority in the ranking.
21. The robots in the final compete in two heats.
22. In the final competitions, the rules of derailment in the qualifying round apply.

4.3 Final races

1. ***Start:*** Starting with 64 robots, the robots are paired two by two in each round. The pairing is made as 1st robot and 64th robot, 2nd robot and 63rd robot.
2. ***First Elimination:*** 64 robots compete in pairs and 32 robots advance to the next round.
3. ***Second Elimination:*** 32 robots compete again by pairing randomly in pairs and 16 robots advance to the next round. (If 32 robots cannot reach the second elimination round in the first elimination, the number is completed to 32 robots with the robots with the best time from the eliminated robots).
4. ***Third Elimination:*** 16 robots compete again by being randomly paired in pairs and 8 robots advance to the next round. (if 16 robots cannot reach the third elimination round in the second elimination, the number is completed to 16 robots with the robots with the best time from the eliminated robots).
5. ***Fourth Elimination:*** 8 robots compete again by randomly pairing in pairs and 4 robots advance to the next round. (if 8 robots cannot reach the fourth elimination round in the third elimination, the number is completed to 8 robots with the robots with the best time from the eliminated robots).
6. ***Fifth Elimination:*** 4 robots compete again by randomly pairing in pairs and 2 robots advance to the final competition. (If 4 robots cannot reach the fifth elimination round in the fourth elimination, the number is completed to 4 robots with the robots with the best time from the eliminated robots).
7. ***Third place:*** In the fifth elimination round, the third place competition is held between the robots that cannot advance to the upper round (cannot qualify for the final).
8. ***Final:*** The 2 finalists meet in the grand final. First and second are determined.

4.4 Other Rules

1. No break, maintenance or repair time is allowed.
2. No permanent mark or marking may be left on the track or damaged. Robots that damage the track are disqualified.
3. Robots can use an energy source such as a battery or battery group. They cannot use liquid, flammable energy sources.

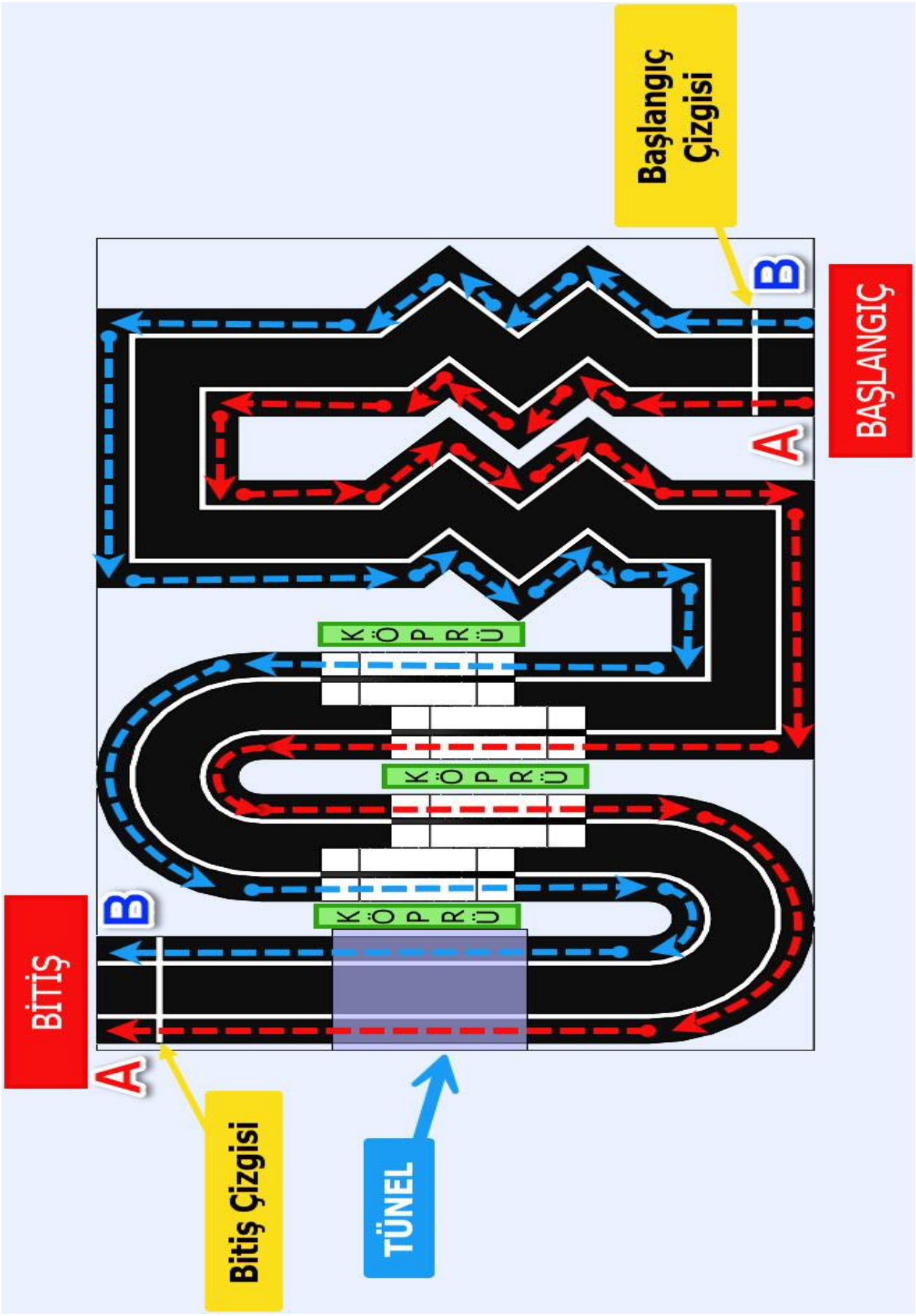
4. During the competitions, they cannot make any changes on the robots other than changing the tyre wheels and batteries. In all physical changes such as changing the robot body, the robot is disqualified.
5. During the competitions, the robot will be disqualified if the square code affixed on the registration desk is removed, replaced and the square code is damaged.
6. Robots that do not match the competitor robot photos registered in the system at the referee table are disqualified.
7. When electronic elements need to be replaced, the same type of elements can be replaced in the same place. The QR code must not be damaged during the replacement of the elements. Otherwise, the robot is disqualified.
8. The QR code must be affixed to the robot body. It should not be pasted on removable materials. In such cases, the referee disqualifies the robot in case of a problem with the robot.
9. There may be changes in the dimensions of the tracks during the construction phase without disturbing the general structure.
10. During the competitions, objections made due to illuminated signs, cameras and lighting around the track will be deemed invalid.
11. The Competition Organising Committee has the right to change the rules when it deems necessary so as not to disrupt the integrity of the competition

5. WARNINGS

- Only lower secondary school students can apply to this category.
- The general rules regarding the competition applications and the Line Tracing (Basic Level) category are included in the 'Application Guide'. The Application Guide must be read before making an application.

6. CONTACT

Competitors are required to 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. The responsibility in this regard belongs to the competitor.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