

## International Robotic Competition “ROBO-VEHICLE PILSEN 2020” under the call "Future autonomous urban mobility" (the working title of the competition is “ROBO2020”)

### Description

The aim of the competition is to drive along a defined track in the shortest possible time in a specially designed robotic vehicle carrying a cup holding a measured amount of water without spilling the water. The track is formed of a curved black guideline on a white background; there is no intersection. The start line is also the finish line. The vehicle must start automatically on its own on the black line marked START and, after completing the track, stop automatically on/beyond the black line marked START.

### Description of the team

The competition involves a number of two-member student teams: a maximum of six teams from each participating country. The students are between 17 and 21 years old. Teams work independently without any intervention from a teacher or other adult. Consultation with teachers is permitted.

### Technical conditions

#### Track specification

- the track is formed by a white, flat plastic sheet of 3,000 x 3,000 mm, with a closed curved loop drawn in black (the curved black guideline is 15 mm in width); it does not intersect anything anywhere and is not interrupted by anything; both the start and the finish are formed by a black line marked START with a width of 15 mm which intersects the black guideline; the track is flat;
- scanning of the guideline by the vehicle: optical
- shape of the track: <https://www.souepl.cz/index.php/pro-verejnost/international-robotic-competition-robo-vehicle-plzen-2020-robo-2020-as-the-challenge-towards-future-autonomous-city-mobility/>

#### Illustration of track shape



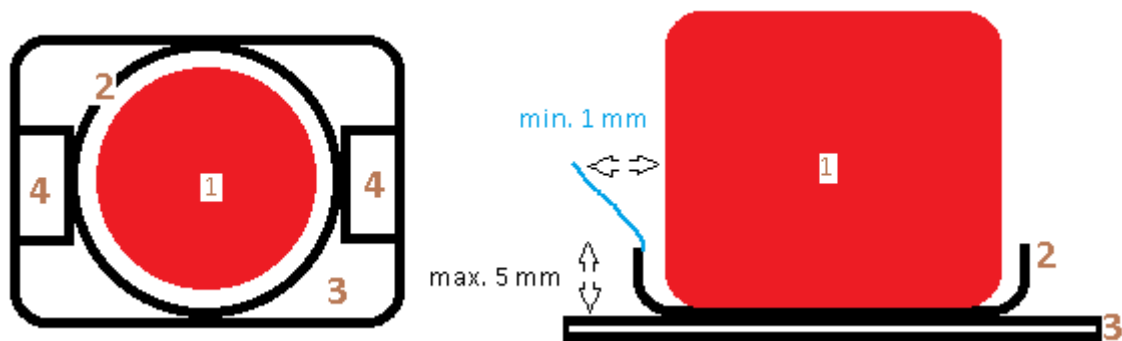
### Specification of the robotic vehicle

- maximum size of robotic vehicle (length x width): 200 x 200 mm
- number of axles: unlimited
- chassis: unlimited
- engine power: unlimited
- vehicle drive: electric motors
- wheels, belts and other technical mechanisms of the vehicle must not damage the track or the track surface
- the vehicle will form a single unit
- fitting the cup on the vehicle: the cup will be placed in a ring-shaped cast

### Fitting the cup on the vehicle

- fitting the cup on the vehicle: the cup must be placed in a ring-shaped cast, with the inner diameter of the cast being slightly larger than the outer diameter of the cup bottom – the cup must stand free in the cast; the inner height of the cast must not exceed 5 mm;
- the cast of the cup for transport of water will be printed by the teams themselves on a 3D printer
- it is not allowed to change the size or otherwise modify the cup cast
- printable data for download is at:

<https://www.souepi.cz/index.php/pro-verejnost/international-robotic-competition-robo-vehicle-plzen-2020-robo-2020-as-the-challenge-towards-future-autonomous-city-mobility/>



1 cup

2 cast

3 base for fitting the cup

4 groove for attaching the cup cast to the vehicle with M3 screws; the groove allows clearance for attaching the cup cast to the vehicle

### Vehicle control unit

- any platform (Arduino, Picaxe, Raspberry, etc.)
- the vehicle must be completely autonomous and must not hide the possibility of external control (wi-fi, Bluetooth)

### Cup

- the size of the cup for transport of water will be printed by the competing teams themselves on a 3D printer
- it is not allowed to change the size or otherwise modify the cup
- the colour and the material on which the cup is printed is unimportant (ABS, ASA, PET, etc.)
- printable data for download is at:

<https://www.souepi.cz/index.php/pro-verejnost/international-robotic-competition-robo-vehicle-plzen-2020-robo-2020-as-the-challenge-towards-future-autonomous-city-mobility/>

## Evaluation criteria

### Best performance category

- **the time required to complete the whole track** (speed) - in the case of deviating off the guide line, the vehicle must be placed again at the START ; however, if the vehicle itself returns to the guide line, it can continue to the finish ; if the vehicle is put back at the START, the total time will be calculated. The vehicle can be replaced at the START three times as the maximum. The total time to travel over the entire track, including replacing the vehicle at the START, is seven (7) minutes.
- **the cup of water tips over on the track** – if the cup with water tips over, the vehicle must be placed at the START again
- the team can use up to the full time limit on the track (7 minutes) by replacing the vehicle at the START of the track several times; the fastest time to complete the track is what matters.

### Best design category

- original appearance of the vehicle (colours, elaboration of parts, quality of parts, etc.)
- protection of electronics against water
- original lighting (headlights, beacons, etc.)
- unconventional sounds (beacon, warning sounds, etc.)

### Best presentation in English

Electronic presentation by means of a computer in connection with a data projector; both team members can present the vehicle.

The presentation must be in the range of 10 minutes + 5 minutes for discussion and include:

- a brief description of the vehicle
- a description of the most challenging technical parts and their solutions
- the greatest success in construction (electronics, design, mechanical construction, programming, adjustment, etc)
- the biggest problem encountered during construction (electronics, design, mechanical construction, programming, adjustment, etc.)
- benefit to student's own professional development
- use of resources (web, literature, etc.)

For the needs of the evaluators, the competing teams will provide their presentation and the technical documentation of the vehicle in English and in pdf format.

Presentations will be provided free of charge to members of all teams after the competition.

## Description of the evaluation

The evaluation will take place between 13 and 17 January 2020 in Pilsen. The teams' presentations will take place on 14 January 2020; the competition itself will take place on 15 January 2020.

The evaluators will always be as follows: two experts from Tianjin, two from the Pilsen Region, two from the University of West Bohemia, two from Germany and two from Slovakia. Each evaluator will fill in an evaluation form from which the data will be transferred to the overall score sheet.

The evaluators will evaluate the robotic vehicles in three independent categories:

- Best performance category
- Best design category
- Category for the best presentation of the vehicle in English

## Overall ranking

### Best performance category

- the total of all times in milliseconds
- In this category, the team with the shortest run time wins.

### Best design category

(scoring 0 - 5 points; best: 5 points)

#### Evaluation criteria:

- original appearance of the vehicle (0 - 5 points)
- protection of electronics against water (0 - 5 points)
- original lighting (0 - 5 points)
- non-traditional sounds (0 - 5 points)

In this category, the team with the highest score wins.

### Category for the best presentation of the vehicle in English

(scoring 0 - 5 points; best: 5 points)

#### Evaluation criteria:

- technical documentation of the vehicle (0 - 5 points)
- presentation within the range of 10 minutes + 5 minutes for discussion comprising:
  - a brief description of the vehicle (0 - 5 points)
  - the description of the most challenging technical parts and their solution (0 - 5 points)
  - the greatest success in the construction (electronics, design, mechanical construction, programming, adjustment, etc.) (0 - 5 points)
  - the biggest problem in construction (electronics, design, mechanical construction, programming, adjustment, etc.) (0 - 5 points)
- contribution to the student's own professional development (0 - 5 points)
- use of resources (web, literature, etc.) (0 - 5 points)

In this category, the team with the highest score wins