robotex

ARMENIA

AUTONOMOUS
ROBOTS IN THE
CLEAN CITIES
RULES

Avag Sayan
+374 55 288 144
avag.sayan@uate.org

UATE

CONTENT

1. AIM OF THE COMPETITION OR COMPETITION OBJECTIVES

1.1. The competition aims to encourage and publicize interest in robotics, programming, and design, to build interest in the fields of robotics and engineering and to develop engineering thinking. Moreover, competition is a platform for youth involved in robotics and programming to demonstrate their knowledge, skills, and abilities.

2. COMPETITION TASK AND STAGES

2.1 The Robot must move across the streets of the urban environment built on the playing area and reach the FINISH line by implementing the following actions:

- parking,
- cross crossroads with traffic lights,
- dispose trash bins,
- extinguish fire.

*Robots representing 2 teams will compete on the playing area during each competition period.

2.2. During the competition period the top teams that scored the maximum number of points will transfer to Final stage. The team with maximum number of points will be the winner.

3. DEFINITIONS

3.1 Team members:

• Children between the ages of 10 and 18 may be involved in the teams.

• The maximum number of team members is 5 (including the Team Mentor).

• One of the team members must be a team leader (moderator).

The team mentor should keep the distance of 3-4 m from the playing area and is not allowed to interfere in the process after the start of the competition period.

3.2 Area specifications

The competition area is a model of a small urban environment. It is classified as a green and clean city and the cleanliness of the city should be ensured by the robots.

The competition area is rectangular shaped space with a maximum of 5 x 5 meters. Area's border walls height is 10 cm, ensuring that the robots can't exit the field.

The playing area consists of the following conditional components:

- **Parking areas or charging areas**: rectangular 49 x 45 cm spaces with a wireless charging logo. The color of the road floor is dark-gray. The roads are routed with white interrupted lines. There will also be a wireless charging symbol at the surface of the parking area. The color of the parking space is blue:
- **Trash bins/baskets:** green colored, 10 x 6 x 6 cm cuboids. The separated section for the trash bin is a 49 x 45 cm rectangular area.
- **Traffic light crossroads:** traffic lights with a height of 15cm. The colors of the lights will change according to the standard traffic lights red and green. The light diffraction range is approximately 20-30 cm, which can distinguish color sensors. In addition to the traffic light, there are also 30 x 2 cm (L x w) led lights on the intersection of crossroads that works in parallel with the traffic light.
- **Fire-pushing section:** This is a separate area of 49 x 45 cm with a 10x10x15 cm burning small house there, the front part of which is open with a fire burning inside. There is no any roof. The fire is a candle/alcohol type burning cylinder with a diameter of 1 cm.
- **Roads and Paths:** Roads have a width of 30 cm. The robot's motion paths are marked with 4-5cm white-striped lines along the center of the road. Dark gray 4-6 cm width and 6-8cm height walls will be along the borderlines of the roads.

1, 2 or 3 brown line hinting indicators will be in the areas of the parking spots, trash bins and crossroads.

3.3 Field Scheme

The competition area has two equally distributed START points. In the middle part of the area there is a 20cm height bridge (bridges) connecting the 2 sides of the area.

From below link you can find the schemes and sizes of the competition area.

Competition area schematics
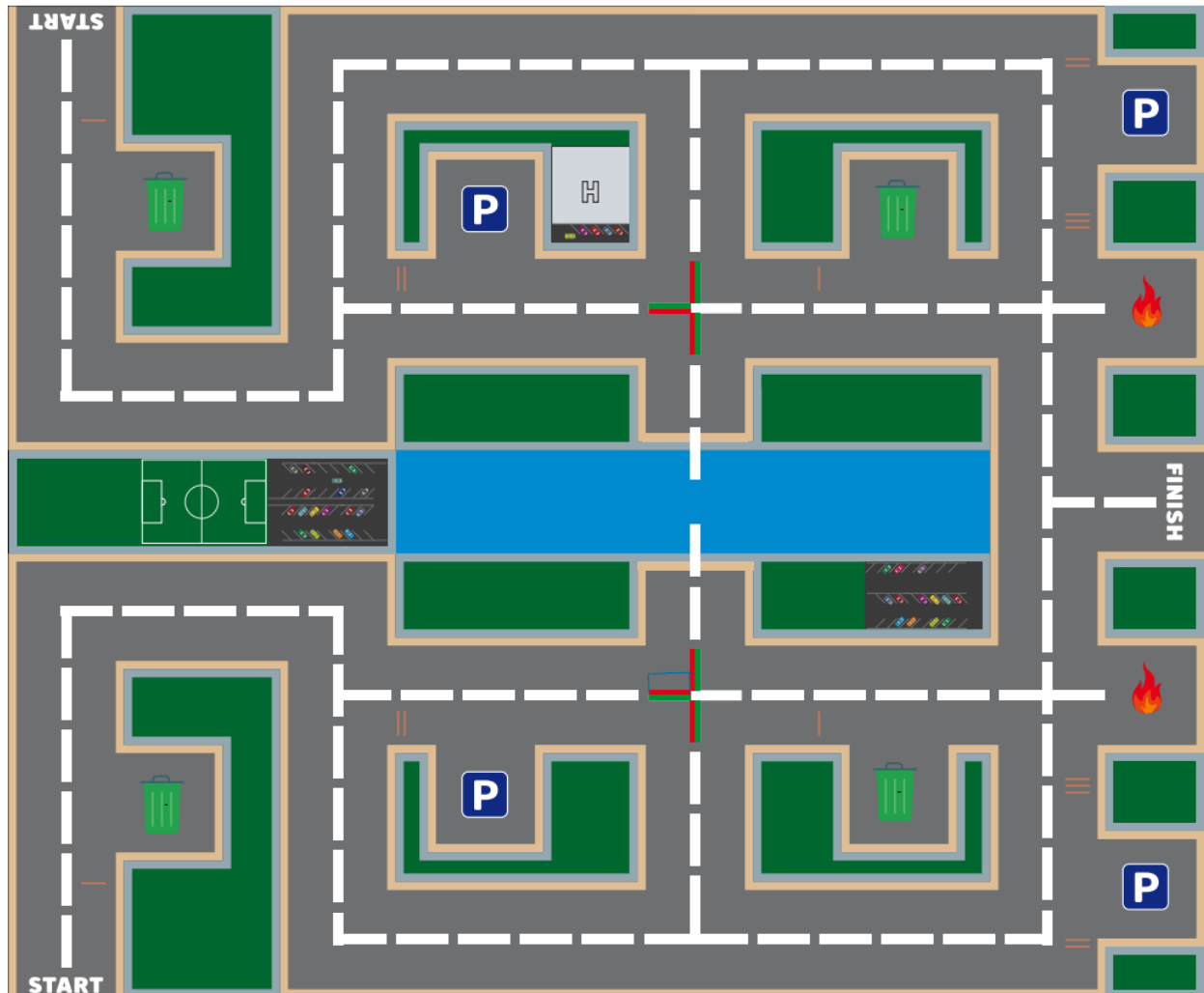
The field

4. THE ROBOT

4.1 Specifications

Before the launch of the competition, the maximum dimensions of the robot are limited to 25 cm x 25 cm x 25 cm. The weight of the robot, including all the details and parts, should not exceed 10 kg.

There are no restrictions on the types of robots' movements. It can stand straight, move on wheels, roll, walk, jump, etc.

The robot must have a specific and unique design. Design elements and engineering solutions implemented by different types of equipment and machines (three-dimensional printer, milling machine, laser machine, etc.) will also be evaluated.

4.2. Visible Signs (Beacons or pharos)

The team can place up to 4 beacons out of the competition area. The beacons

should be placed on a 2 m distance from the competition area walls. The beacons can be of the following types: RF Transmitter, Illuminator / IR Emiter, Voice / Ultrasonic Pointer, paper images that can be recognized by the robot's camera. The RF transmitter must satisfy one of the free frequency broadcast layers at the competition site.

4.3 Inertial measurements

Robots can use mechanical and/or electronic accelerometers, gyroscopes and compasses. Other types of detectors, like optical coders, can also be used.

4.4 Control

After the launch, the robot must be controlled independently without the support of any person (automatic software solution).

The controller must be embedded into the robot. The SERob3 controller will be sent to the teams after the required registration.

The Robotex Armenia Organizers team will preliminary support the teams in getting familiar with Serob 3 device. Anyway, the teams are free to choose any control panel they want (Arduino, Arduino_based, RaspberryPi, Rpi_based, BananaPi, OrangePi or another type of single-board controller).

The operations of the robots are based on the information received from the sensors. The software and the circuits of the robot should be open and visible to the jury members.

4.5 Energy source

The robot must be powered by a built-in power source, such as a robot-mounted battery, and must meet the time requirement of 8 minutes. The robot cannot be powered by an external wired stationary energy source.

5. COMPETITION PROCESS

5.1. Pre-match settings:

On the competition day, the competition is launched when the 2 robots simultaneously enter the urban environment competition area (according to the results of the list of teams decided through the lottery).

 "Competition Zone" is the area and the space surrounding it. No one is allowed to

enter the Competition Zone except the robot controller and the judge (jury member). Additional preparation time is given for the robot to enter the field.

5.2. Competition process:

The proposed standards for the robots are checked by the jury, after which the robot is placed on the start line. The start is given only by the referee's order.

- The competition period is 8 minutes. During this time the team should perform all tasks.
- The maximum number of start launches of the robot is 3.
- The competition area is conditionally divided into 4 zones. Each zone is designed for a certain task solution.
- After the completion of each zone, the team is earning points.

The robot is placed in its appropriate place on a started area. The starting process should be done by one of the team members (mentor or manager cannot). The robot starts its movement after the announcement of the launch. The following items will be located on the road:

- **Trash bins**, which the robot should take with hand or with the help of another lever, raise it and reinstall it to the initial place.
- **Stops**, where the robot must stop, perform the charging of the wireless battery at a predetermined time of maximum 10 sec and then move forward. Additional points are earned during the stop time. After 10 seconds, no points are earned.
- **Traffic lights crossroads**, where the robot can cross only if the green light is on, otherwise, no point will be accumulated for crossing the crossroads. Led lights on the roof.
- **The fire area**, which is a conventional small house with open windows (without roof) and a fire inside. After approaching the house, the robot should extinguish the fire (with the help of wind, sand, water, or another method).

During these stages, the team will receive pre-defined points for each correct action. Out of the 2 competing robots, the one that will get to the FINISH line and get the highest score will pass to the final stage.

6. SCORING

6.1. Upon the end of the competition period, each team will score points by the following determinants

- overcoming the first part of the urban model,

- overcoming the second part of the urban model,

- overcoming the third part of the urban model

- overcoming the last part of the urban model

- each parking/stop,

- each crossroad passed when the green light is on,

- each trash bin/basket disposal,

- the design or the external look of the robot,

- the mechanical – engineering solutions of the robot.

7. WINNERS AND PRIZE TEAMS

The teams that scored the same number of points will compete against each other during the next rounds after which the winning teams will be determined. The winner is chosen according to the accumulated number of points earned during the competition.

Upon the jury's decision, the Competition winner, as well as the 2nd and 3rd prize winners, will be awarded monetary and/or non-monetary rewards, and some teams may also receive encouraging rewards.

All disputed issues arising during the competition are resolved by the jury as a result of discussions.

THE FINAL COMPETITION WILL BE HELD ON 9TH OF NOVEMBER.
TO BECOME A PARTICIPANT, YOU NEED TO FILL IN THE <u>FOLLOWING APPLICATION FORM</u> TILL 15TH OF August.