

ISTANBUL TECHNICAL UNIVERSITY ROBOT OLYMPICS 2019

LINE FOOTBALL CATEGORY RULES

Definition of the task:

- In this category, robots try to cross the obstacles by dribbling and to shoot the ball like a football practice.

Success Criterion:

- In this category, success criterion is to finish the competition without reaching the penalty limit and to shoot the ball at least three times.

Robot Features:

- Robots must be 25 cm in width, 40 cm in length and 25 cm in height in maximum.
- There is no restriction for the weight of the robots.
- Robots must be autonomus.

Track Specifications:

1. The track is made of white dakota.
2. The road that the robot should follow is composed of black lines on a white background or white lines on a black background. The robot does not need to follow the line, what matters is not to go beyond the gray dotted border lines on the edge of the road.
3. There are gray dotted border lines at the right and left 80 mm from the line on track being followed. Thickness of a line is 18 mm.
4. At the entrance of the task field, there are thick lines vertical to the road being followed. Thus, before dribbling and shooting tasks, robots will be able to understand which task is about the begin by sensing these thick lines and their sensors will be focused on the given task.
5. After passing through the first thick line the robot must carry out the dribbling task and after passing through the second one it must carry out the shooting task.
6. When the robot is performing the dribbling task, there will be a dead end with an obstacle. The robot must perceive this obstacle and continue in the other direction .
7. In the shooting zone, there is a goal which is 150 cm in width and 25 cm in height. There is a distance of 40 cm between the shooting zone and the goal.

8. Right in the middle of the goal, there is a goalkeeper which is 10 cm in width and 10 cm in height. There is a distance of 70 cm between the goalkeeper and goalposts at the right and left. The aim of the goalkeeper is to save the robot's third shot.
9. The ball that robots dribble has a diameter of 6,68 cm.
10. The ball that robots shoot has a diameter of 4 cm and its weight is 2-3 grams.
11. It is forbidden to step on the track outside of the marked areas.
12. The margin of error with the size of the balls is $\pm 5\%$.

Competition:

1. Each robot competes in turn.
2. Incoming competitors take their robots from the referee table and put them behind the starting line.
3. Competitors can put their robots anywhere behind the checkpoint at the starting line. Robots are allowed to start anytime they want, after the referee commands. After passing through the checkpoint at the starting line, the time of the robot starts.
4. The road on the shooting zone will be split into 5 sideways. Each sideways forms a straight line to a goal on the track. Robots will carry out their shooting task in this zone.
5. After passing through the first thick line, the robot must carry out the dribbling task and after passing through the second one it must carry out the shooting task.
6. After the first thick line, there will be one ball on the line road. The robot will detect this ball and move along the line, driving it without losing ground contact and rolling characteristics. After the ball has started to move, the robot will turn to the first crossroads that will appear and leave the ball in the ball drop area at the end of this road. It will then return to the main road and continue his journey in the direction he came from.
7. The duration of the ball will be calculated separately and will start from the moment the robot starts to drive.
8. The road will be divided into 5 side roads in the shooting task area. These sideways will end up aligned with a goal in any part of the track. The robots will perform shooting missions in this area.

Shooting Task:

1. The ball to be shot will be on the floor. Robots should approach the ball and hit.
2. Robots can hit the ball using their own body and speed. Apart from that, the robots can also hit by using another stroke system.

3. The goal will be large enough for entrance of the ball. The ball has to cross the goal line. Strikes will not be accepted as a result of the ball doesn't pass the goal line.
4. The vertical distance between the ball and the goal line shall be 40 cm.
5. The ball will not be included in the ball scoring if the result does not exceed the goal line.
6. The stroke angle of the ball will be the same as the line road. So robots do not need to aim at the ball.
7. There will be a goalkeeper in the middle of the goal. The goalkeeper is at a standstill and is 70 Cm away from the poles at the level of the goal line. When the ball is knocked flat except for the third stroke, the goalkeeper will not be able to prevent the ball from being the goal.
8. The robot, who strikes the first side-road, returns to the main road and will hit the 2nd, 3rd, 4th and 5th side roads in the direction he came from and will also hit in these places.

Scoring:

1. The ranking is made towards the robot with the highest score from the robot with the lowest score. Low score robots stands at the top.
2. $\text{Score} = \text{duration} + (\text{time} * 0.50 * \text{penalty number}) - (\text{time of the ball} * 1.50) - (\text{number of balls passing the goal line} * 3)$.
3. Points received may be less than 0.
4. In the event of a dribbling, the robot intervenes and puts the robot 10 cm behind the start of the dribble. The robot does not continue to dribble, it receives a penalty and the dribbling time is not included in the scoring.
5. If the robot misses one of the side-ways he must shoot, he will be penalized 15 points.
6. Robots are entitled to a total of 4 penalties. If the penalty limit is exceeded, the robot is not included in the ranking.
7. The robots must be able to perform at least 3 shots. Robots that don't realize this are not included in the ranking.
8. The robot is penalized for more than 5 seconds anywhere except the place where the robot must move the ball and hit the ball.
9. If the entire robot goes beyond the boundary lines, the robot gets punished.
10. If the entire robot goes out of line except for dribbling and kicking, the competitor intervenes and puts it back on the runway approximately 10 cm before the last successful checkpoint. Robot takes the number of penalties up to his mistake.

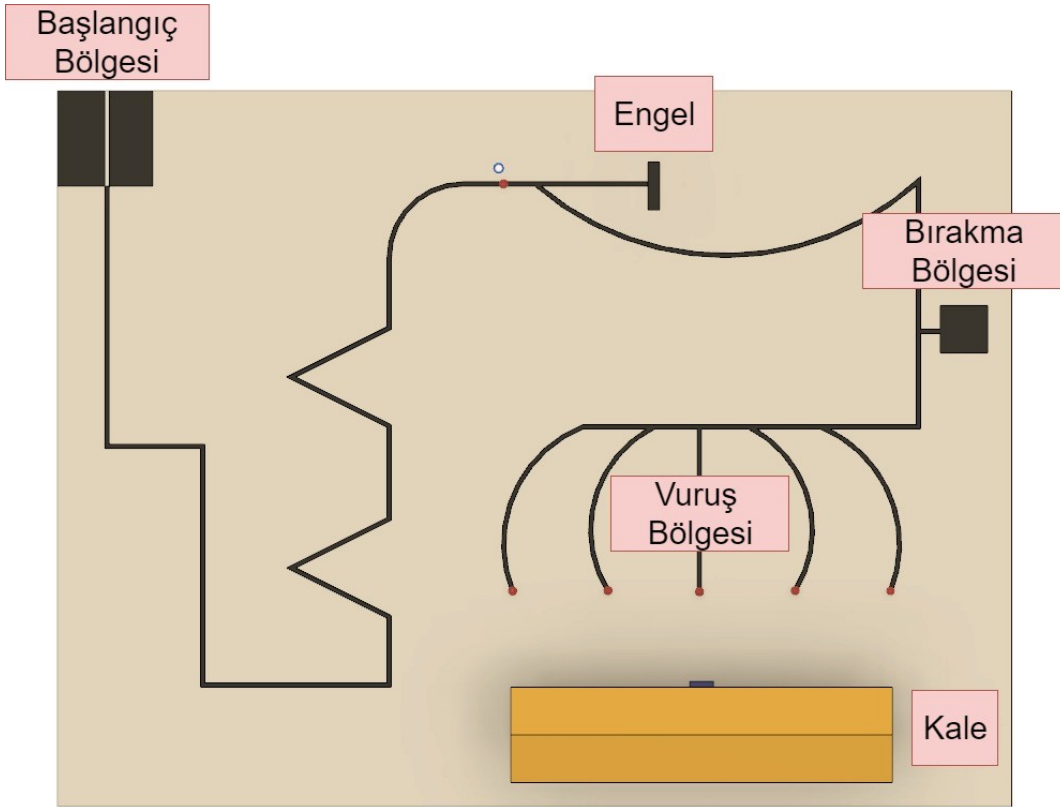


Figure 1 - Top view of the track and area names

Başlangıç bölgesi = Starting area

Engel = barrier

Bırakma Bölgesi = Leaving area

Vuruş bölgesi = Shooting area

Kale = Goal

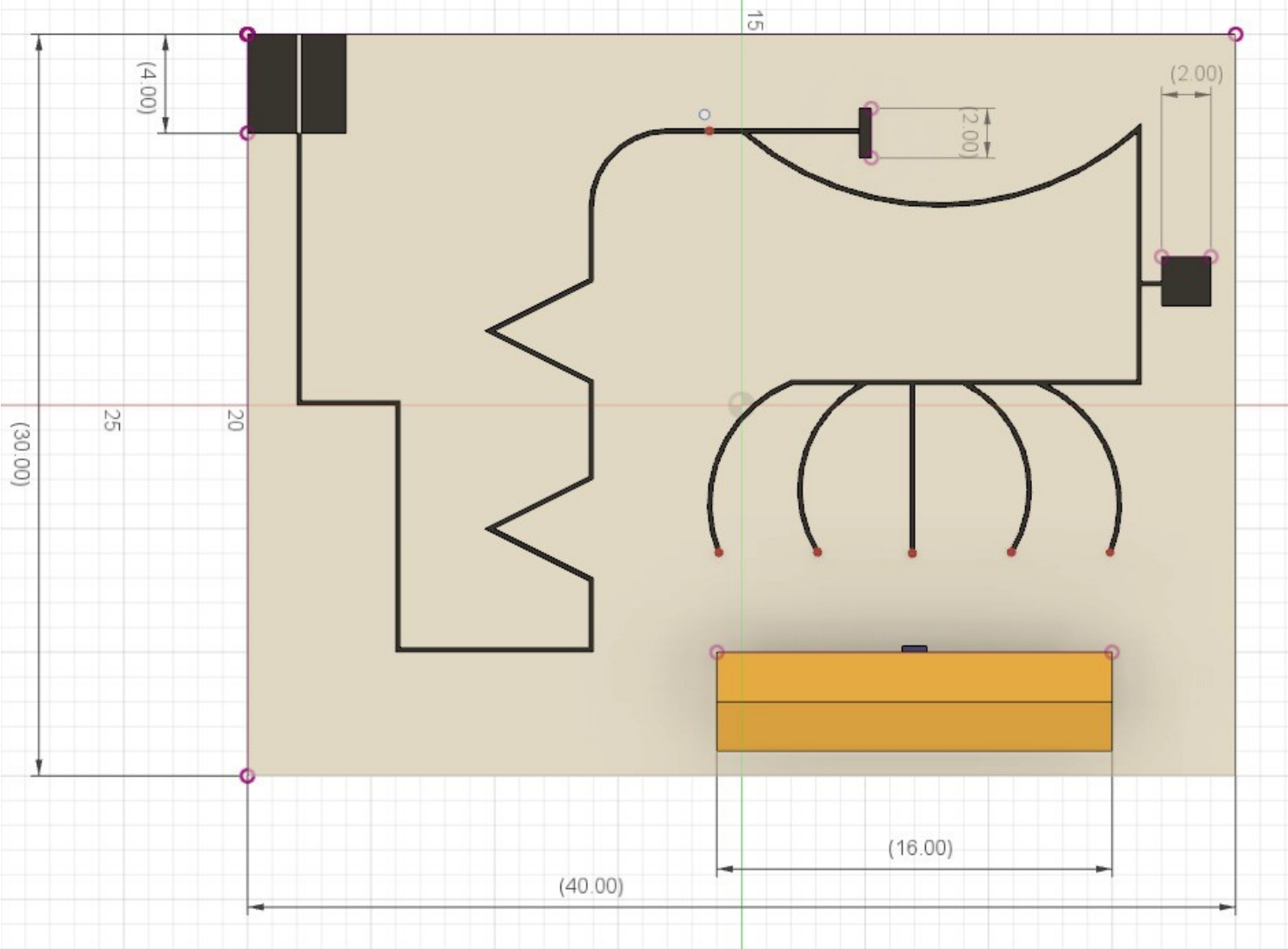


Figure 2 - Figure 2 - Top view of the track and the dimensions of the areas (the scale is 1:10 cm.)

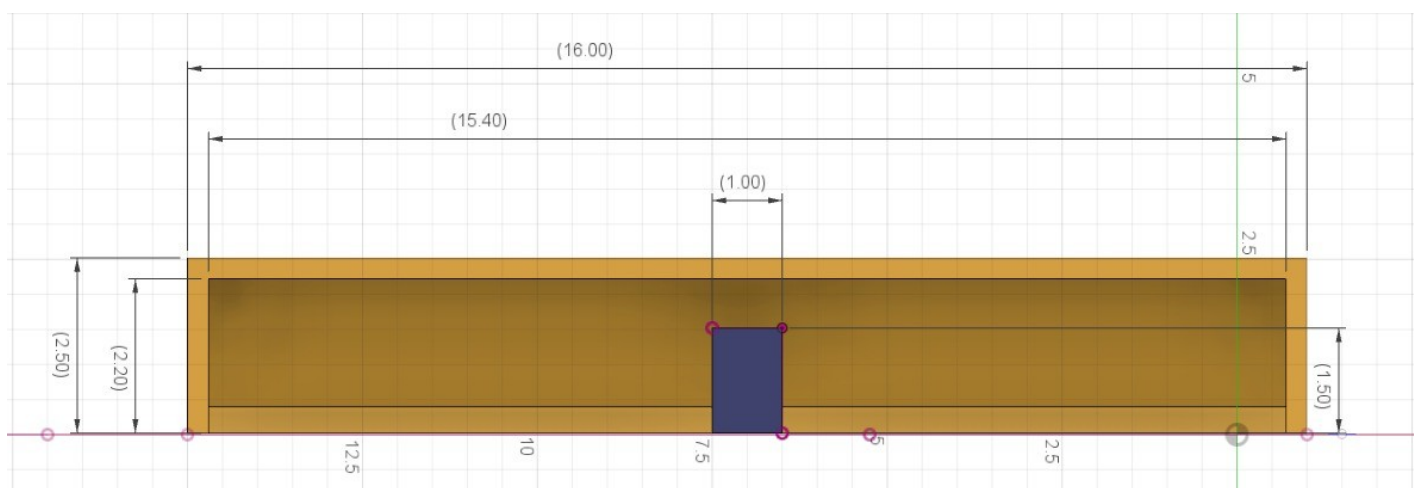


Figure 3 - Front view of the goal and measures (the scale is 1:10 cm.)