robotex International

LINE FOLLOWING ENHANCED RULES

COMPETITION COORDINATOR

Kaspar Laks
kaspar@robotex.ee

Content

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 Lighting conditions

The lighting in the area needs to be as close to real sunlight as possible (Midday), with consistent color and stability. The field cannot have shadows while the attempt is running. Lighting is allowed to change between attempts, but it needs to be consistent for every field.

3 Technical inspection and registration

The robot needs to pass technical inspection before the competition. The robot technical inspection is based on paragraphs “6.” and “8.”. During the inspection, it is checked whether the robot or the operator who is handling the robot meets the paragraphs requirements. **Only one team member with a robot** (the currently selected robot operator) **can come to the technical inspection. If necessary, they can have a translator or team instructor with them.** The purpose of this is to guarantee a smooth course of the competition and technical inspection.

4 The field

1. The field consists of white synthetic sheets with an area of 3 to 100 m².
2. The 15 mm 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 and road split obstacle.

7. The lines on the cross-section are perpendicular at least to the extent of 20 cm. On the cross-section the robot must follow the straight line (it cannot turn to the crossing line or it will lose its trial).
8. The start and finish lines are separately marked on the field, for a closed track the start and finish lines can be the same.

5 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.
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. A remote for starting and stopping the robot is strongly recommended as fast robots may cause injuries to the competitor, judge or get itself damaged while it is being stopped.
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.

6 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. In case the optical time measuring system fails to register the time, the judge can allow the competitor to redo the attempt.
4. The competition queue will be either drawn by lots or determined according to the order of registration.
5. The competitors have up to 5 rounds, 1 attempt for each round. Final number of rounds depends on the number of registered competitors.
6. 10% of the fastest competitors will get to compete in the finals. Depending on the timetable, the organizers are allowed to increase the number of robots in the finals to 25%.

7. In the finals each team has 5 minutes at which time they are allowed to do as many attempts as they wish – only the best attempt will be counted. First 3 places are determined by who is the fastest in the finals.
8. Robots must start the trial when the referee gives the signal.
9. The robot must start moving in 3 seconds after the referees start command. If the robot does not start moving within 3 seconds after the referees start command, it will fail the current attempt.
10. Maximum lap time is 3 minutes. If the robot exceeds this time, the trial time will be not fixed.
11. 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.
12. One operator and up to four assistants may be registered for each robot (**maximum of five team members in total**). **The team may change the designated operator in accordance with the competition rules.*
13. The robot is not allowed to drive off the track; if it does, the robot will fail the current attempt.

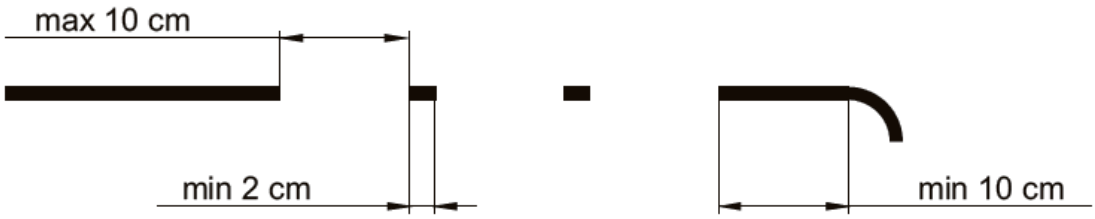
6.1 Delay of the competition

When competitions start to delay, organizers have the authority to act in accordance with rules to minimize the delays and bring the competition back on schedule. The competition will continue as smoothly as possible, eliminating any rematches or any moments that could cause delays, and instead using a less time-consuming judging system based on rules. Any objections will not be accepted during the delay, and competition will not be delayed to resolve the objections. If the robot cannot be found in the designated area, the attempt is considered a failure.

7 Obstacles

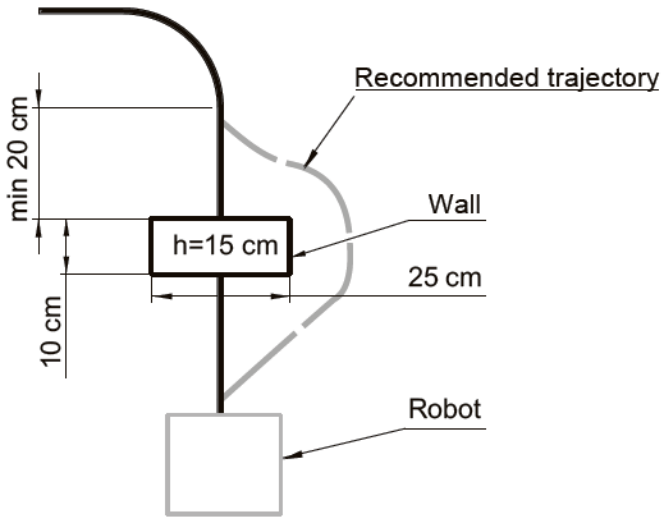
7.1 Line break

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.



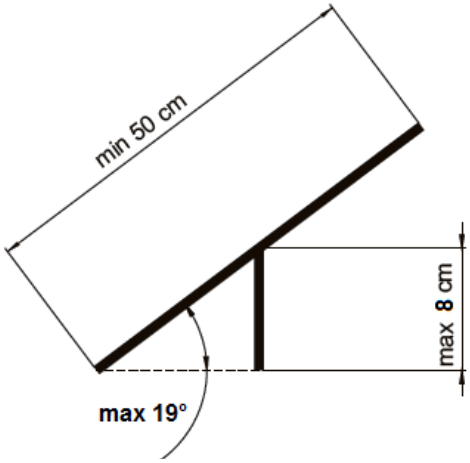
7.2 Wall or obstacle on the line

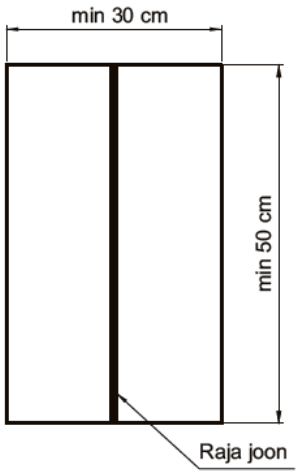
There are cuboid shaped obstacles on the track, or walls (see Figure 2) with maximum dimensions of 25 x 15 x 10 cm. The task of the robot is to drive around the obstacle and continue with line following shortly after the obstacle. The robot must start following the line again within 30 cm after the obstacle (robot must cover the line at least partially within the 30 cm following the obstacle and continue 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.



7.3 Swing

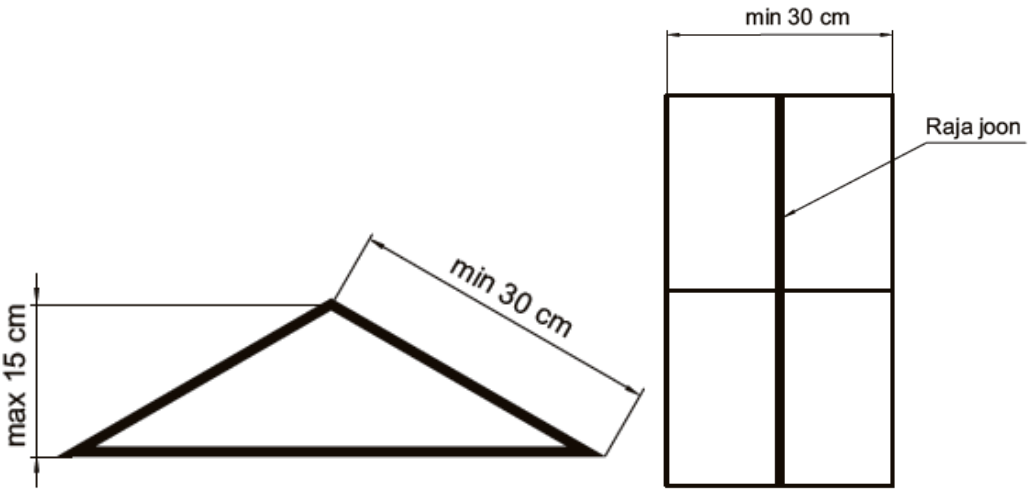
There is a swing on the field (see Figure 3). The task of the robot is to cross the swing and continue following the line. The robot is not allowed to drive around the swing. The length of the swing is at least 50 cm. The width of the swing is at least 30 cm. The fulcrum of the swing is positioned no 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.





7.4 Mountain

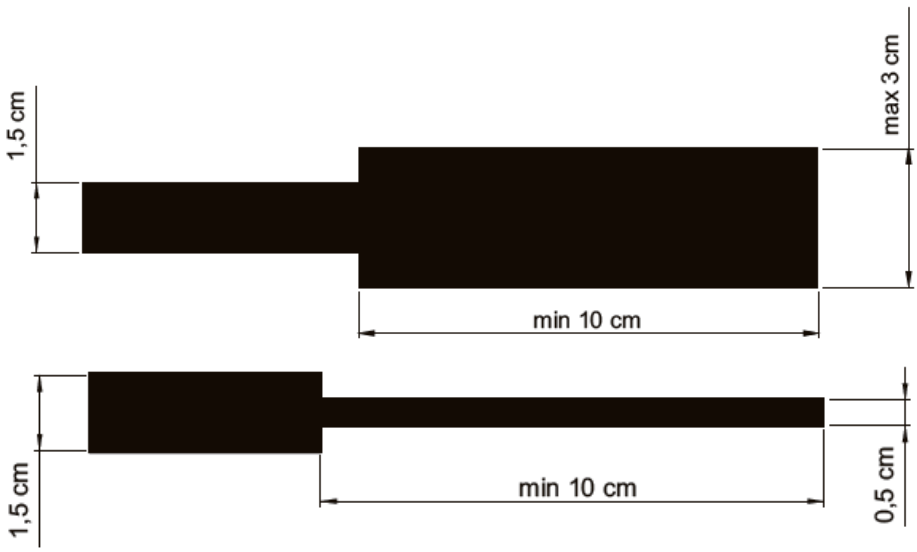
From the side view, the mountain is an isosceles triangle and from the top view, a rectangular shaped static obstacle on the track (see Figure 4). Its height is a maximum of 15 cm and the arm of the triangle is at least 30 cm. The width of the mountain is at least 30 cm. The task of the robot is to drive/jump 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.



Side view Top view

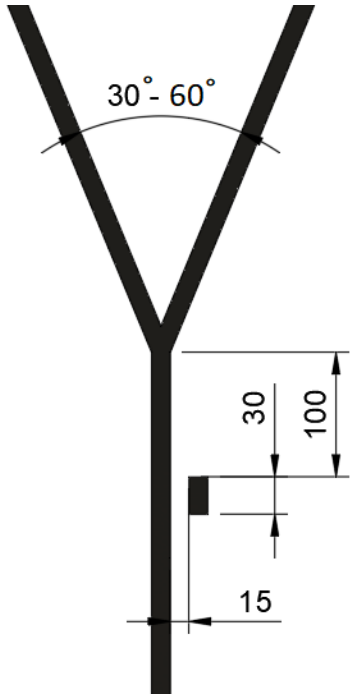
7.5 Expansion/constriction of the line

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.



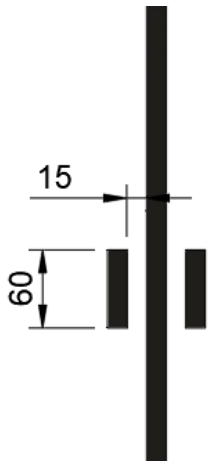
7.6 Road split

During the road split obstacle the track splits into two tracks. One track is longer than the other and thus takes longer to pass. The shorter path is marked on the side of the track before the road split. The mark is placed on the side where the path is shorter. Marking is distanced at least 100 mm before the road split and 15 mm from the main track. The marking measures 15 x 30 mm in size and is black in colour. Before the road split marking there is at least 20 cm of straight line. Road split angle measures between 30-60 degrees. Road might join together with the main line at a random angle but the correct path is again marked by a 15 mm marking at the correct side of the line.



7.7 Speed limit zone

The speed limit zone is a zone on the field (shortly before the finish line) where the robot must travel slower than 0,5 m/s. The speed is measured by an extra optical time measuring system at this zone. Speed limit zone is marked with two 15 x 60 mm black lines on both sides of the track. The markings are distanced 15 mm from the main track. Speed limit zone starts as soon as the markings end. There is at least 25 cm of straight line before the markings. PS! Main lap completion time will be measured before entering the speed limit zone. In case the robot moves faster than 0,5 m/s in the speed limit zone the time spent in the zone will be added to the final lap completion time. In case the robot is slower than 0,5 m/s and detect the speed limit zone correctly, no extra time will be added to the main lap completion time.



8 Organizing

14. The competition field and testing fields are made of same materials.
15. 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 number will be drawn.
16. Technical inspection must be completed by the time that is specified by the organisers.
17. All questions and problems arising during the competition are solved by the referee.
18. The decisions of the referees are not subject to appeals. Complaints must be submitted during or immediately after the match. If no settlement is reached with the referee, claims must be submitted immediately to the Robotex Head referee. Any later complaints will not be accepted. In case of any conflicts or disputes, the final word will be said by the referees and/or the organisers. **NB! Rude behaviour is not tolerated and the team who does not respect the referees / head referees decisions can be disqualified by the head referee and/or event organisers.**

8.1 Lighting and infrared noise

The arena has at parts uneven lighting and infrared noise, which may disrupt the work of sensors during the competition. For this reason, the organizers recommend using covers or blinds for sensors, testing the sensors under intense lighting conditions or even under direct sunlight to imitate the lighting conditions of the competition arena.

8.2 Winners one-year break

Winners of 1st place cannot compete in the same category next year– they must take a one-year break from that category. At least 50% of the team must consist of non-winners. If the winners' team has three members, next year they should have at least one new member who was not previously on this team to compete in the same category again instead of taking a year off from it. This rule is aimed at bringing new people, giving everyone a fair chance and encouraging recurring winners to try new competitions they usually do not participate in and to educate and engage new beginners in the field of robotics. *

*** The rule complies only with Robotex International standards and is used for Robotex International competition.**

9 Changes and cancellations in the rules

Changes and cancellations made to the rules are adopted by the main organiser of the competition, according to the regulations of the regulatory committee of the competition.

10 Appendix 1 Dimensions of the field and the robot

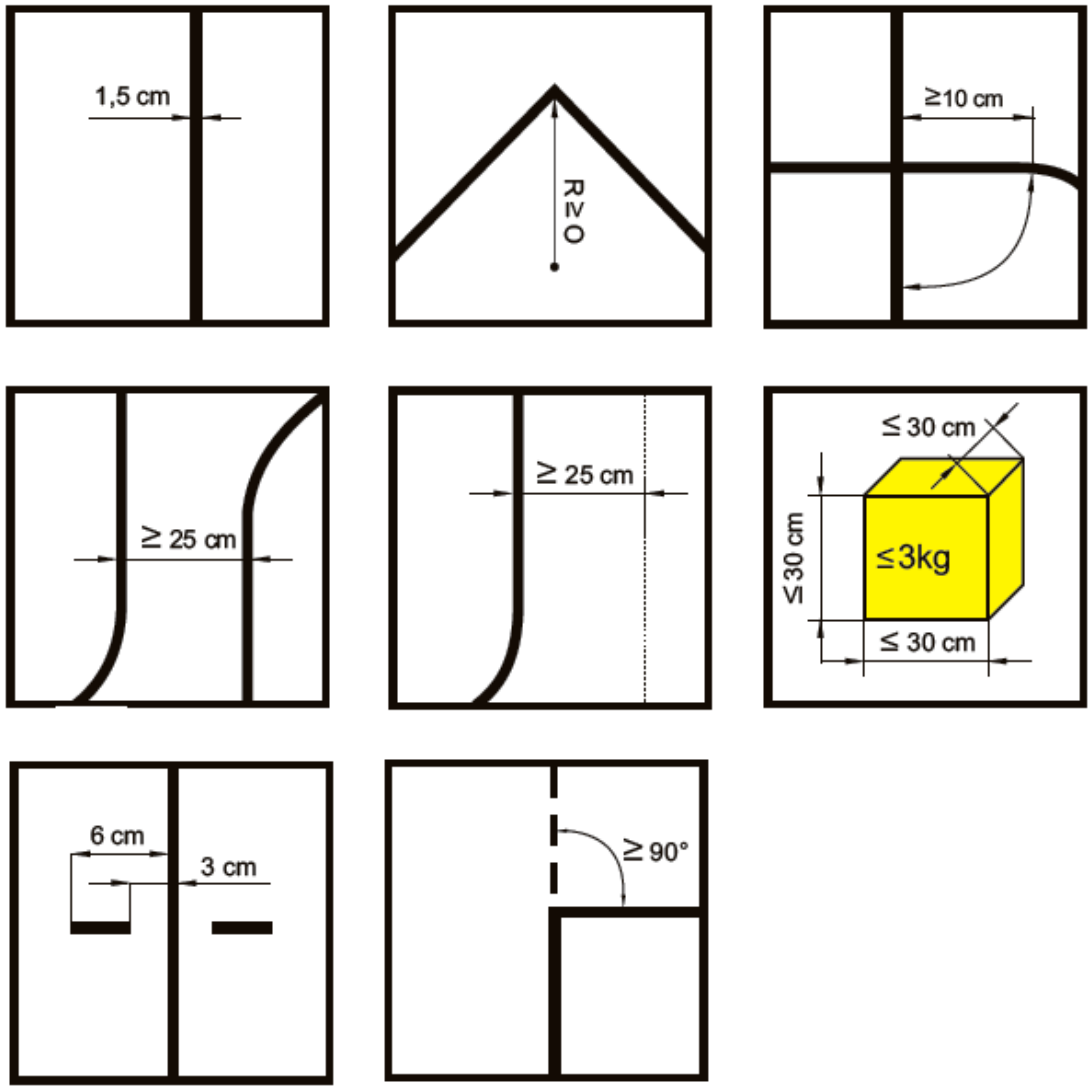


Figure 7: Dimensions of the field and the robot

11 Revision history

1. Added “road split” and “speed limit zone” as new obstacles on 20th of August 2021.
2. Specified “road split” obstacle on October 25th 2021.
3. Clause 6 in Paragraph 6: Specified lighting conditions of 18th of January 2022.
4. Redefined “speed limit zone” obstacle on 18th of January 2022.
5. Clause 5.2 in Paragraph 5: specified when to return to track after “wall” obstacle on 18th of January 2022.
6. Paragraph 4: changed the number of maximum rounds of 18th January 2022
7. Paragraph 5: Removed “track loop" from obstacles (previously clause 5.6) on June 20th 2024
8. 08.02.2026 Removed previous rule change history before 2021.
9. 08.02.2026 All paragraphs were updated.
10. 08.02.2026 Added two new paragraphs: 2. And 3. .