



International robotics competition
“ROBO-VOZÍTKO PLZEŇ 2021 EU / ROBO-VEHICLE PILSEN 2021 EU”
under the call “Future Autonomous Urban Mobility”
(working title of the competition “ROBO2021-EU”)
February 16, 2021, online

Abstract

The aim of the competition is to drive a robotic vehicle, constructed for this purpose, transporting a cup with a measured amount of water (**100 ml**) through a pre-defined track in the shortest possible time without spilling the water in the cup and, at the same time, not colliding with the noise barrier.

The track is a black curved guideline on a white background (tarpaulin); it does not intersect anywhere, the starting line is also the finish line. One double-sided noise barrier is placed along the track. The vehicle must take off autonomously from the black start/finish line marked on the track and, after a safe passage throughout the track, stop autonomously again on or behind the start/finish black line crossing the track.

Team Description

The competition shall be attended by two-member student teams, a maximum of six teams from the Czech Republic, a maximum of six teams from Germany, a maximum of six teams from Croatia and a maximum of six teams from Slovakia. Other countries can join (again, a maximum of 6 teams apply). Team members (students) must be between the ages of 17 and 20. During the competition, the teams work independently, without any intervention of a teacher or other adult.

The complete documentation can be downloaded from
<https://www.souepl.cz/index.php/international-robotic-competition-robo-2021/>

The participating schools will be sent the following items:

- Track (tarpaulin), 1 pc
- Noise barrier, 1 set (2 parts)
- Cup platform, 1 pc
- Cup, 1 pc
- Software application for time measurement



Communication

Team communication will take place via the platform - we will specify.

Contacts and Queries about the Organization of the Competition

Organization Queries:

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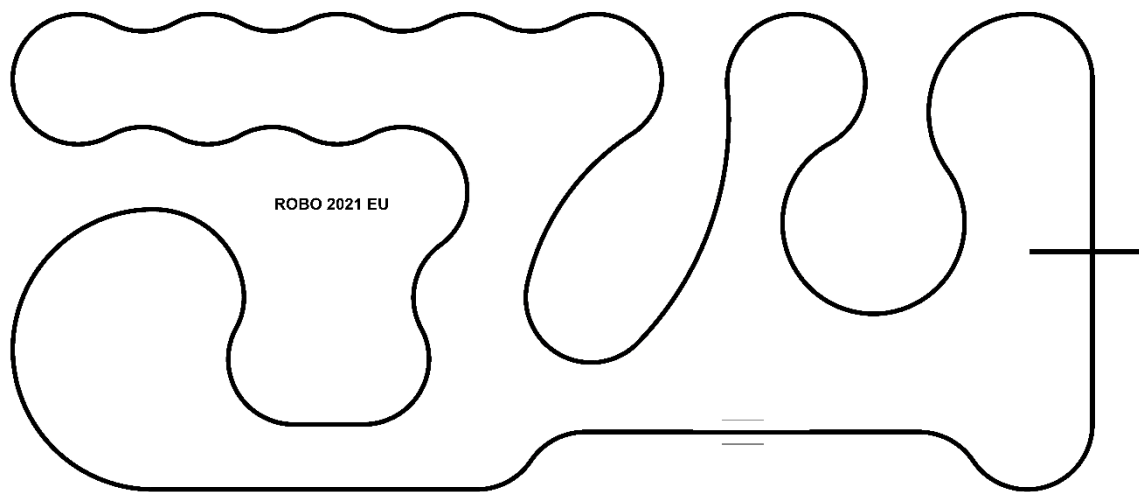
Technical Terms and Conditions

Track Specification

The base for the track is white straight tarpaulin of 2000 x 3000 mm, on which a closed curved loop is drawn in black (curved black guide line 15 mm wide); this black guide line does not intersect anywhere; it is not interrupted; the start/finish line is a short black line that intersects the black guide line; a double-sided noise barrier with a length of 150 mm is placed at one place along the track.

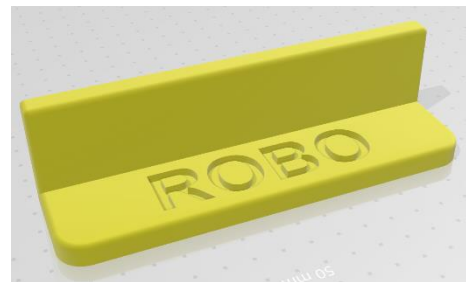
The reading of the guideline by the vehicle shall be optical.

Sample Track



Noise Barrier Specification

- Noise barrier material: 3D print, length 150 mm, 2 pcs
- The noise barrier consists of 2 opposite plastic walls 150 mm long; the edge of the wall is set at 140 mm from the axis of the guideline. The exact position of the noise barriers is defined by two placement lines 150 mm long and 3 mm wide.



line width 3 mm, line length 150 mm



line width 3 mm, line length 150 mm

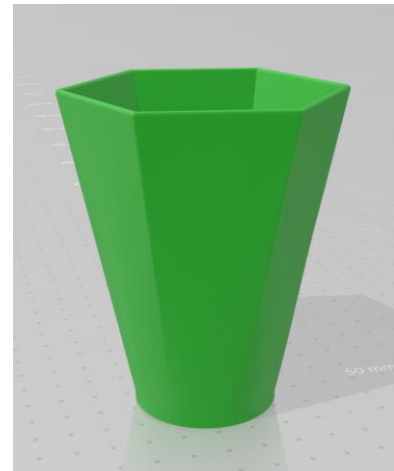
Position of the noise barriers: the team shall place the barriers on the thin lines 150 x 3 mm

The Robotic Vehicle Specification

- Maximum dimensions of the robotic vehicle (length x width): 200 x 200 mm
- Axle quantity: unlimited
- Chassis: unlimited
- Motor(s) wattage: unlimited
- Propulsion type: electromotor(s)
- Wheels, tracks and other vehicle mechanical parts must not damage the track and/or the tarpaulin
- The vehicle shall be a single unit
- Mounting of the cup on the vehicle: the cup will be placed on a platform with a ring-shaped rim

Mounting of the Cup onto the Vehicle; the Cup

- Mounting of the cup onto the vehicle: the cup will be placed on a ring-shaped platform with a raised rim, where the inner diameter of the rim will be slightly larger than the outer diameter of the bottom of the cup –the cup must stand completely free and must not be clamped by the rim. The internal height of the rim must not exceed 5 mm. The flange of the platform has two grooves for attaching the platform to the vehicle using M3 screws; the groove allows for the adjustable attachment of the platform onto the vehicle.
- It is not allowed to change the size of the platform or otherwise modify or alter the platform.
- It is not allowed to change the size of the cup or modify or alter the shape of the cup (however, the colour or material from which the cup is printed – ABS, ASA, PET, etc. – does not matter).



Vehicle Control Unit

- Any suitable platform (Arduino, Picaxe, Raspberry, etc.)
- The vehicle must be completely autonomous; it must not hide the possibility of external control (wi-fi, Bluetooth, etc.)

Evaluation Criteria

The jury will evaluate the contestants and appoint winners in the following categories:

- **1–3 overall place – the School**
- **1–3 place in “Best Ride” category**
- **1–3 place in “Best Design” category**
- **1–3 place in “Best Presentation in English” category**

“Best Ride” Category

- **Runway Time (speed)** – if the vehicle diverts from the black guide line, the vehicle must be placed at the start/finish line again; however, if the vehicle returns autonomously back to the black guide line, it may continue on to the finish. In the case of repositioning the vehicle on the start/finish line, the final time consists of the times of all attempts. The vehicle can be repeatedly placed on the start/finish line a maximum of 3 times. The total time to run through the track, including repositioning the vehicle on the start/finish line, is 7 minutes. The vehicle must pass through the noise barrier.
- **Spilling the Cup on the Track** – In the event of spilling the cup while the vehicle is on the track, the vehicle must be placed on the start/finish line again and the cup must be refilled with the prescribed amount of water.
- The team can use the full time on the track (7 minutes) and place the vehicle on the track several times; the best runway time counts.
- The runway time will be measured using a special application “desktop_timer”.

“Best Design” Category

- **Presentation of the design via video** (*.mpeg4) of max. 10 minutes in English. A video exceeding the maximum length or sent in a different format shall be penalized by points deduction.

The jury shall take into consideration:

- Original body of the vehicle (colours, parts elaboration and quality, etc.)
- Protection of electronics against water
- Interesting lighting (headlights, flashing lights, etc.)
- Unusual sounds (horns, warning sounds, etc.)
- The participating schools shall send a link to the presentation video by 12:00, February 15, 2021, at cedik@souepl.cz with a cc at bsob@seznam.cz; the video will then be downloaded and uploaded to a shared data storage, where it will be made accessible to the jurors.

“Best Presentation in English” category

Electronic presentation (*.pptx; *.pdf); both team members can present online.

The presentations in the length up to 10 minutes (longer presentations or presentations in a different format will be penalized by points deduction) shall cover:

- A concise description of the vehicle
- A description of the most interesting parts and their solution
- The greatest achievement reached during the construction (electronics, design, mechanical structure, programming, adjustment, etc.)

- The greatest issue addressed during the construction (electronics, design, mechanical structure, programming, adjustment, etc.)
- The contribution towards the team member's professional growth
- Used resources (Internet, publications, etc.)
- The participating schools shall send a link to the presentation video by 12:00, February 15, 2021, at cedik@souepi.cz with a cc at bsob@seznam.cz; the video will then be downloaded and uploaded to a shared data storage, where it will be made accessible to the jurors.

After the end of the competition, the videos and presentations will be made accessible and downloadable from the shared data storage to all participating teams for free.

Evaluation Procedure

The evaluation will take place in the afternoon on February 16, 2021.

The jurors will be two experts from the Regional Administration of the Pilsen Region, two from the University of West Bohemia in Pilsen, two from Slovakia, two from Croatia and two from Germany (in the case of other participant schools from other countries, their experts may also be involved). The jurors are prohibited from taking any part in consultations concerning the respective vehicles being developed. Each juror fills in the evaluation form, from which the data will be transferred to the overall result list.

Prizes

- **1–3 overall place – the School** – ROBO 2021 EU cups for the awarded schools, diplomas for the awarded schools
- **1–3 place in “Best Ride” category** – non-cash prizes for the team members
- **1–3 place in “Best Design” category** – non-cash prizes for the team members
- **1–3 place in “Best Presentation in English” category** – non-cash prizes for the team members
- **all participants** – non-cash prizes
- **all participants** – diplomas

Note: Both team members will receive the same prizes.

Competition Organizers

Pilsen Region
University of West Bohemia
Vocational School of Electrical Engineering in Pilsen