

The international robotics competition "ROBO-VEHICLE PILSEN 2024" 4. 3. – 7. 3. 2024

Annotation

The task is to construct a robotic vehicle, present it in front of an international jury in English and drive it along a defined track in the shortest possible time. The vehicle will transport a cup with a measured amount of water, which it must not spill. Competing teams will be graded also for the design of the vehicle. There will be competition in the categories of best ride, best design, best English language presentation and overall ranking.

The competition will take place from 4 March to 7 March 2024 in the city Pilsen. If the competition team could not participate in person, it will be allowed to participate online.

The goal of the competition is to deepen cooperation between schools in the field of digital competence development. This is important for the future job market, comparing skills between schools and getting new inspiration for pupils.

Teams from the Czech Republic, the Slovak Republic, the Republic of Croatia, the Federal Republic of Germany, the People's Republic of China, the Principality of Liechtenstein, the Republic of Finland and the Republic of Turkey are invited to the competition.

Team description

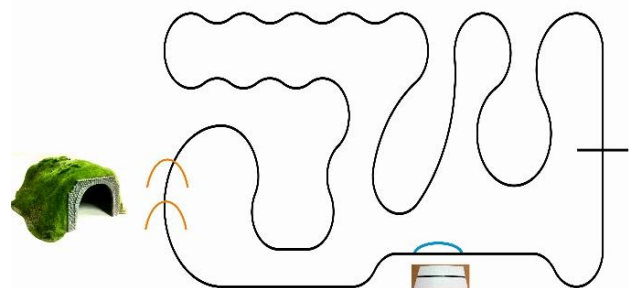
Each country can enter up to four teams in the competition. One team consists of two students between the ages of 17 and 20. During the competition the teams work independently without the intervention of their teacher or an adult.

Technical conditions

Track specification

The surface of the track is made up of a flat white sheet 2000 x 4000 mm in size, on which there is a curving black line (15 mm wide) forming a closed loop. The black line does not cross anywhere, it is not interrupted. The start and finish are formed by a black line (15 mm wide). The start and finish line crosses the main black line. The track has a small elevation. There is an unlighted tunnel on the track.

Optical sensing of the curving black line, evaluating the change in speed around the elevation



Vehicle specification

- ⊙ maximum size of the robotic vehicle (length x width x height): 200 x 200 x 200 mm
- ⊙ number of axles: no restrictions
- ⊙ chassis: no restrictions
- ⊙ motor performance: no restrictions
- ⊙ vehicle powered by: electric motors
- ⊙ the wheels/tracks and other technical mechanisms must not damage the track or its surface
- ⊙ the vehicle will consist of one unit

Vehicle control unit

- ⊙ any platform (Arduino, Raspberry, LEGO, micro:bit, Odroid, ...)
- ⊙ the vehicle must be fully autonomous and must not include any possibility of remote control (wi-fi, Bluetooth, etc.)

The water cup and its placement on the vehicle

The water cup will be built into the lining in the shape of a ring. The inside diameter of the liner will be a little larger than the outside diameter of the bottom of the cup. The water cup must stand completely freely in the lining. It must not be clamped. The inside lining must not be higher than 1,5 mm. Around the cup must be a free zone of min. 25 mm.

The cup base has a slot for fastening it onto the vehicle using M3 screws; the slot allows for some clearance in fastening the cup base to the vehicle. It is forbidden to change the shape of the cup base or otherwise modify the cup placement in any way. It is forbidden to change the size of the cup or modify its shape (the color and the material from which the cup is printed do not matter - ABS, ASA, PET, ...).

The lining in the shape of a ring



The water cup



- ⊙ not complying with the technical specification of the vehicle including the free zone around the cup 25 mm will be penalized

The elevation

- ⊙ the elevation is formed by a polystyrene mound
- ⊙ it has a black line as a guide
- ⊙ it is located in a straight part of the track
- ⊙ it is firmly fixed with the track
- ⊙ if the vehicle falls from an elevation, the vehicle must be returned on START / FINISH



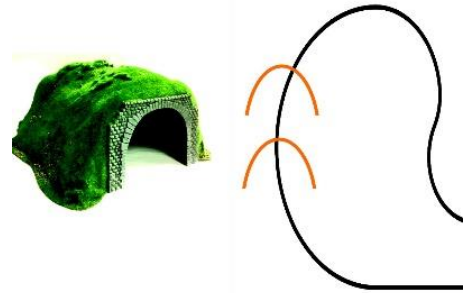
There is a red and a green dot with a diameter of 15mm. The vehicle must visibly slow down after registering a red dot and visibly accelerate after registering a green dot. When the vehicle does not change speed, the vehicle must be returned on START / FINISH.

the red dot: C: 0; M: 100; Y: 100; K:0

the green dot: C: 100; M: 0; Y: 100; K:0

The tunnel

- the tunnel is covered, without light
- inside is a black line as a guide
- it is in the left turn of the track
- it is firmly fixed with the track
- when the vehicle does not go through the tunnel,
- the vehicle must be returned on START / FINISH



The materials for the competition are available at this link <https://www.souepi.cz/robovozitko2024/>.

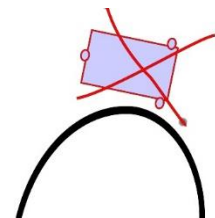
Competition rules

Best ride category

A measured amount of water – 70 ml – will be poured into the cup before the start of the competition. If the cup with water is knocked over, the vehicle must be placed at the start again and the cup must be refilled with the prescribed amount of water. A robo-vehicle transporting a cup of water must pass the track in the shortest time possible without spilling the water in the cup. The track is formed by a guiding black curved line on a white background. The black line does not cross anywhere, it is not interrupted. The start line is also the finish line. There is a tunnel without light on the track and a small elevation. The vehicle must slow down on an elevation and then accelerate on the downhill.

The vehicle must start on the black line (start/finish). The student manually starts the vehicle. The vehicle crosses the black line by itself. The vehicle will correctly drive the track and overcome all obstacles. After safely crossing the track the vehicle automatically stops behind the black line crossing the track (start/finish).

In the case of driving off the guiding black line, the vehicle must be placed at the start again (the vehicle will leave the black line with its entire chassis). It also returns to the start if the conditions are not fulfilled. Shortening the track is not allowed.



The total time to pass the track, including repositioning the vehicle at START is 7 minutes. A competition team can use the full track time 7 minutes. The time measurement will be done electronically. The best time to pass the track will be entered in the score sheet.

In this category wins the team with the shortest time to cross the track.

Best Design category

The evaluation committee monitors and assesses:

- original vehicle fairing (color, build quality and sophistication, ...)
- protection of the electronic components from water damage
- lighting effects (headlights, flashing lights, ...)
- untraditional sounds (siren, warning acoustic signals, ...)

In this category wins the team with the highest number of points.

Best Presentation in English category

An electronic presentation (format .ppt; .pptx; .pdf). Any format of presentation will be penalized by deduction of points.

The presentation must include:

- a brief description of the vehicle
- a description of the most interesting technical parts and their solution
- the greatest success in constructing the vehicle
(electronics, design, mechanical construction, programming, fine-tuning, ...)
- the biggest problem in constructing the vehicle
(electronics, design, mechanical construction, programming, fine-tuning, ...)
- the benefits for one's own professional development
- references to resources used (websites, publications, ...)

Students will present on a computer with a projector. Both team members can present. The presentation is for a maximum of 10 minutes. After the presentation, the evaluation committee has up to 5 minutes for questions. The presentations will be provided free of charge to all contestants after the competition. In this category wins the team with the highest number of points.

Evaluation description

The evaluation committee consist of experts from the University of West Bohemia and possibly other experts of universities from the participating countries.

The evaluation committee will evaluate the following categories:

- Best ride
- Best design
- Best presentation in English
- Overall best team

Awards

1st to 3rd team in the Overall best category; The cups and the diploma ROBO 2024 for the top 3 teams

1st to 3rd team in the Best Ride category; prizes for the competitors

1st to 3rd team in the Best Design category: prizes for the competitors

1st to 3rd team in the Best Presentation in English category: prizes for the competitors

Techmania Science Center, o. p. s. will present prizes for the popularization of science

All competitors will receive certificates of participation.

Both members of the team receive the same prizes.

Competition organizers

The Pilsen Region

The University of West Bohemia

The Secondary Vocational School of Electrical Engineering, Pilsen

Competition partners

Techmania Science Center o. p. s.
New technologies – Research centre, The University of West Bohemia
Faculty of Applied Sciences, The University of West Bohemia
Ladislav Sutnar Faculty of Design and Art, The University of West Bohemia

Contact information regarding the organization of the competition

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