

## REGULATIONS «ENHANCED LINE FOLLOWING»

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## 1 Introduction

The aim of the competition is to drive through the track as fast as possible, while precisely following the track line from the beginning to the end.

## 2 The Field

1. The field consists of white synthetic sheets with an area of 3 to 10 cm<sup>2</sup>.
2. The 15mm wide line, or track, has been printed on the field with black ink or marked with a black tape.
3. The track may be either closed or open. The start and finish lines may cross each other or be in different locations.
4. The track may have one or more turns, or curves with up to a 90-degree angle (inclusive).
5. The minimum turning radius of the line is 0.
6. The line is surrounded by 25 cm of free space on both sides, except on cross-sections.
7. The lines on the cross-section are perpendicular at least to the extent of 20 cm.
8. The field is composed of two adjacent tracks which have their ends connected to each other.
9. The start and finish lines are separately marked on the field.

## 3 The Robot

1. The robot must be autonomous.
2. The maximum dimensions of the robot are 30 x 30 x 30 cm and its mass is 3 kg. NB! LEGO robot measure box will be 30 x 30 x 30 cm with +2 mm tolerance.
3. The robot must always cover the line once it follows it, otherwise the race is considered to be failed.
4. The robot must not damage the field or endanger the spectators in any way.
5. It is forbidden to use higher voltage than 24 V in the robot.
6. The robot must have a start and stop button.
7. The body of the robot must entirely block the light beam of the time measuring system with a diameter of 3 mm at the height of 3 cm.
8. The robot must have a start and stop button or a remote control.

## **4 The Competition**

1. The robots compete against the clock on the track.
2. An optical time measuring system measures the start and finish times at the start and finish lines.
3. The competition queue will be either drawn by lots or determined according to the order of registration.
4. One robot is competing in one round.
5. There are two attempts in one round that must be carried out within the prescribed period.
6. The time of the fastest attempt will be recorded as passed.
7. A robot, who achieves the best trial time, wins the competition.
8. Robots must start the attempt when the referee gives the signal.
9. Maximum lap time is 3 minutes. If the robot exceeds this time, the trial time will be not fixed.
10. If all robots fail to reach the finish in three minutes, then the winner of the trial will be the robot who is the closest to it.
11. It is allowed to have up to five members in a team.
12. The robot is not allowed to drive off the track; if it does, it will be disqualified. No part of the robot may exceed the limits of the field.
13. The competition is organized for the ARDUINO, LEGO® MINDSTORMS, ENGINO platforms.

## 5 Obstacles

### 5.1 Line break

There are line breaks on track sections (see Figure 1) with a maximum length of 10 cm. Before the curve, there is at least 10 cm long and uninterrupted section of the track line. Line breaks may occur sequentially, but between two line breaks, there is at least 2 cm long track line.



Figure 1: Line break

### 5.2 Wall or obstacle on the line

There are cuboid shaped obstacles on the track, or walls (see Figure 2) with maximum dimensions of 25 x 15 x 10 cm. The task of the robot is to drive around the obstacle and continue with line following. It is allowed to hit the obstacle, but it is not recommended in terms of the safety of the robot. The obstacle is not white and can be made of any material. After the obstacle, there is at least 20 cm long and uninterrupted section of the track line and the robot must follow the line while being on that track.

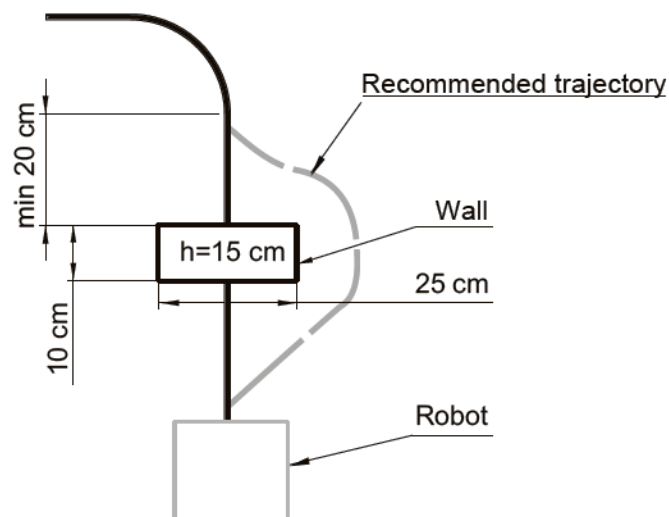
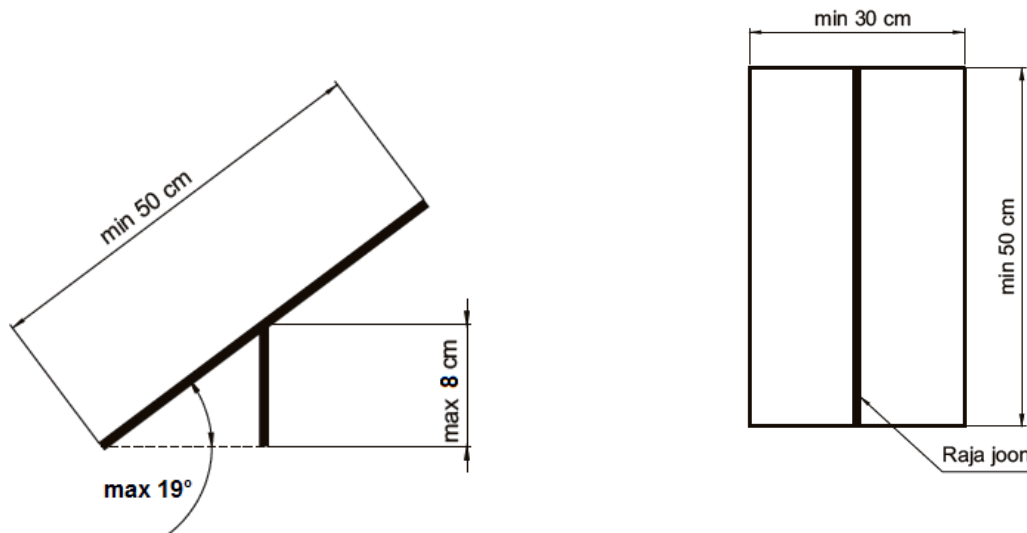


Figure 1: Wall

### 5.3 Swing

There is a swing on the field (see Figure 3). The task of the robot is to cross the swing and continue following the line. The robot is not allowed to drive around the swing. The length of the swing is at least 50 cm. The width of the swing is at least 30 cm. The fulcrum of the swing is positioned no more than 8 cm above the surface of the field. Standard track line will continue on the swing. After the swing, there is at least 20 cm of straight line.



**Figure 3: Swing**

### 5.4 Mountain

From the side view, the mountain is an isosceles triangle and from the top view, a rectangular shaped static obstacle on the track (see Figure 4). Its height is a maximum of 15 cm and the arm of the triangle is at least 30 cm. The width of the mountain is at least 30 cm. The task of the robot is to drive/jump over the mountain and continue following the line. The robot is not allowed to drive around the mountain. Standard track line will continue on the mountain. After the mountain, there is at least 20 cm of straight line.

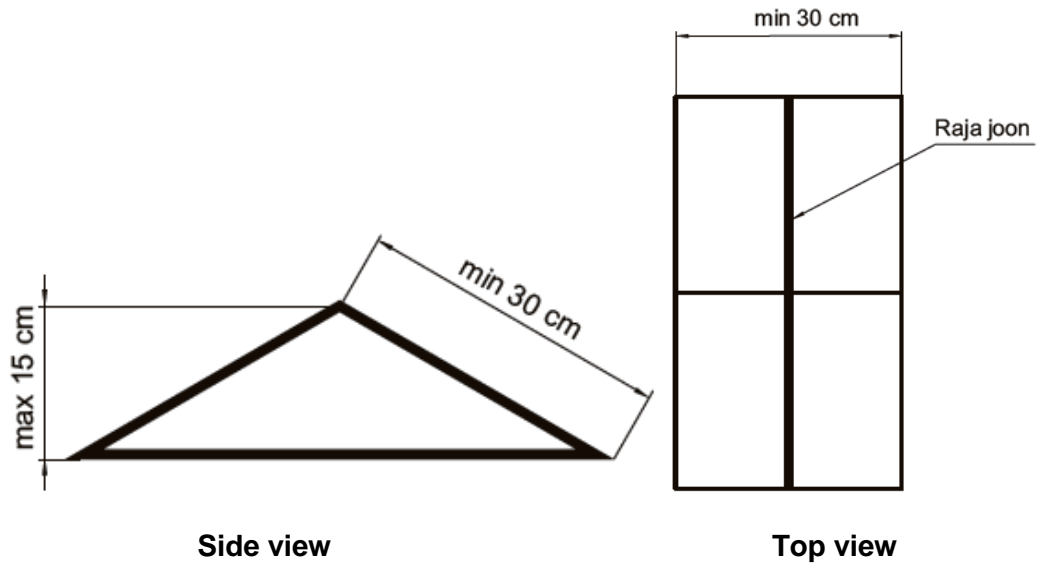


Figure 4: Mountain

#### 5.4.1 Expansion/constriction of the line

There are places on the sections of the track, where regular 15 mm line expands or constricts at a right angle. The width of the line may vary in the range of 5–30 mm. Expansion or constriction occurs on the track section with a length of 10–50 cm, where there are no other obstacles or curves at the same time. The length of the expanded or constricted line is at least 10 cm.

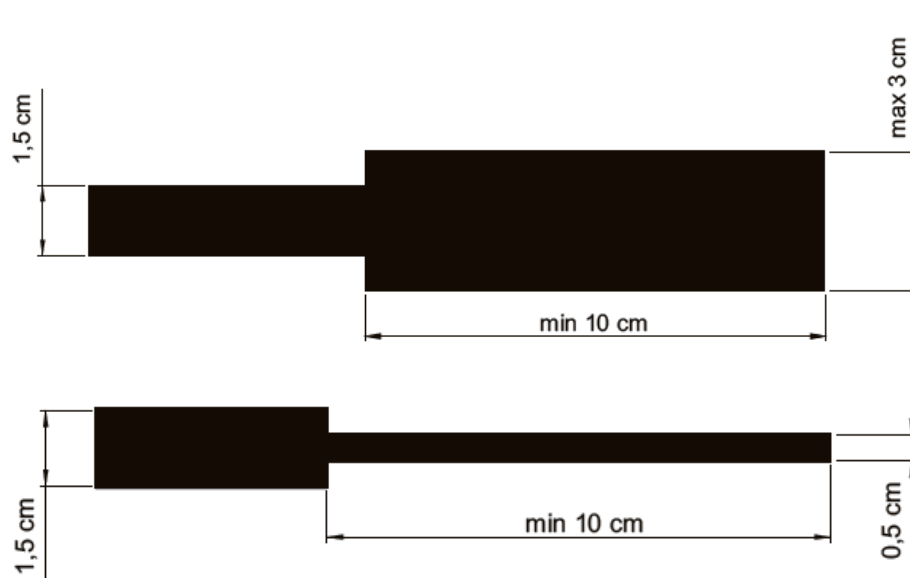


Figure 5: Expansion/constriction of the line

### 5.4.2 Track knot or loop

The loop is a circle with a radius of up to 30 cm, which has been horizontally placed onto the track line. The contestant must fully drive through the loop and once it gets out of the loop, it must continue with line following. The loop may be passed a maximum of three times, otherwise the robot loses the attempt.

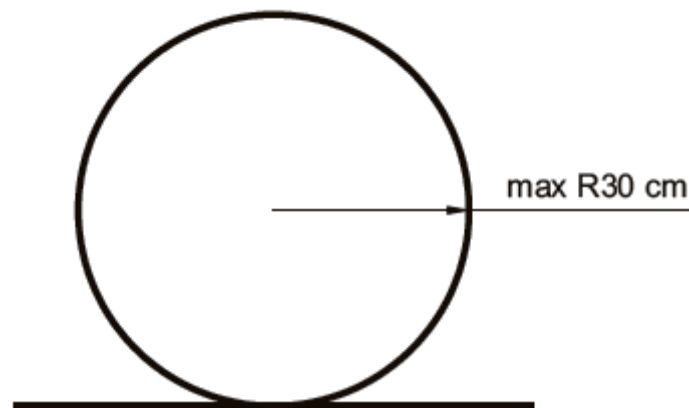


Figure 6: Loop

## 6 Terms and Conditions of Participation

1. Participation in ROBOTEX CYPRUS assumes and requires acceptance of all terms and conditions for participation by competitors, the coaches and the organizations they represent.
2. In case of any difference in the competition rules between the English and the Greek versions, the English version is considered as correct.
3. The robot must be registered before the competition. The registration process includes technical inspection of the robot, marking the robot with a number sticker, and the order in which it will compete which is generated by an algorithm in the information system supporting the ROBOTEX CYPRUS organization.
4. All questions and issues that may arise during the competitions must be reported to the judges.
5. The final decision about objections will be taken by the judges in cooperation with the organizers.
6. Judges' decisions on any objections are considered final and can not be challenged by participants, the coaches or the organizations they represent.



## **7 Robot Technical Control**

1. The robots' technical control will take place on the day of the competition at an area and on time specified by the organizers.
2. Failure of a team to come in time for a robot's technical check leads to the team being excluded from the event.
3. The leader of the team only is responsible to take the team's robot for technical control.
4. Technical control takes place before each phase of the competition (preliminary, qualifying, final) in which the team may participate.
5. Technical control includes the control of the robot based on the above and the paragraph "The Robot", if this paragraph exists. If the robot does not meet the requirements it will not be accepted to compete and will automatically be disqualified from the event.

## **8 Changes and Cancellation of Rules**

Any changes and/or cancellations in the rules of the competition are decided by the Cyprus Computer Society in consultation with the Organizing Committee of the ROBOTEX CYPRUS. You may address comments and suggestions to the Organizers at [robotex@ccs.org.cy](mailto:robotex@ccs.org.cy) .

