

# Sumo Challenge



## Line Follower Regulations



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## 1. Short description of category

In this competition robot has to complete the route as fast as possible. The competition is splitted into five categories:

- Line Follower (Classic Line Follower)
- Line Follower Turbo (robots with turbines)
- Line Follower Enhanced (Line Follower with obstacles)
- Line Follower Enhanced3D
- Line Follower LEGO

## 2. Course of the game

The competition is held in two stages:

- a) preliminaries - each robot has an unlimited number of attempts to complete the track, within the time frame provided by the schedule given on the day of the competition. Robots with the best times will take part in finals (the fastest time decides).
- b) finals - the robots have four attempts to complete the route - the best one will be counted. Ranking is determined by who was the fastest in the finals.

## 3. The track

The route is made with a black line (about 19 mm wide) on a white field.

- a) The route is "closed" (the starting point is also the finish line) with the possibility of more than one lap.
- b) The track consists of 3mm thick HDF boards joined together. Minimal gaps and unevenness may occur on connections - although the number of such unevenness and their size is reduced to a minimum.
- c) Possible obstacles in the Line Follower Enhanced / Line Follower Enhanced3D category:
  - **Line break:**
    - There might be line breaks on track sections with a maximum length of 10 cm (*Fig.1*).
    - Line breaks are not placed on curves, so the straight-ahead direction should keep you on track.
    - A sequence of several short breaks is possible.

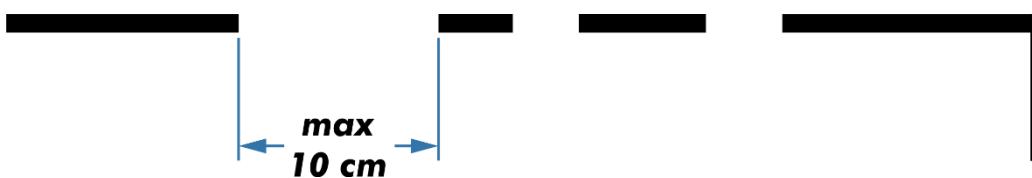
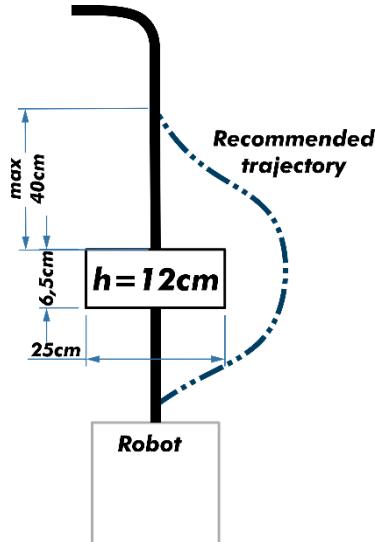


Figure 1 Line break

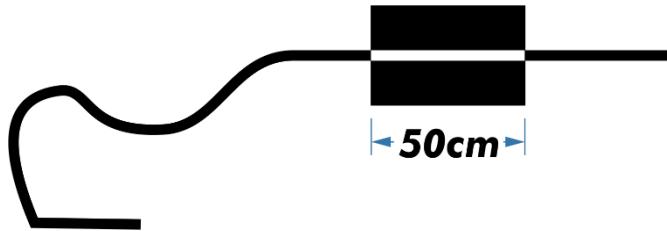
- **Wall:**

- Approximate dimensions (length - 25 cm, width - 6.5 cm, height - 12 cm, *Fig. 2*).
- The task of the robot is to drive around the obstacle and continue with line following.
- The robot is allowed to touch the obstacle.
- The route is constructed so that the robot can drive around the obstacle on its right side.
- The robot must return on the route at a distance of not more than 40 cm behind the obstacle.



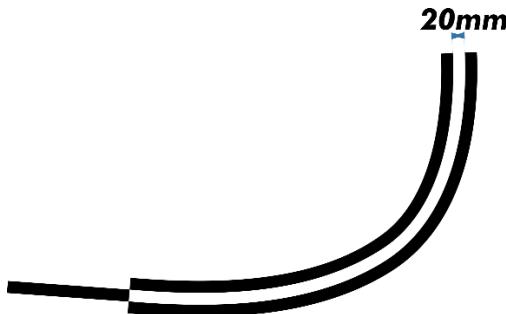
*Figure 2 Wall*

- **Intersection:**
  - There might be different types of intersections along the track, that may make it difficult for the robot to complete it. The intersection should be passed straight ahead.
- **Inverted colours:**
  - The route may include a fragment no longer than 0.5 m, on which the route will be a white line on a black background (*Fig. 3*).
  - The robot must adapt to the changed colours.



*Figure 3 Inverted colours*

- **Double line:**
  - There may be a section on the route where the line is doubled – which means, it consists of two parallel lines separated from each other by approx. 20 mm (the width of the route, *Fig. 4*).

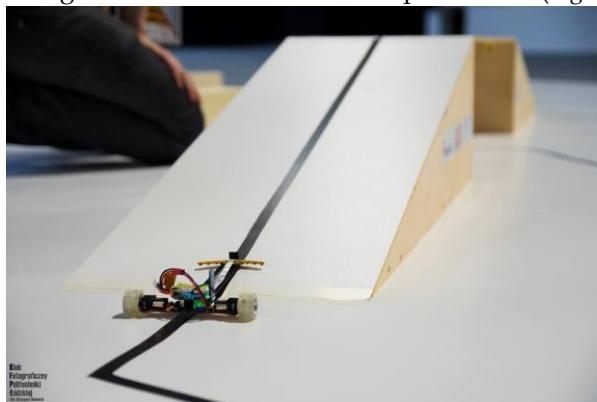


*Figure 4 Double line*

- **Fork:**
  - There may be a section on the route where it splits into two possible tracks. There are different obstacles on both possible routes - so the robot can choose the one depending on its preference. After the obstacle, the line reconnects into one route.

- **Bridge (and tunnel)**

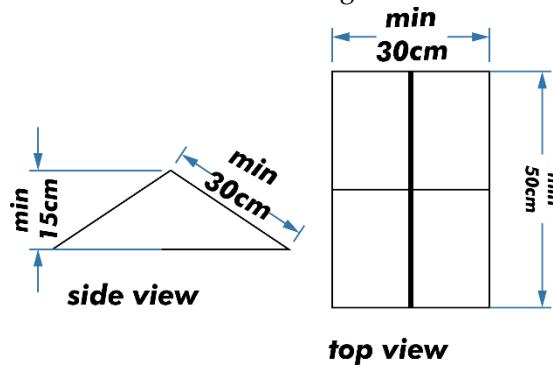
- Part of the route can run on a rounded "hill" which has dimensions of: width - 35 cm, height (clearance at the highest point) - 16 cm, height (clearance at a distance of 10 cm from the centre) - 14.5 cm.
- In addition, the bridge can be used as a tunnel to pass under (Fig. 5).



*Figure 5 Bridge*

- **Hill**

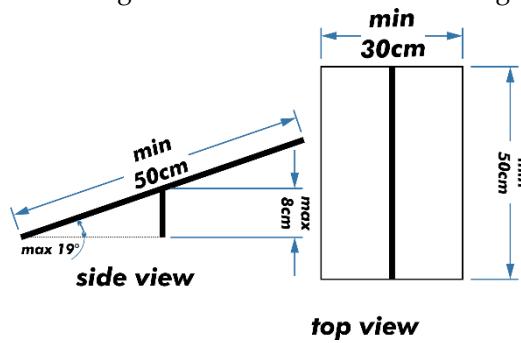
- Viewed from the side, it is an isosceles triangle, while from above it is a rectangle (Fig. 6).
- The maximum height of the hill is 15 cm, the length of the driveway will be at least 30 cm and the width will be at least 30 cm.
- The robot's task is to drive over or jump over a hill and continue racing. The robot cannot drive past a hill.
- After the hill there will be at least a 20 cm of straight line.



*Figure 6 Hill*

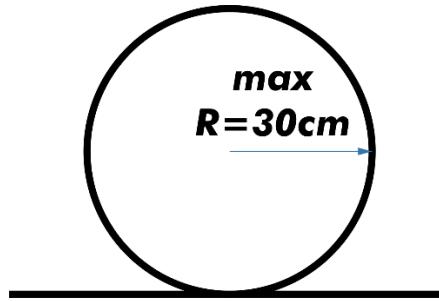
- **Swing**

- A swing may appear on the route. 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 and the width is at least 30 cm. The fulcrum of the swing is positioned no more than 8 cm above the surface of the field (Fig. 7).
  - After the swing there are at least 20 cm of straight line.



*Figure 7 Swing*

- **Loop**
  - There may be a section where the route forms a loop (Fig. 8). Its diameter is up to 30 cm.
  - The task of the robot is to fully drive through the loop and continue with line following. The loop may be passed a maximum of three times, otherwise the robot loses the attempt.



*Figure 8 Loop*

- **Change of line dimensions**
  - There may be a section where the line width may change. The basic width of 19 mm can be extended to approx. 38 mm or constricted to approx. 10 mm.
  - The length of this kind of section will be at least 10 cm long and no additional obstacles will be placed on it.

- d) The Organizers decide on which obstacles will occur on the track on the day of the competition. If it turns out, that one of the obstacles is too difficult for more competitors, the Organizers may (but do not have to) remove it from the route.
- e) Possible obstacles in the LF Enhanced3D competition include: driving on the ceiling or vertical loop (diameter 200cm ± 50cm)

#### 4. Robots specification

- Robot must fit on an A4 sheet of paper.
- The weight is unlimited
- The robot must be autonomous.

##### 4.1) Requirements and restrictions

- Robots in the Line Follower category (classic LF) must not contain parts that actively increase their downforce (in particular tunnel drives).
- Robots containing parts that actively increase their downforce take part in the Line Follower Turbo and Linefollower Enhanced3D categories (LF with turbine).
- At the competitor's request, a robot without a turbine can take part in the Line Follower Turbo category.
- The same robot cannot participate simultaneously in the Line Follower and Line Follower Turbo categories.
- In order to register the same robot in two categories (LF Standard and LF Enhanced or LF Turbo and LF Enhanced), you must complete the registration form twice.
- In case of a small number of competitors, the organizers may combine Line Follower and Line Follower Turbo categories.

- g) Robots in the LEGO Follower category must only consist of parts from LEGO bricks (a maximum of one main cube and 4 colour sensors).
- h) It is not allowed to take part with two identical robots in the same competition.

## 5. Rules

The robots are placed on the starting line and start their attempt at the sign given by the judge. When the robot leaves the line during the race, it must return to it without external interference. Shortening the track is not allowed. The time of attempt must not exceed 3 minutes.

The time is measured using optical time measuring system, in case it fails, it may be done using a stopwatch.

## 6. Final provisions

It is not allowed to submit to the competition constructions, that are officially being sold. If the robot is a modified version of the finished structure, please contact the Organizers to agree on the rules of participation. If the participant does not inform the Organizers before the competition, he or she will be disqualified. Structures from sets that are not explicitly dedicated to this competition (e.g. Lego) can participate on the usual rules.

Competitions can take place in varying lighting conditions, which is why robotic sensors should be properly protected against the adverse effects of light. Contestants are not allowed to move around the track to provide shade on the route.

Robot is perceived as an inseparable object - no element (except the battery) can be used in another robot.

All situations not described in the regulations are solved by the Chief Judge.

The Chief Judge's decision is final and indisputable.

In case of a small number of robots, the organizers can decide to award only one prize.

Organizers have the right to make minor changes to the regulations until the start of the competition - all will be listed at the beginning of the regulations.