REGULATIONS «LINE FOLLOWING»

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Table of Contents

1. Introduction

The challenge of Line Following is considered one of the most popular robotics competitions in the world. In the international ROBOTEX competition, Line Following was implemented for the first time in 2010.

2. Objective

The task for line following robots is to drive through the track marked with a black line as fast as possible.

3. The Team - Eligibility for Participation

1. The competition accepts participation of teams and not individuals.
2. The team consists of two (2) – five (5) persons.
3. **Only one player** of category X is eligible to participate in a team of the immediate higher category. That is:
   - A player of category «4th – 6th Grade Primary» is allowed to participate in a team of category «Gymnasium»
   - A player of category «Gymnasium» is allowed to participate in a team of category «Lyceum»
   - A player of category «Lyceum» is allowed to participate in a team of category «University».
4. The opposite of the rule 3.3 above does not apply. That is, one player of category X is not allowed to participate in a team of any lower category. For example, a player that belongs in category «Lyceum» is not allowed to participate in a team of category «Gymnasium» or «4th – 6th Grade Primary»; a player in the «University» category is not allowed to participate in the category «Lyceum» or «Gymnasium» etc.
5. The coach of the team is not allowed to participate in the same competition with his/her team.
6. The team defines one of its members as a leader who will be responsible for the communication with the Organizing Committee, the judges, for the technical control process and for operating the robot during the competition.

4. Robotic Platforms, Categories & Levels

1. The competition is organized for the robot platforms, in the categories and levels shown in the table below:

Table 1: Robotic Platforms, Categories & Levels for LINE FOLLOWING Competitions

Competition	Robotic Platform	Primary 4th -6th	Gymnasium 1st – 3rd	Lyceum 4th – 7th	University	Special (Adults & Soldiers)
SELF-DEVELOPED ROBOT Line Following **(ΝΕΟΣ)**	ARDUINO, RASPBERRY Pi, ARM, ESP που έχουν τροποποιηθεί και προσαρμοστεί	√	√	√	√	√
Line Following	ARDUINO, RASPBERRY Pi, ARM, ESP	√	√	√	√	√
LEGO Line Following	LEGO EV3, LEGO SPIKE PRIME, LEGO MINDSTORMS NXT	√	√	√	√	√
ENGINO Line Following	ENGINO PRO & GINO BOT, ENGINO PRODUINO	√	√	√	√	√
EDISON Line Following	EDISON	√	√	√	√	√

5. The Robot

1. The robot must be autonomous.
2. The maximum dimensions of the robot are (25 cm Width x 25 cm Length x 25 cm Height) and its mass 1 kg.
3. For confirmation of the specifications indicated in point 6.2 above, the robot will be weighted and must fit easily in a control box.
4. The control box has dimensions (30 cm length x 30 cm width x 30 cm height) plus two (2) millimetres of tolerance.
5. *The two (2) millimetres tolerance refers to the control box only and not to the size of the robot which is specified in the clause 5.2 above. Tolerance is given so that the robot can easily fit in the control box*.
6. The robot must be placed in the control box without exerting pressure on it.
7. The robot must always cover the line once it follows it; otherwise the race is considered to be failed.
8. The robot must not damage the field or endanger the spectators in any way.
9. It is forbidden to use higher voltage than twenty four (24) V in the robot.
10. The robot must have a start and stop button.
11. 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.
12. Additional requirements for LEGO robot:
    - The robot must be exclusively constructed with authentic and licensed parts of LEGO and TECHNIC.
    - The robot must use only batteries or cells that are recommended by LEGO, preferably rechargeable.
13. Additional requirements for ENGINO robot:
    - The robot must be exclusively constructed with authentic and licensed original ENGINO parts.
    - The robot must use only batteries or cells that are recommended by ENGINO, preferably rechargeable.
14. Additional requirements for EDISON robot:
    - The robot must be exclusively constructed with authentic and licensed original EDISON parts.
    - The robot must use only batteries or cells that are recommended by EDISON, preferably rechargeable.

6. The Field

1. The fields of the competition remain secret until the competition day. Participants are expected to take into consideration the details below and in the Appendix and develop a generic code that can perform successfully on any field.
2. The fields are white synthetic sheets.
3. The starting and finishing points of the field are the same.
4. The characteristics of the field for each robot platform are shown in the table below.

Competition	Robotics Platforms	Minimum Area (m^2)	Maximum Area (m^2)	Width Black Line (cm)	Type of Field
Line Following	ARDUINO, RASPBERRY Pi, ARM, ESP	3	100	1.5	Open or Closed
SELF-DEVELOPED ROBOT Line Following (NEW)	Platforms above that have been modified/customized	3	100	1.5	Open or Closed
LEGO Line Following	LEGO EV3 LEGO SPIKE PRIME LEGO MINDSTORMS NXT	3	100	2.0	Open or Closed
ENGINO Line Following	GINO BOT, ENGINO PRO & PRODUINO	3	100	2.5	Open or Closed
EDISON Line Following	EDISON	3	100	2.5	Open or closed

5. An «open field» is defined as a field whose starting and finishing points are located at different sides of the field, usually at opposite sites. A «closed field» is defined as a field whose starting and finishing points are located at the same side of the field.
6. The line is being printed on the field with black ink or marked with a black tape.
7. The minimum turning radius of the line is zero (0).
8. The line is surrounded by twenty-five cm free space on both sides, except cross-sections.
9. The lines on the cross-section are perpendicular at least to the extent of twenty (20) cm.
10. To test the robots prior to the start of the competition, sample fields will be available to which the teams will have access for a specific time and according to a schedule.

7. The Competition

1. Each team will be given time of X minutes in order to make as many attempts on the fields as possible. Between the attempts, changes on the robot and its algorithm are allowed.
2. The exact time X will be decided by the Organizers depending on the total number of teams to be registered in each Line Following competition. In any case, the time X will not be less than five (5) minutes.
3. Prior to the beginning of the attempts, the relevant technical inspection will be performed.
4. Each robot runs alone in the field against the time.
5. An optical time measuring system will measure the time taken by the robot to complete he field during each attempt.
6. For each robot, its best (minimum) time will be recorded.
7. It is the responsibility of the team leader to ensure that his/her team makes all attempts within the time framework specified.
8. The robot should start moving within three (3) seconds after the referees have given the start command.
9. If the robot does not move within three (3) seconds, it is assumed that the robot has failed in the attempt.
10. The robot is not allowed to drive off the limits of the field. If it does, then the robot is considered to have failed the attempt.
11. The robot must always cover the black line while competing; otherwise the attempt is considered to have failed.
12. If the robot does not complete the field then the distance it covered from the starting point until the point it stopped is recorded.
13. If the robot fails the attempt, then a DNF – DID NOT FINISH is recorded.

8. Declaring the Winning Team

1. Upon completion of all attempts of all robots of each category a ranking will be performed based on the minimum (best) time of the robots of each category separately (i.e Primary, Gymnasium, Lyceum, University, Special).
2. In case that no robots of a category have finished any attempt, then the ranking will be based on the longest distance covered by the robots on the field.

1. Based on the number of teams in each category the Scientific Committee will decide for the number of teams that will be promoted in the final round (Best of the Best).
2. In the final round each robot will make one (1) attempt in the field.
3. Upon completion of the final round, a new ranking will be realized.
4. The winner is the robot ranked first (with the minimum time) in the ranking of the final round.
5. In case of a tie in the final round, then the process above is repeated for the robots that are in a tie, until a winner can be declared.

9. 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. In this challenge, there are two (2) judges. An additional head judge may also be present to supervise the whole process.
5. All questions and issues that may arise during the competitions must be reported to the judges.
6. The final decision about objections will be taken by the judges in cooperation with the organizers.
7. Judges' decisions on any objections are considered final and can't be challenged by participants, the coaches or the organizations they represent.
8. In the case of a deliberate alteration or change of marking of the unique number of robots, the coach and his team will be automatically expelled from the event. As a result, they will not be able to take part in any other challenge they may have enrolled. The coach and his team will leave the venue immediately. The coach also loses the right to take part in the next ROBOTEX CYPRUS event and is automatically excluded from participating in ROBOTEX INTERNATIONAL in case one of his/her teams has won a ROBOTEX CYPRUS competition. The Organizing Committee reserves the right to publicly announce the coach, the team and its members.
9. It is expected that both the coaches and the members of the teams will exhibit a spirit of noble rivalry and will behave with mutual respect, decency and esteem both to themselves and to the organizers, judges and volunteers. The behaviour of all coaches and team members should promote "fair play". Therefore, the Organizing Committee reserves the right to expel anyone from the venue of the event who violates the above principles of good practice.

10. Robot Technical Control

1. An initial technical control of the robot technical control will take place on the day of the competition at an area and on time specified by the organizers.
2. Technical control takes place before each phase of the competition (preliminary, qualifying, final) in which the team may participate.
3. Failure of a team to come in time for a robot's technical check leads to the team being excluded from the event.
4. The leader of the team only is responsible to take the team's robot for technical control.
5. Technical control includes the control of the robot based on the above and the section «**6. The Robot**». If the robot does not meet the requirements it will not be accepted to compete and will automatically be disqualified from the event.

11. Changes and Cancellation of Rules

1. 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 ROBOTEX CYPRUS. You may address comments and suggestions to the Organizers at **robotex@ccs.org.cy**.

APPENDIX – DETAILS OF THE LINE FOLLOWING FIELD

2.5cm for ENGINO and EDISON.
2.0 cm for LEGO and 1.5 cm for all other platforms.

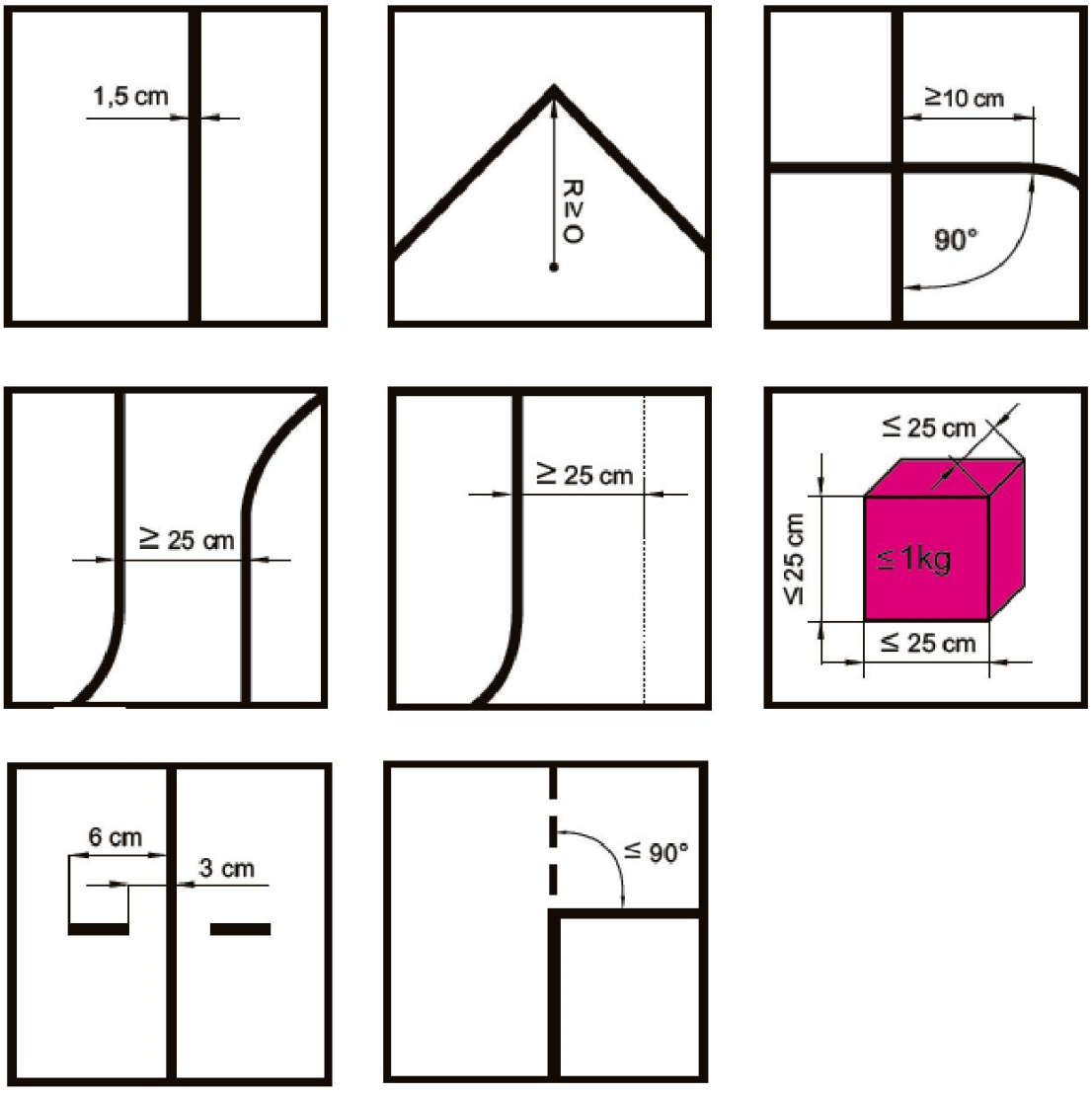

Figure 1: Technical Characteristics of Line Following Field