robotex International

MULTI TERRAIN PASSING

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1 Introduction

The aim of this competition is to create a self-driving robot that can pass through tough terrain. The teams need to design and build a self-driving robot that can traverse through difficult terrain, pick up an object and return to home base with the object. The restrictions on building the robot are size, weight and budget.

2 Competition Field

1. The Competition area is approximately 1000 x 3000 mm.
2. There is a 20±1 cm high wall around the competition area.
3. The competition area contains 3 different terrain types: sand, stone and gravel. Additionally, there are smaller obstacles through out the whole competition field.
4. At the start of the competition area there is a home bas approximately 1000 x 500 mm in size.
5. The end of the home base is marked by a 50 mm wide blue line (RAL 5005 blue).
6. At the end of the competition area there is the sample gathering area, the start of which is marked by a red line.
7. The size of the sample gathering area is approximately 1000 x 500 mm.
8. The start of the sample gathering area is marked by a 50 mm wide red line (RAL 3020 red).
9. At the sample gathering area there is 1 measuring cup without handle, that contains liquid.
10. The measuring cup is approximately 200 ml. The image below serves as an example:

(*Photo from Arkanlabs, https://www.arkanlabs.com/measuring-cup-210-ml*)

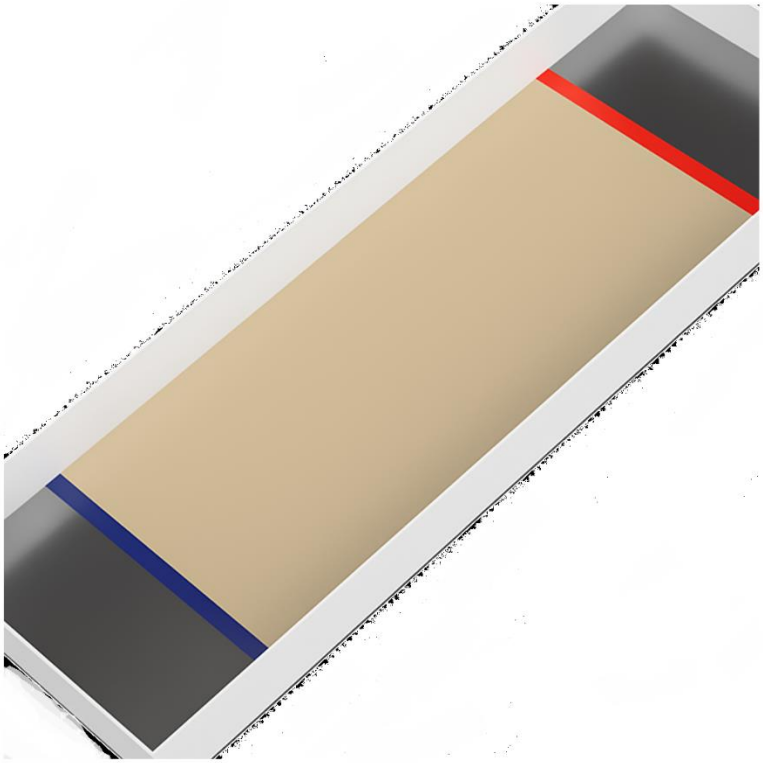

Image 1 - example competition field, the obstacle area is beige

3 The Criteria for Robots

1. The robot must be autonomous.

2. The maximum dimensions of the robot during starting position are 20 x 20 x 20 cm and mass 2 kg.

3. The robot may increase in size after starting up to +10 cm to all dimensions (meaning the robot can increase its size to be 30 x 30 x 30 cm after the start).

4. The maximum budget for building the robot is 180€ (VAT included). The price of components must be shown and submitted as a separate table. The components that the team possessed before the challenge must be assigned a value that is equal or near to the market value of those components. **NB! If the jury sees that the cost of building the robot clearly exceeds the budget, the jury reserves the right to disqualify the team from competing**.

5. These criteria also prohibit the usage of study robots such as LEGO NXT, EV3, Spike as well as Makeblock mBot etc.

6. The cost of simpler structural elements is not counted towards the budget, such as

3D printed elements and plywood / plex glass details.

7. The robot cannot damage the competition field nor be dangerous to spectators.

8. The robot cannot use a voltage higher than 24 V.

9. The robot must have a start / stop button or a remote controller to start and stop the robot.

4 Competing

1. The competition takes place in 3 rounds. Each team has 1 attempt per round.
2. The team who gathers the most points wins. The points are distributed in the following manner:

    - Driving through the whole course successfully (from base to the sample area and back to base) gives +30 points. To be counted towards successful navigation means crossing the line of the sample area (from top-down view) and crossing the line of the home base (from top-down view).

    - The robot may go to the sample area and back multiple times during one try however the points for successful navigation are only given once per attempt (meaning going back and forth does not stack +30 points per cycle).

    - Each **+10ml** of liquid above 150ml in the measuring cup that is transported back to home bas gives **+5 points**.

    - Each **-10ml** of liquid below 150ml in the measuring cup that is transported back to home bas gives **-5 points**

3. The robot will be inspected by a jury pane which awards a maximum of +20 points for the following criteria:
    - General solution and budgeting: **5 points**
    - Software design and solution logic: **5 points**
    - Teamwork and work distribution: **5 points**
    - Design (visual aesthetic and cleverness in design): **5 points.**
4. Points for successfully completing the course and gathering the samples are summed up from all three rounds and the jury points are added on top of this score.
5. Each attempt can yield a maximum of 60 points (30 points for navigation + 5 x 6 points for sample gathering). For all three attempts then it is possible to gather a maximum of 3x60 = 180 points. Adding the jury score (of up to 20 points) and the bonus points (up to 20 points) to the 3 attempts score yields a maximum of **200 points** for the whole competition.
6. The robots must start their attempt on the command of the competition judge.
7. The robot must start moving a maximum of 3 seconds after the start command. If the

robot does not start moving within 3 seconds of the start command, the attempt is counted unsuccessful.

8. The maximum time for completing all assignments is 3 minutes. Surpassing this limit all other actions are discounted towards the attempt.
9. If no robot can complete the course in 3 minutes, the robot that reaches the furthest wins.
10. One team can have up to 3 team members.

5 Organization

1. The organizers do their best to ensure smooth lighting conditions during the competition, however they cannot guarantee an arena without shadows with perfectly distributed lighting conditions. **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.**
2. 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.
3. Technical inspection must be completed by the time that is specified by the organizers.
4. All questions and problems arising during the competition are solved by the referee.
5. The final decision regarding any appeals is made by the referee and/or the organizers. All complaints must be reported to the referee during the match or right after the ending of the match. Complaints filed later will not be accepted. The final decision regarding any disputes or inconsistencies is always made by the referee.

6 Amendments to rules

Changes and amendments to the rules are made by the competition coordinator according to the competition organization committee regulations.