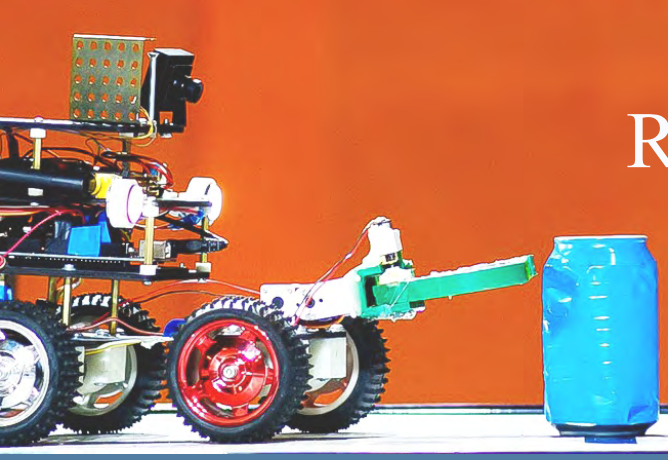


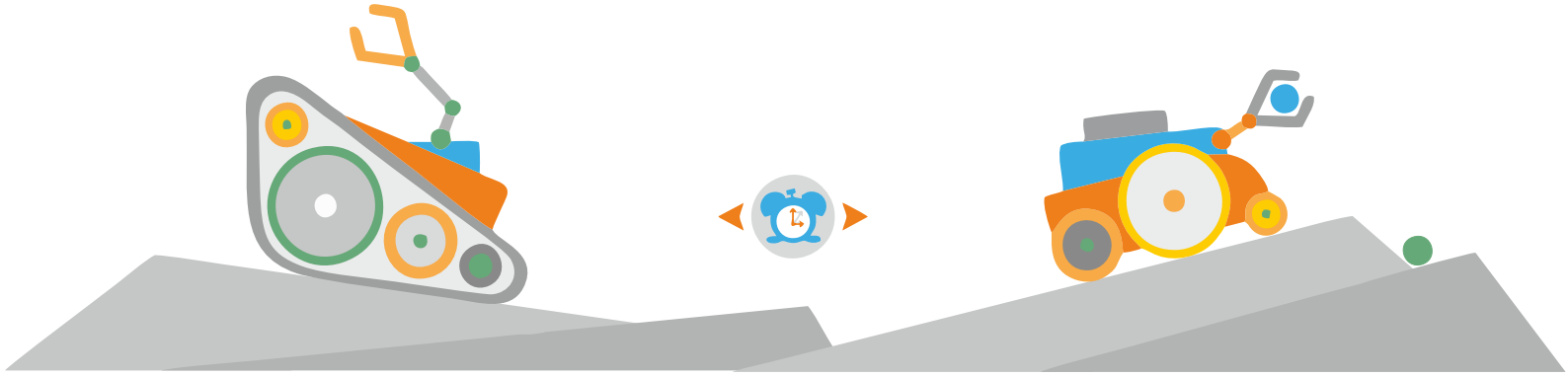
RTC CUP COMPETITION REGULATIONS
International stage

1. General Provisions

1.1. At the RTC CUP competition, the participants are presented with a polygon on which areas of varying complexity are modeled: from rugged terrain to the consequences of disasters such as earthquakes, tsunamis, landslides, mud falls and so on.

The purpose of the competition at such a training ground is to inspire and stimulate young robotics engineers to create robots that can work in extreme situations, completely replacing a person, or acting as an assistant.

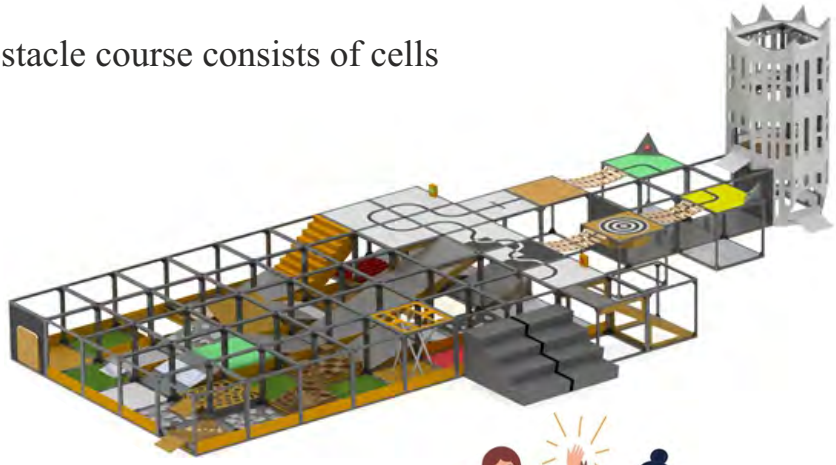
1.2. At the RTC CUP competition, the robot must pass the largest number of landfill sections in the allotted time, performing the assigned tasks.



2. Test Arena (Polygon)

2.1. The automated, reconfigurable obstacle course consists of cells enclosed by a metal profile.

2.2. The configuration of the polygon changes every competition and is not communicated to the participants in advance.



3. Requirements for the team. Nominations

3.1. The robot can only have one operator.

3.2. One participant can only be involved in one team during the current competition.

3.3. It is allowed to change the robot operator between attempts (laps).

3.4. A team has the right to exhibit only one robot, and only in one nomination during the current competition.

3.5. The age of each team member must meet the nomination requirements.

3.6. Competitions are held in two categories:

SEEKER

The operator can observe his robot directly.

Age: from 7 to 14 years old inclusive

two robots can pass the polygon from different teams at the same time!

EXTREME

The operator does not see the robot. The control is carried out using the robot's video vision.

Age: 7 years old and older

there is one robot on the training ground!

*** If the team members are 17 or more years old, then they are representatives of the older age category - "Extreme PRO". This means that there is a separate mandatory task for such teams. "Extreme" and "Extreme PRO" are awarded together (one trio of winners).**

4. Requirements for the robot

4.1. Basic requirements:

Maximum weight - 10 kg

Power supply on board

Wireless control
(range - not less than 10 m)

Recommended dimensions - no more than
350x400x400 mm (HxLxW)

4.2. Allowed:

Any element base

Own wi-fi network

4.3. Is prohibited

IR remote

Harm to others
(communication interference, dangerous structures)

5. Course of the competition

5.1.

30 minutes before the start of their attempt, the team must be near the range

5.2.

The transfer of an attempt is possible no later than one attempt before arrival. Carrying over carries a penalty to the future outcome of the attempt

5.3.

3/7

From the moment the participant is called, time starts to prepare for the start: "Seeker" - 3 minutes
"Extreme" - 7 minutes

5.4.

10 minutes are allowed to try

5.5.

The competition consists of 2 attempts for each team. The best attempt goes to the final list of points

5.6.

There are two start fields on the range. The first attempt starts from the specified start, and the second from the opposite

5.7.

Each of the presented polygon cells is optional, the operator himself decides how to build his route

5.8.

For re-passing the cell, points are not awarded

5.9.

Only one team member can be on the site - operator

5.10.

If you try to talk to the operator, the team is disqualified

5.11.

Management intervention (repair) can be carried out by both the operator and any team member

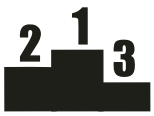
5.12.

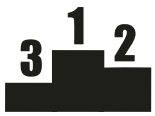
Holding the enemy robot in any way for 20 seconds is considered stuck. Both robots move to the previous cells without penalty.

5.13.

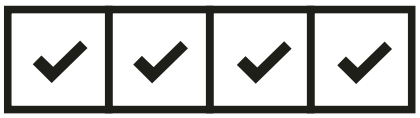
You can stay in one cell of the polygon for no more than 2 minutes. If the robot does not leave the cell, it is considered stuck and moves to the previous cell with an intrusion penalty.

6. Assessment criteria

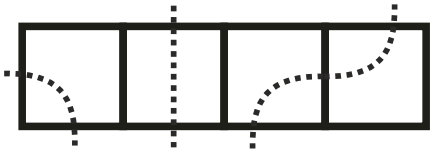




6.1. "Seeker" and "Extreme" are evaluated according to a single point system, but are awarded separately

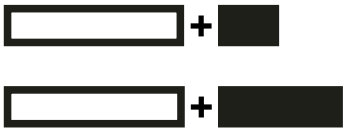


6.2. Points are awarded for passing the polygon cells and completing tasks



6.3. A cell is counted if the robot entered it with its entire base, and left the other end (exception - dead-end cells)

6.4. If two teams have the same number of points, the team that completes the attempt in less time wins



6.5. In case the time is also the same, the team with the highest total score in two attempts wins.

7. required tasks

7.1. To get the results of an attempt into the offset, it is necessary to have and use:

Seeker

Extreme (to 16 years old inclusive)

7.1.1. functional sensors or manipulator (successful completion of any task using elements of autonomy or manipulator)

Extreme (17 years old and older)

7.1.2. functional sensors (successful completion of any task with the use of autonomy elements)

7.2. To demonstrate the operation of the manipulator, you must complete one of the following tasks:

- **door opening (by yourself, by the handle)**
- **button press**
- **pipe rotation / extraction**
- **valve opening / closing**
- **wreck / ball / beacon capture**
- **the implementation of the revolution of the robot by the manipulator**

7.3. To demonstrate how the sensors work, you must complete one of the following tasks:

- **must complete one of the following tasks:**
- **line movement (one cell)**
- **autonomous wreck / beacon capture**
- **movement along the inner wall of the polygon (one cell) reading QR code by robot**
- **robot reading danger sign**
- **autonomous robot flip**

8. Judging

8.1. At the end of the attempt, the operator signs the score sheet, agreeing with the results of the attempt.

8.2. The protocol is not intended for use by participants. It is forbidden to photograph or copy the protocol.

8.3. Control and summing up of the results is carried out by the panel of judges in accordance with the rules of the competition.

8.4. Appeals are accepted in handwritten form within an hour after the announcement of the results.

8.5. Disputes arising during the competition are resolved by the panel of judges on the spot.

8.6. Participants must obey the decisions of the panel of judges.

9. Rewarding

9.1. Each participant in the competition receives a Diploma for participation.

9.2. Prize-winners (I, II and III places) in each nomination are awarded with Diplomas and cups indicating the prize-winning place, and also receive commemorative prizes.

9.3. Prize-winners of the qualifying stages of the competitions taking place throughout the year are automatically credited to the list of Finalists and take part in the RTC CUP: Final.

Read more about additional privileges for the winners of the RTC CUP: Final on our website cup.rtc.ru

ANNEX TO THE REGULATIONS
COMPETITIONS
"RTC CUP»
international stage

Description of the polygon and points

The polygon for the RTC Cup competition was developed at the Russian State Scientific Center for Robotics and Technical Cybernetics. It has a unique patented design.

The polygon is a reconfigurable obstacle course, a maze of sections that simulate rough terrain and urbanized environments, as well as the aftermath of disasters.

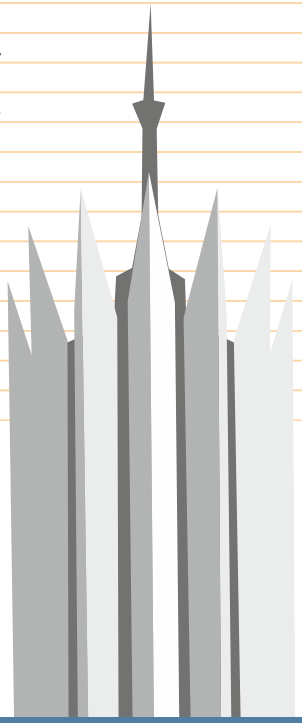
Each test and task at the test site is justified from the point of view of combating emergency situations.

The points for passing the polygon are strictly regulated and are not negotiable.

The assessment of the passage of the robot by the polygon is carried out by the forces of the panel of judges. In the event of a disputable situation between the team of participants and the panel of judges, the decision remains with the Chief Judge of the competition - Oleg Aleksandrovich Shmakov.

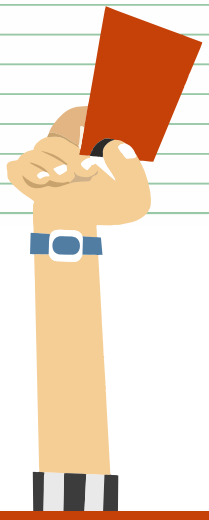
Table of contents:

1. Tests



1.1. Inclined and stairs

2. Tasks



3. Special challenge "Tower»

4. Penalties

Terms

Competition is a separate RTK Cup event; qualifying stage or final.

Proving Ground (hereinafter "Polygon") - the track on which the RTK Cup competitions are held. Consists of separate cells with tests, fields for autonomous passage and a special test "Tower".

Cell is a cube or square with a side of 800mm, limited by a metal profile. Part of the polygon. The cells contain tests, tasks, or empty plywood platforms. The inner size of the cell is a cube or square with a side of 720 mm. All mesh elements are made of painted plywood, unless otherwise stated.

A test is an obstacle inside a cell that serves to demonstrate the capabilities of a robot. An exception is the Tower test, which is not located inside the cell, but is a separate part of the test site. The test is placed in one cell unless otherwise specified. The test occupies the entire face area of the cell unless otherwise specified.

Task is a certain order of actions with objects located on the polygon or outside of it.

The **beacon** is an aluminum cylinder of a certain color with a diameter of about 65mm and a height of about 110mm. Serves as a generic object for performing some tasks.

Symbols

A difficult test or task, overcoming or completing which gives the right to receive a special token for passing the "Tower" challenge.

1. Tests

Ball pool

A layer of ping-pong balls with a thickness of 40 to 150 mm, located in a recess between any two inclined tests or in a deep box without auxiliary exits, located in one cell (box depth - 15). The diameter of the ball is 40 mm.

Tasks:
Overcome the challenge.

Goals:
This section serves to demonstrate the high cross-country ability of the robot. High maneuverability and good robot control skills are also required to pass this test.

Rationale:
The consequences of hydrodynamic accidents are the breakthrough of dams (dams, sluices, bridges) with the formation of breakthrough waves and catastrophic flooding.

8 points

Logs

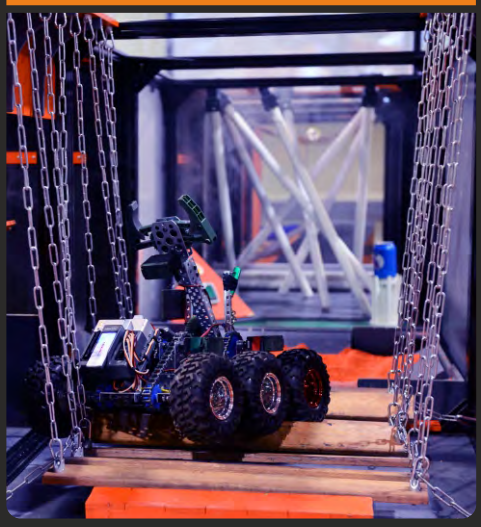
The test is a bridge made of planks. The width of one plank is 65 mm, the distance between the planks is 35 mm.
All planks of the bridge are connected by a chain, and move apart to a width of no more than 65 mm. The width of the bridge is 500 mm. The height of the bridge relative to the floor of the cube is 80 mm. Check-in is carried out from a box or with a special attached slope. The test is housed in one standard 800 mm high cube.

Tasks:
Overcome the challenge.

Goals:
This test is intended to demonstrate the robot's patency on variable geometry surfaces and its suspension capabilities.

Rationale:
Simulation of work in emergency conditions in buildings, communications and technological equipment of industrial facilities.

10 points



Gueraki

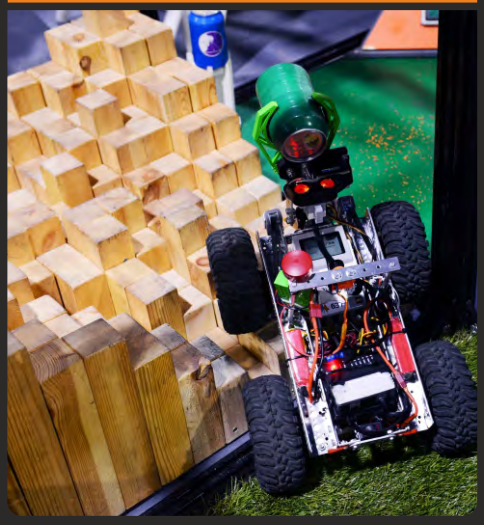
The construction is made of 50x50mm wooden blocks of different lengths, installed vertically, tightly to each other. The test is housed in one standard 800 mm high cube.

Tasks:
Overcome the challenge.

Goals:
The passage of such a surface demonstrates the patency of the robot and the power of its motors, as well as its ability to overcome difficult terrain.

Rationale:
Simulation of the consequences of geological (exogenous geological) emergencies - landslides, mudflows, landslides, talus, avalanches, slope washout, subsidence of loess rocks, subsidence (landslides) of the earth's surface.
Simulation of the consequences of geophysical and cosmogenic emergencies - earthquakes, volcanic eruptions, falling asteroids.

17 points



Hypnodisk

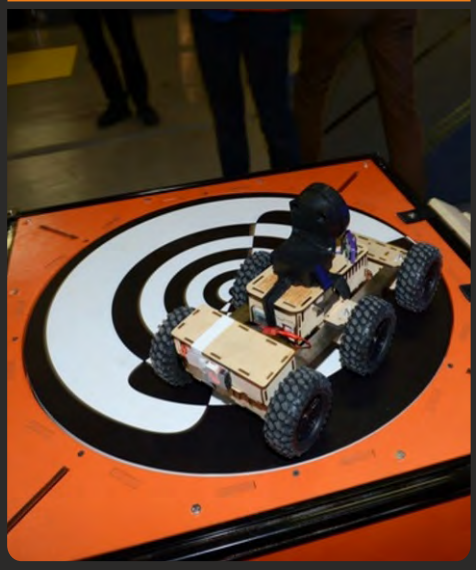
The hypnodisc is a standard labyrinth cube, in which there is a disc with a diameter of 650 mm rotating at a variable speed, fixed in the upper cover. Disc material - plywood 10 mm. The surface of the disc is covered with vinyl.

Tasks:
Overcome the challenge. If the robot fell from the cube, but did not move off it, points are not awarded.

Goals:
This test is intended to demonstrate operator control skills.

Rationale:
Simulation of meteorological emergencies - storms, hurricanes, tornadoes, squalls, vertical eddies.

8 points



Slide with pipes

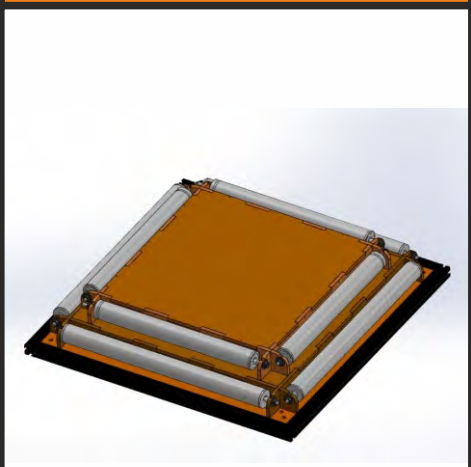
The obstacle includes a base in the form of a stepped body, consisting of two levels. Rotating pipes are fixed to each of them before entering. Step height - 50 mm.

Tasks:
Overcome the challenge.

Goals:
This section is necessary to demonstrate the patency of the robot.

Rationale:
Simulation of work in emergency conditions in buildings, communications and technological equipment of industrial facilities.

7 points



Door

A door that opens in both directions at 90 ° (towards and away from you) with a handle of the "rod" type. Overall dimensions of the door - 480x480x8 mm. To open the door from yourself / to yourself, an effort of 200 g (2 Newtons) is required, because in the zero position, the door is held by magnets located on the door jamb and at the end of the door opposite each other. The height of the door handle above the floor is 220 mm, the thickness of the handle is 8 mm, and the length is 110 mm. Handle material - metal. The test is housed in one standard 800 mm high cube, which can contain an additional test.

Tasks:
Open the door towards yourself or away from you (in the second case, it is necessary to bring the door to the "open" position at an angle of 90 °).

Goals:
The door is intended to demonstrate either the accuracy and functionality of the manipulator or the maneuverability of the robot.

Rationale:
Simulation of opening doors in buildings for further elimination of fires, explosions or explosion threats.

pull - 6 points, push - 1 point

Blockage

The test is a standard polygon cube, the lid of which is cut out of plywood, to which multidirectional polypropylene pipes are attached using metal card loops. Thus, the pipes block the path through the cube.

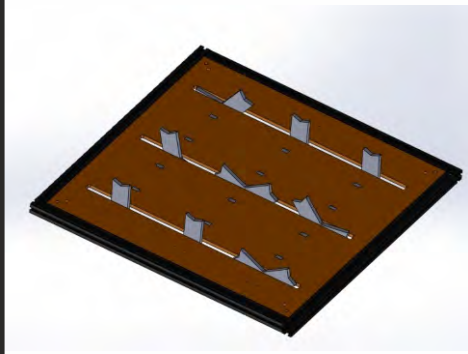
Tasks:
Overcome the test by pushing the pipes back in different ways: with a robot body or a manipulator.

Goals:
The blockage tests the robot's patency, the power of its motors, the structural strength and the functionality of the manipulator.

Rationale:
Simulation of work in emergency conditions in buildings, communications and technological equipment of industrial facilities.

5 points

Asterisks



A test involving a flat base containing parallel slots. Inside the slots, there are rotating three-rayed stars attached to rods located on the back of the base. The stars protrude 50-70 mm above the surface.

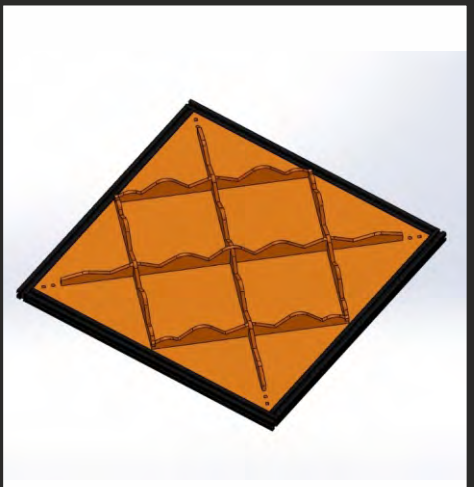
Tasks:
Overcome the challenge.

Goals:
This test is intended to demonstrate operator control skills and robot maneuverability.

Rationale:
Simulation of work in emergency conditions in buildings, communications and technological equipment of industrial facilities.

6 points

Hedge



The test includes a flat base with plywood strips with a wave-like edge. Plywood elements are made in the form of long flat strips fastened to the base located at right angles to each other and fastened to each other. The height of the slats above the surface ranges from 20 to 70 mm.

Tasks:
Overcome the challenge.

Goals:
This section is necessary to demonstrate the patency of the robot.

Rationale:
Simulation of work in emergency conditions in buildings, communications and technological equipment of industrial facilities.

8 points

Stones

Test, which is a sheet of plywood with pieces of broken stones attached to it, with sharp corners and strong differences in height. The average height of the stone layer is 40 mm. Platform dimensions 740x740x50. The test is placed in one standard cube or in a square.

Tasks:
Overcome the challenge.

Goals:
A stone platform to demonstrate the robot's patency, engine power and suspension capabilities.

Rationale:
Simulation of the consequences of a sudden collapse of buildings and structures.

3 points

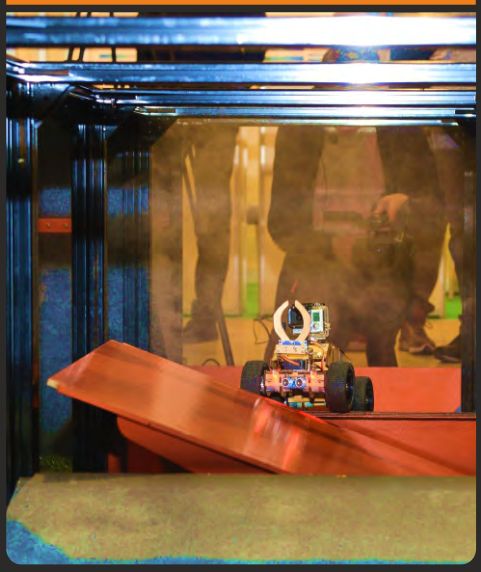
Swing

Plywood fixed on an axis running in the middle of the cell. The swing is located at a standard inclined 15 ° height. The maximum swing angle is about 30 °.

Tasks:
To overcome the test from one incline to another, for which it is necessary to drive exactly along the axis, keeping balance.

Goals:
This obstacle demonstrates the responsiveness of the robot and the skill of the operator.

Rationale:
Simulation of the consequences of geophysical emergencies - earthquakes, volcanic eruptions, as well as sudden collapse of buildings and structures.



6 points

Expanded clay

Test, which is a box filled with expanded clay, with a particle size of 10-20 mm. Box dimensions 720x720x100. The height of the expanded clay layer ranges from 20-30 mm. Inside the box there are inclined ramps; outside, inclined surfaces with an angle of inclination of no more than 30 ° are attached to the box.

Tasks:
Overcome the challenge.

Goals:
This section is necessary to demonstrate passability on crumbling surfaces.

Rationale:
Simulation of the consequences of a sudden collapse of buildings, structures, as well as the consequences of geological (exogenous geological) emergencies - landslides, mudflows, landslides, debris, avalanches, slope washout, subsidence of loess rocks, subsidence (landslides) of the earth's surface.

3 points

Hoof

A structure representing a sharp rise (30 °), turn and descent (30 °). The structure is covered with carpet for better traction on the rise and fall. Lift height - 200 mm.

Tasks:
Overcome the challenge. The test can be either fenced off with walls to restrict the movement of the robot exclusively along the entire length of the bend, or not fenced at all. In the second case, the robot can act as in the case of standard tests: enter from one side of the cell and exit from it from either side.

Goals:
The test evaluates the robot's maneuverability, balance and moment on wheels.

Rationale:
Simulation of the consequences of geophysical emergencies - earthquakes, volcanic eruptions, as well as sudden collapse of buildings and structures.

5 points

Roof

Test, which is a piece of roofing sheet (ondulin), fixed on a plywood platform. Overall dimensions of the test - 740x740x40 mm.

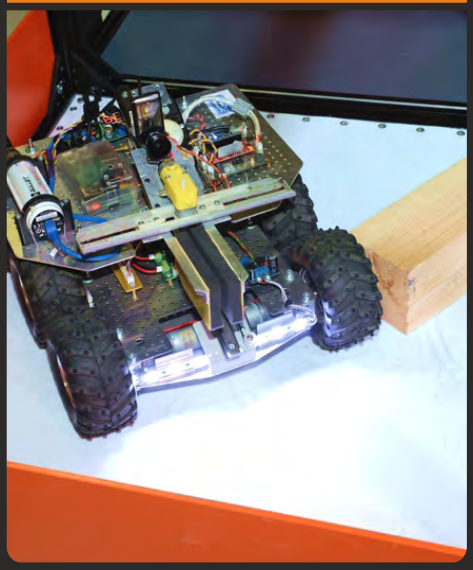
Tasks:
Overcome the challenge.

Goals:
Demonstration of the robot's patency, engine power and suspension capabilities.

Rationale:
Simulation of the consequences of geophysical emergencies - earthquakes, volcanic eruptions, as well as sudden collapse of buildings and structures.

3 points

Ice



Slippery surface (PTFE plate) attached to a plywood sheet. Overall dimensions 740x740x10 mm. For greater slipperiness, WD-40 universal grease is applied to the surface.

Tasks:
Overcome the challenge.

Goals:
The ice is used to demonstrate the quality of the traction of the wheels / tracks of the robot with the surface.

Rationale:
Hydrometeorological emergency - severe ice.

2 points

Forest

The test is a standard polygon cell covered with artificial grass. In the cell, type-setting structures made of artificial grass, imitating trees (bushes), are randomly located. The maximum diameter of the grass circle is 150 mm, the maximum height of the typesetting unit is 110 mm.

Task:
Overcome the test, if possible, bypassing the hills (drive through the forest).

Goals:
Demonstration of the maneuverability and maneuverability of the robot.

Rationale:
Driving over rough terrain, through thickets, forest.

4 points

Luke

The test, located on the 2nd floor of the labyrinth, in a cell with a hatch instead of a floor, as well as a special beacon. When the beacon is removed, a timer is started. After the expiration of time (4 seconds), the hatch opens, and if the robot is still in the cell, then it falls to the 1st floor of the labyrinth, onto the foam rubber floor.

Tasks:
Capture the lighthouse and leave the cell within the allotted time. If you shoot down a lighthouse, then points are still awarded. Further, it is supposed to deliver a special beacon to a special field (not necessarily for execution).

Goals:
This test is intended to demonstrate the operator's control skills as well as the functional characteristics of the manipulator, including its accuracy and power.

Rationale:
Simulation of work in emergency conditions in buildings, communications and technological equipment of industrial facilities.

activation - 4 points
foam rubber under the hatch - 1 point

Mines

Mines are cylinders resembling washers, recessed into the surface of a cell with grass.
The activation of the mine is accompanied by a light signal. Each mine can be activated only once per attempt. The diameter of the mines can range from 40 to 100 mm. The distance between mines is not less than 400 mm.
Demining:
The robot can deliberately defuse a mine, for example, by clicking on it with any foreign object. At the same time, during the demining process, the robot cannot touch the mine with any of its parts. The robot receives points for clearing each mine.
Undermining on a mine:
For hitting a mine or activating a mine with any part of the robot, the team receives a penalty.

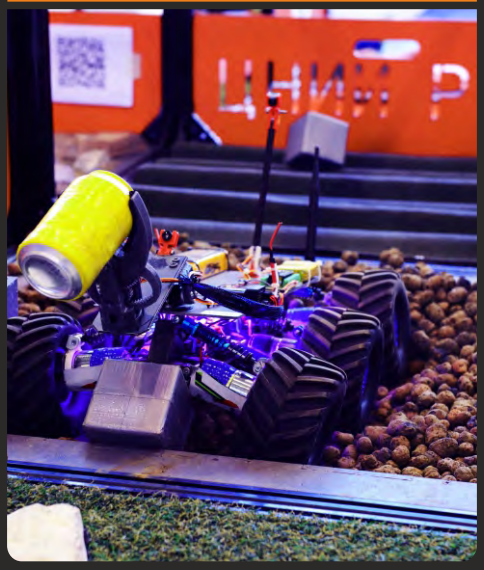
Tasks:
Drive through the cell and / or clear the field without being "blown up" by a mine.

Goals:
This test is intended to demonstrate platform maneuverability and operator control skills, as well as to demonstrate the capabilities of navigation equipment.

Rationale:
Simulation of work in a minefield, conducting demining work.

travel without explosions - 5 points
mine clearance - 3 points

Low boxes



Box with sand / expanded clay / wires / cones - the test is a plywood box with a depth of 40 mm, filled with various bulk materials.

Task:
Overcome the challenge.

Goals:
Demonstration of high cross-country ability of the robot, testing of chassis characteristics.

Rationale:
Driving on various crumbling surfaces: on construction sites, in the forest. Moving around in rooms in a mess (tangled wires on the floor).

3 points

Ravine

The test is a layered plywood structure, the layers of which form two elevations. The height of the projections is 70 and 50 mm. The interval between coats is 5 mm.

Task:
Overcome the test (drive through the ravine).

Goals:
Demonstration of high cross-country ability and balance of the robot.

Rationale:
Natural ravines, hummocks, forest landscape.

4 points

Sand

Test, which is a box filled with quartz sand (particle size 0.2-2.5 mm). Box dimensions 720x720x100. The height of the sand layer ranges from 20 to 30 mm. Inside the box there are inclined ramps; outside, inclined surfaces are attached to the box.

Tasks:
Overcome the challenge.

Goals:
A sandy cell is necessary to demonstrate the patency on crumbling surfaces, the strength of the robot, and its susceptibility to breakdowns under the influence of external stimuli.

Rationale:
Simulation of the consequences of geological (exogenous geological) emergencies - landslides, mudflows, landslides, talus, avalanches, slope washout, subsidence of loess rocks, subsidence (landslides) of the earth's surface.

3 points

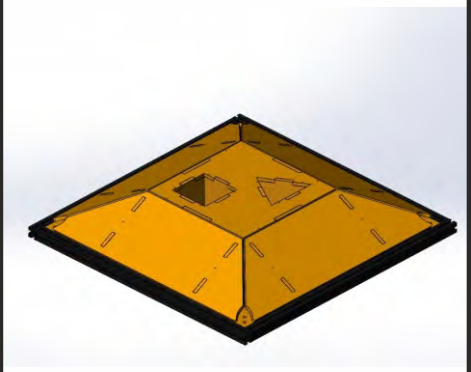
Failures

The obstacle includes a base, made in the form of a truncated pyramid with prismatic recesses in the upper part, inside which are tennis balls (65 mm in diameter).

Task:
Overcome the challenge.
Deliver the ball from one recess to another (optional). Points are awarded for each delivered ball.

Target:
Demonstration of the cross-country ability and maneuverability of the structure.

Rationale:
Traffic on construction sites, in warehouses (board dump).



overcoming - 3 points
ball capture ★ - 5 points
delivery of the ball to the adjacent groove - 3 points

Broken road (thorns)

The test is a standard polygon cell with or without holes and secured with prefabricated plywood (or solid wood) blocks. Blocks can be of various shapes: round and triangular prism, parallelepiped. Edge length - 70mm, edge width - 50mm, spike height - 50mm. Hole width up to 120 mm.

Task:
Overcome the challenge.

Target:
Demonstration of the cross-country ability and maneuverability of the structure, testing the characteristics of the chassis, ground clearance and suspension.

Rationale:
Imitation of a broken road.

8 points

Ramps "Agro»

The test is a standard polygon cell filled with 15 ° inclined ramps of different directions. Ramps of different heights with a drop of 50 mm.

Task:
Overcome the test (drive through the board dump).

Target:
Demonstration of the cross-country ability and maneuverability of the structure.

Rationale:
Traffic on construction sites, in warehouses (board dump).

4 points

This is a standard cell filled with 15 ° tilt boxes with different directions.

Tasks:
Overcome the challenge.

Goals:
Checks the patency of the robot.

Rationale:
Simulation of the consequences of a sudden collapse of buildings and structures of residential, social and cultural purposes, the collapse of elements of transport communications.
Simulation of the consequences of geophysical and cosmogenic emergencies - earthquakes, volcanic eruptions, falling asteroids.

3 points

Ramps "Wave»

A standard cube filled with boxes of different heights, with a height difference of 50mm.

Tasks:
Overcome the challenge.

Goals:
Checks the patency of the robot.

Rationale:
Simulation of the consequences of a sudden collapse of buildings and structures of residential, social and cultural purposes, the collapse of elements of transport communications.

Simulation of the consequences of geophysical and cosmogenic emergencies - earthquakes, volcanic eruptions, falling asteroids.

8 points

Straight ramps

This is a standard cell filled with 15 ° tilt boxes with different directions. Ramps of different heights with a height difference of 50 mm.

Tasks:
Overcome the challenge.

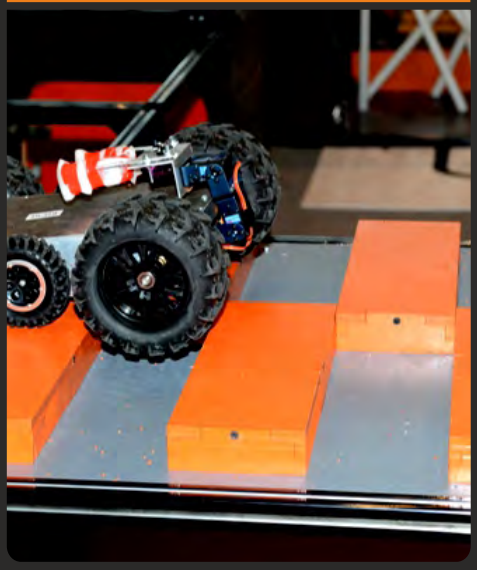
Goals:
Checks the patency of the robot.

Rationale:
Simulation of the consequences of a sudden collapse of buildings and structures of residential, social and cultural purposes, the collapse of elements of transport communications.
Simulation of the consequences of geophysical and cosmogenic emergencies - earthquakes, volcanic eruptions, falling asteroids.

9 points

Ramps "Skaty»

Ribs



The test is a plywood platform with rectangular boxes alternating in a checkerboard pattern with overall dimensions of 355x120x40 mm (LxWxH).

Tasks:
Overcome the challenge.

Goals:
This test is designed to demonstrate the robot's cross-country ability, engine power, and suspension capabilities.

Rationale:
Simulation of the consequences of a sudden collapse of buildings and structures of residential, social and cultural purposes, the collapse of elements of transport communications.
Simulation of the consequences of geophysical and cosmogenic emergencies - earthquakes, volcanic eruptions, falling asteroids.

4 points

Rails

The test is a standard polygon cube with a plywood pad with rows of holes drilled on two opposite sides. Screws are inserted into the holes protruding from two bars. The section of the timber from which the rails are made: 70x70 mm. The width of the rail is adjusted to the width of the robot base before starting. Access to the rails is either from the box or from a slight slope.

Tasks:
Overcome the test by driving exactly along the rails without touching the area on the floor of the cell. If any part of the robot touches the bottom of the cell, the points are not counted.

Goals:
This test is intended to demonstrate the maneuverability of the robot and the operation of the motor encoders.

Rationale:
Simulation of work in emergency conditions in buildings, communications and technological equipment of industrial facilities.

6 points

Sieve

The sieve is a lattice with holes of various shapes, 70-80 mm in diameter.

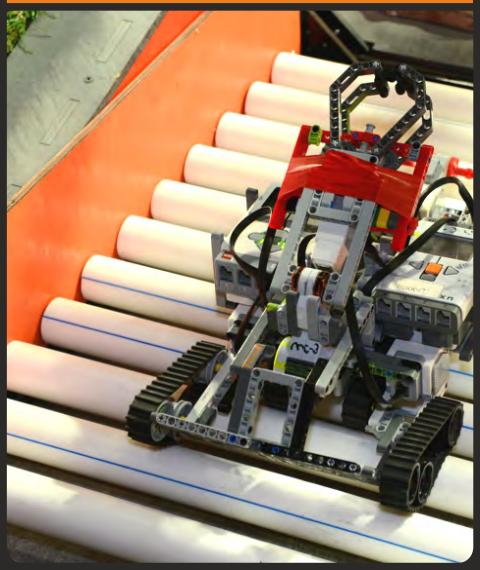
Tasks:
Overcome the challenge.

Goals:
Demonstration of the robot's patency, engine power and suspension capabilities.

Rationale:
Simulation of the consequences of geophysical emergencies - earthquakes, volcanic eruptions.

3 points

Rollers



The floor of the cell is a roller conveyor made of polypropylene pipes mounted on bearings. The pipes rotate around their axis, making it difficult for the robot to move.

Tasks:
Overcome the challenge.

Goals:
The rollers test the patency of the robot and the power of its motors.

Rationale:
Hydrometeorological emergency - severe ice.

3 points

Net

This test is a frame with dimensions of 740x740 mm. The mesh is stretched on the frame. The mesh can also be stretched over a flat frame that is flush with the metal profile of the cube. The mesh sags slightly due to the weak tension. The mesh size in the grid is 10x10 mm. The mesh material is a thin nylon cord, the weaving is nodular.

Tasks:
Overcome the challenge.

Goals:
Passing this section reveals defects in the design of the robot: protruding, clinging parts, poorly distributed weight.

Rationale:
Simulation of the consequences of a sudden collapse of buildings and structures of residential, social and cultural purposes, the collapse of elements of transport communications.

3 points

Broken scales

Plywood fixed on an axis located in the center of the cell. The maximum swing angle is about 30 °.

Tasks:
Overcome the challenge.

Goals:
This obstacle demonstrates the responsiveness of the robot and the skill of the operator.

Rationale:
Simulation of the consequences of geophysical emergencies - earthquakes, volcanic eruptions, as well as sudden collapse of buildings and structures.

3 points

Bog

The cell is packed with a polyester bag filled up to half with polystyrene balls with a fraction of 4-6 mm.

Tasks:
Overcome the challenge.

Goals:
In this test, the robot demonstrates its permeability in a viscous environment.

Rationale:
Simulation of the consequences of an accident on communal life support systems, as well as the consequences of hydrodynamic accidents - breakthroughs of dams (dams, sluices, bridges) with the formation of breakthrough waves and catastrophic flooding.

8 points

Grass

Plywood platform with artificial grass made of polypropylene with a pile length of 40 mm. Platform dimensions 740x740x50.

Tasks:
Overcome the challenge.

Goals:
Artificial grass serves to demonstrate the integrity and strength of the robot's structure, as well as its patency in natural conditions.

Rationale:
Elimination of forest fires, fires of steppe and grain fields, peat fires, underground fires of fossil fuels.

1 point

Trench

The test is a plywood platform with two 40 mm deep oblong rectangular trenches. The trench is 670 mm long and 140 mm wide. One trench is filled with tennis balls (65 mm in diameter), the other is empty.

Tasks:
Overcome the challenge.
Deliver the ball from one trench to another (optional). Points are awarded for each delivered ball.

Goals:
This test allows you to demonstrate the patency of the robot, as well as the functional characteristics of the manipulator, including its accuracy and power.

Rationale:
Simulation of liquidation of consequences of accidents with release (threat of release) of radioactive substances (collection of radioactive waste).

overcoming - 4 points
ball capture - 5 points
delivery of the ball to the adjacent trench - 3

Fog

Smoke cubes. It consists of several connected cells (2-3 cells), with a plywood floor (thickness 8 mm) and walls made of transparent plexiglass and plywood. The sections have entrances (500x500 arched openings, curtained with rubber strips 50 mm wide). The smoke is generated by a smoke machine installed inside one of the cells. Obstacles are randomly screwed to the floor of the cells - plexiglass cylinders with a diameter of 100 mm (6-8 pcs). The passage width between the cylinders is at least 350 mm.

Tasks:
Overcome the challenge by avoiding obstacles. It is allowed to install flashlights, headlights and other means to improve visibility on the robot.

Goals:
This section is used to assess the ability of the robot to navigate and maneuver in conditions of reduced visibility.

Rationale:
Simulation of a hydrometeorological emergency - fog, as well as natural fires and fires (explosions) in buildings, on communications and technological equipment of industrial facilities.

1 cell - 3 points (★ for all cells)

Pit

The test is a layered plywood structure, the layers of which form two indentations. The depth of the depressions is 70 and 50 mm. The interval between coats is 5 mm.

Task:
Overcome the test (drive through the hole).

Target:
Demonstration of high cross-country ability and balance of the robot.

Rationale:
Natural ravines, pits, forest landscape.

4 points

1.1. Inclined and stairs

Gable slide

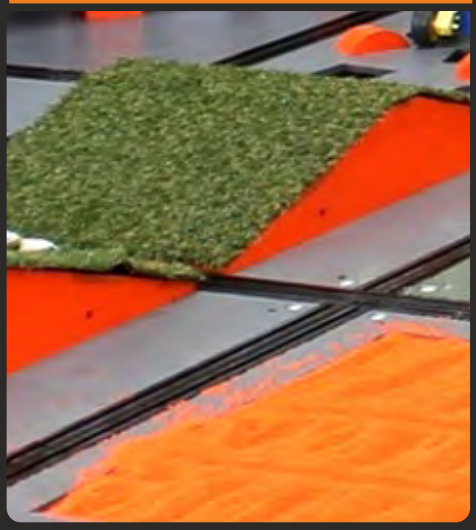
The test is a gable slope 15 °, with dimensions 420x690x160, on which a strip of artificial grass or stones is fixed. The height of the pile is 15 mm, the dimensions of the stones are arbitrary, but the height of the stone is no more than 40 mm. The width of the side openings along the edges of the slide is 163 mm (including the profile).

Tasks:
Overcome the challenge. Overcoming the cell is counted only for a complete ride over the hill.

Goals:
Demonstration of the traction quality and power of the robot's motors, as well as its ability to overcome difficult terrain at an angle.

Rationale:
Elimination of forest fires, fires of steppe and grain areas, peat fires, underground fires of fossil fuels.

4 points



Stone slide

The test is an inclined 15 °, with dimensions 740x690x200, on which the stones are fixed. The height of the stones is 15-40 mm.

Tasks:
Overcome the challenge. Scored once (either ascent or descent). It is counted once (travel either in one direction or in the other direction).

Goals:
Demonstration of the robot's patency and the power of its motors, as well as its ability to overcome difficult terrain at an angle.

Rationale:
Simulation of the consequences of geological (exogenous geological) emergencies - landslides, mudflows, landslides, talus, avalanches, slope washout, subsidence of loess rocks, subsidence (landslides) of the earth's surface.

4 points

Grass slide

The test is an inclined 15 °, with dimensions 740x690x200, on which a strip of artificial grass is fixed. Pile height - 40 mm. The width of the artificial grass can be varied, from 200 mm to the entire surface of the slope.

Tasks:
Overcome the challenge. Scored once (either ascent or descent).

Goals:
Demonstration of the traction quality and power of the robot's motors, as well as its ability to overcome difficult terrain at an angle.

Rationale:
Elimination of forest fires, fires of steppe and grain areas, peat fires, underground fires of fossil fuels.

2 points

Ladder

Ladder with overall dimensions 1480x1220x620 mm, step height 150 mm, step width 340 mm. The riser (vertical part of the step) has a slight reverse slope.

Tasks:
Ascend or descend the stairs in any way.

Goals:
The staircase is designed to demonstrate and practice the movement of a mobile robot on surfaces with variable geometry.

Rationale:
Moving in buildings to further extinguish fires, explosions or explosion threats.

ascent - 50 points
autonomous ascent - 100 points
descent - 10 points
autonomous descent - 30 points

- for each of the actions

Mini ladder

The test is a standard polygon cube, inside which there is a staircase leading to the second floor of the polygon. The staircase consists of eight steps 75mm high and 90mm long. A standard inclined (15 °) staircase leads to the staircase.

Tasks:
Ascend or descend the stairs in any way.

Goals:
The ladder checks the robot's patency and the power of its motors.

Rationale:
Moving in buildings to further extinguish fires, explosions or explosion threats.

ascent - 30 points
descent - 7 points

- for each of the actions

Inclined 15 °

Plywood construction with an inclination angle of 15 °, with overall dimensions 740x690x200.

Tasks:
Go up or down the slope. Scored once (either ascent or descent).

Goals:
Demonstration of the balance of the center of gravity and the ability of the mobile robot to overcome inclined sections.

Rationale:
Simulation of the consequences of geophysical and cosmogenic emergencies - earthquakes, volcanic eruptions, falling asteroids.

2 points

Inclined 20 °

Inclined, consisting of 2 cells, the entrance to which is a standard inclined 15 °. An inclined 20 ° leads to the second floor of the labyrinth.

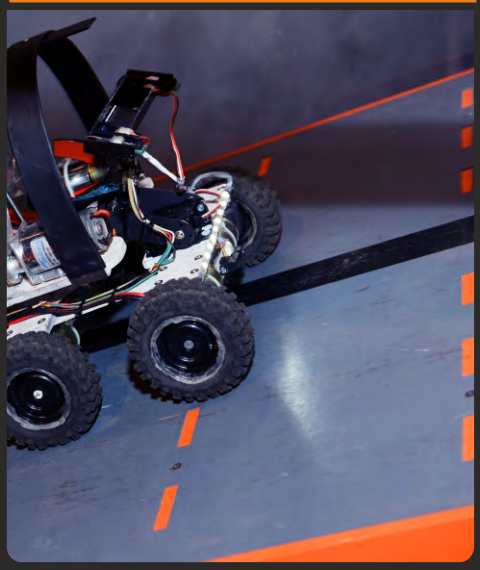
Tasks:
Go up or down the slope.

Goals:
Demonstration of the balance of the center of gravity and the ability of the mobile robot to overcome inclined sections.

Rationale:
Simulation of the consequences of geophysical and cosmogenic emergencies - earthquakes, volcanic eruptions, falling asteroids.

descent - 3 points
autonomous descent - 9 points
ascent - 3 points
autonomous ascent - 9 points

Inclined 30 °



Inclined, consisting of 2 cells. The slope leads to the second floor of the landfill.

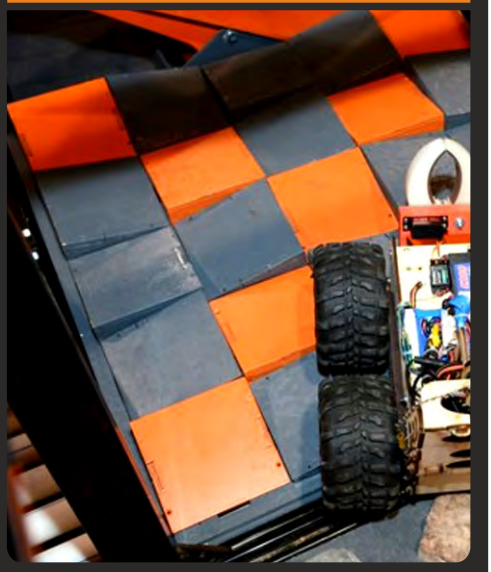
Tasks:
Go up or down the slope.

Goals:
Demonstration of the balance of the center of gravity and the ability of the mobile robot to overcome inclined sections.

Rationale:
Simulation of the consequences of geophysical and cosmogenic emergencies - earthquakes, volcanic eruptions, falling asteroids.

descent - 3 points
autonomous descent - 9 points
ascent ★ - 5 points
autonomous ascent - 9 points

Inclined with ramps



The test is a standard inclined 15 °, with overall dimensions 740x690x200 mm, filled with boxes with an angle of 15 °, of different directions. The ramps are of different heights with a height difference of 50 mm.

Tasks:
Overcome the challenge. Scored once (either ascent or descent).

Goals:
Checks the robot's patency, as well as its ability to overcome difficult terrain at an angle.

Rationale:
Simulation of the consequences of a sudden collapse of buildings and structures of residential, social and cultural purposes, the collapse of elements of transport communications.
Simulation of the consequences of geophysical and cosmogenic emergencies - earthquakes, volcanic eruptions, falling asteroids.

5 points

Embankment

The test is a standard inclined 15 °, with overall dimensions 740x690x200 mm, on which a box with plywood ribs is fixed to prevent the contents from shattering. The depth of the box is 40 mm. The box is filled with sand, expanded clay or gravel.

Tasks:
Overcome the challenge.

Goals:
This test serves to demonstrate the high cross-country ability of the robot and the power of its motors.

Rationale:
Simulation of the consequences of geological (exogenous geological) emergencies - landslides, mudflows, landslides, talus, avalanches, slope washout, subsidence of loess rocks, subsidence (landslides) of the earth's surface.

7 points

*** There may be other inclined surfaces on the landfill, designed to facilitate entry into boxes or other elevations. The angle of inclination of such structures is no more than 30 °. No points are awarded for driving on auxiliary slopes.**

2. Tasks

QR codes

A task involving the use of video vision or a robot camera. Available for execution only in the "Extreme" category.
The dimensions of the QR code are from 50 to 120 mm. The code contains from 1 to 9 words encrypted. The codes are printed on sheets of paper, and are located at different heights (50-200 mm) throughout the polygon.
The decoded information can be used by the participant at his discretion, as an additional advantage (for example, doubling points for capturing red beacons), which is reflected in the points scored for the attempt.
It does not matter when the QR code was read - before or after performing an action giving an advantage (for example, capturing a red beacon). In addition, the participant receives points for reading the code.

Tasks:
Hover over the QR code with the robot's camera and recognize it. There are two options: recognition by the robot (with displaying the decryption of the QR code on the operator's screen) or recognition using an application on the smartphone (in this case, the code is read from the operator's screen).
When performing this task, in the first way, an additional, testing QR-code can be given to check the operation of the QR-scanner of the robot. If the test fails, the task result will be canceled.
When a robot reads the code using a program running in the background, the task is counted as autonomous.

Goals:
Evaluation of the quality characteristics of the camera and video communication of the robot, its maneuverability when searching for the optimal position for reading.

Rationale:
Recognition of signs, signs, obtaining information about the environment.

Robot displaying the decryption on the screen (counted for autonomous action) - 6 points

Smartphone from the operator's screen - 3 points

Base

Colored boxes for the delivery of beacons can be located at the bottom of the box with a frame. Delivery is counted when the lighthouse is dropped at the base - inside the box.

Tasks:
Deliver the colored beacon to the base.

Goals:
Demonstration of the balance of the center of gravity and the ability of the mobile robot to overcome inclined sections.

Rationale:
Simulation of the consequences of geophysical and cosmogenic emergencies - earthquakes, volcanic eruptions, falling asteroids.

6 points

Gates

A structure made of plumbing pipes with valves of various types and sizes is fixed on the wall of the cube or on a low protective wall: a lever (handle size - 90x15x5 mm, stroke - 90 °), medium butterfly (handle size - 50x15x5 mm, stroke - 70 °), butterfly small (handle size - 25x7x15 mm, stroke - 90 °), wedge valve (handle size - 50x15x5 mm, stroke - 3.5 full turns). The moment required to turn the valves:
small butterfly and wedge gate valve - 0.3 Nm;
lever - 0.5 Nm;
medium butterfly - 1 Nm.

Tasks:
Turn the valve until the markings on the valve overlap.

Goals:
This test serves to demonstrate the characteristics of the manipulator: degrees of freedom, power of servomotors.

Rationale:
Overlapping of pipes in case of gas, water, steam leakage.

Lever - 10 points
Wedge gate - 11 points
Small butterfly - 12 points
Medium butterfly - 12 points

- for each of the actions

Movement along the line

The line width in all areas is 50 mm.

Areas with a line (black on white) are 800x800 mm white areas with a black line, intersections and turns. At intersections, beacons may be located, which must be delivered from one intersection to another (any of the available ones).
In front of the labyrinth, as a rule, there are two autonomous routes, each of the two starts has its own. After passing its own autonomous line (corresponding to the start), a team has the right to pass another one.

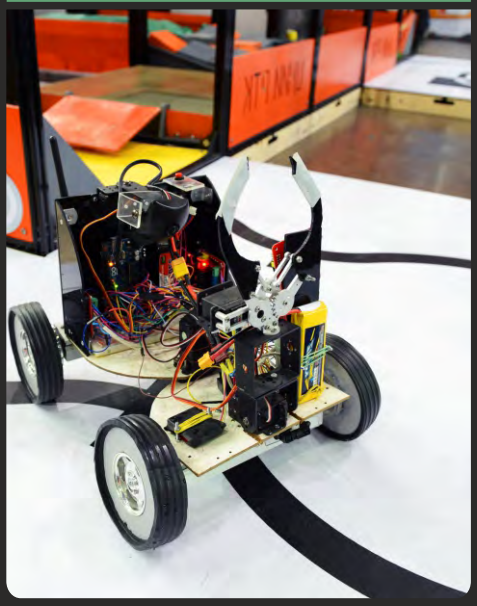
Areas with a line (black on gray) - black line on gray polygon details - inclined, gray fields, stairs.

Suspension bridges (dashed line) - black line on suspension bridge.

Tasks:
Complete the challenge autonomously.

Goals:
Demonstration of autonomous actions, accurate execution of tasks using sensors and background programs.

Rationale:
Imitation of work in conditions of difficult reception or in the complete absence of the possibility of radio exchange, as well as in the absence of the possibility of using wire communication (emergency situations in buildings, on communications and technological equipment of industrial facilities).



on white (for any 2 sites)

- 5 points

***for other types of lines, points are awarded depending on which test the line is applied to. You can find the points for completing such lines in the description of specific challenges.**

Anti-tank hedgehogs

A task located in several cells. The length of the shoots of hedgehogs is 9 cm, the width is 3 cm, and the thickness is 1 cm. The actual height of the lying hedgehog is 140-150 mm, depending on the position. The height to the central part of the hedgehog is 70-80 mm.
Hedgehogs are scattered on the landfill in random order and impede free passage. Hedgehogs can be moved, pushed aside, carried from place to place. Lifting and delivering a hedgehog to another place does not give points, but it is counted for using the manipulator, and it gives a guarantee for the attempt to be counted (if it is spelled out in the mandatory tasks for the nomination).

Tasks:
Don't get stuck on the anti-tank hedgehog.

Goals:
This test is intended to demonstrate platform maneuverability, suspension capabilities and ground clearance.

Rationale:
Simulation of work on the territory of hostilities.

no points

Capture the Flag

Before the start, each robot is assigned a red or green color, depending on from which start of the maze it starts trying.

Tasks:
On the test site there are buttons of two colors - red and green - when pressed, the "Tower" test lights up red or green, respectively (circled in the figure with the corresponding color).
The robot, whose color at the end of the attempt will burn the tower, gets additional points.
The rule works for both nominations, even if one robot is on the training ground at a time.
You can press the button in any way. Pressing a button with a manipulator is counted for using a manipulator, and gives a guarantee for the attempt to be counted (if it is prescribed in the mandatory tasks for the nomination).

Goals:
Demonstration of the accuracy and maneuverability of the robot and the functionality of its manipulator.

Rationale:
Simulation of work in emergency conditions in buildings, communications and technological equipment of industrial facilities.

pressing the button - 3 points
the corresponding color of the tower at the end of the attempt - 15 points

Danger signs

A task involving the use of robot video vision. Available for execution only in the "Extreme" category.
The dimensions of the sign are 100x100 mm. The codes are printed on sheets of paper, and are located at different heights (50-200 mm) throughout the polygon.

Tasks:
Recognize and identify the mark. As a result, the text of the sign should appear on the screen, and the sign itself should be highlighted on the screen (for example, framed).
When a robot reads a character using a program running in the background, the task is counted as autonomous.
A document containing a complete list of marks for printing can be found on the website of the "RTK Cup" at the link:
https://cup.rtc.ru/rtccup/reglament

Goals:
Evaluation of the quality characteristics of the camera and video communication of the robot, its maneuverability when searching for the optimal position for reading.

Rationale:
Recognition of danger signs on barrels, boxes, cylinders and other containers. Obtaining the most complete information about the environment.
Simulation of the consequences of geophysical and cosmogenic emergencies - earthquakes, volcanic eruptions, falling asteroids.

10 points

Button

Ordinary household light bulb switch. When pressed, the LED strip on the "Fog" section lights up. The button is located at a height of no more than 70 mm from the floor. When this button is pressed by the manipulator, the attempt is counted.

Tasks:
Press the button in any way.

Goals:
The button is used to demonstrate the properties of the robot manipulator: accuracy, effort, range.

Rationale:
Simulation of work in emergency conditions in buildings, communications and technological equipment of industrial facilities.

3 points

Lighthouses

The lighthouse is an aluminum cylinder with a diameter of 67mm. Lighthouses have one of the following colors: red, blue, green, yellow, and purple (heavy beacon).
Beacons (white) can also be located on the autonomous line for capture at an intersection and delivery to another intersection. You can also capture any beacon autonomously. For this, the robot must be at a distance of more than 30 cm from the lighthouse, and the judges must be warned about the start of autonomous actions.
A lighthouse is considered captured if it was raised about five centimeters above the surface and held for more than three seconds.

Tasks:
Colored beacons: Capturing and raising a lighthouse, and delivering it in any way to the area corresponding to the color (plastic colored field, base) or on a special field (multicolored field in a small cube). The assignment is not required to be completed.
White beacons: Capturing and raising a beacon at an intersection of black lines and delivery to another intersection (all actions are carried out offline)

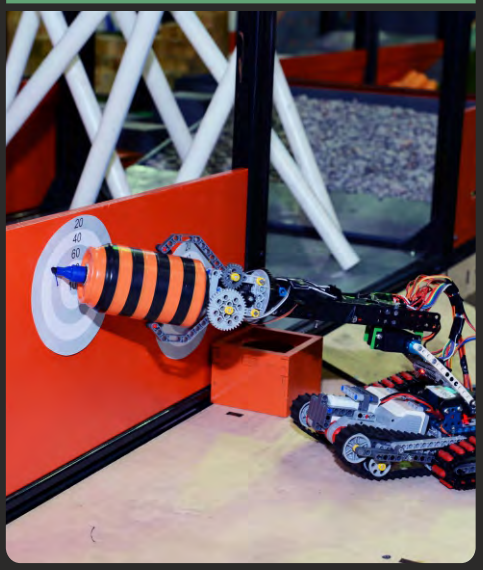
Goals:
The delivery of beacons makes it possible to assess the accuracy and maneuverability of the robot and the functionality of its manipulator.

Rationale:
Simulation of the elimination of the consequences of accidents with the release (threat of release) of chemical hazardous substances.

действие / маяк	захват	захват автономный	доставка	доставка автономная
стандартный	3 балла	9 баллов	6 баллов	-
белый	-	6 баллов	-	8 баллов
тяжёлый	6 баллов	12 баллов	9 баллов	-
специальный (на люке)	5 баллов	15 баллов	8 баллов	-
на башенке (+ к маяку)	10 баллов	-	-	-

★ - за любое действие

Target



These are concentric circles printed on paper and attached to the wall of the polygon. Three targets are fixed at different levels (for the convenience of robots of various designs). The target consists of 5 circles of different diameters. The diameter of the target itself is about 15 cm.

Tasks:
Capture the beacon with the marker fixed in it and place the point as close to the center of the target as possible. The closer to the center the point is, the more points the participant will receive (from 20 to 100).
There is no limit to the number of attempts for this challenge. The best score for each target is scored. If the robot has drawn a line, then only the starting point is counted.
Capturing a can with a marker is read as a demonstration of the manipulator, but does not earn any points.

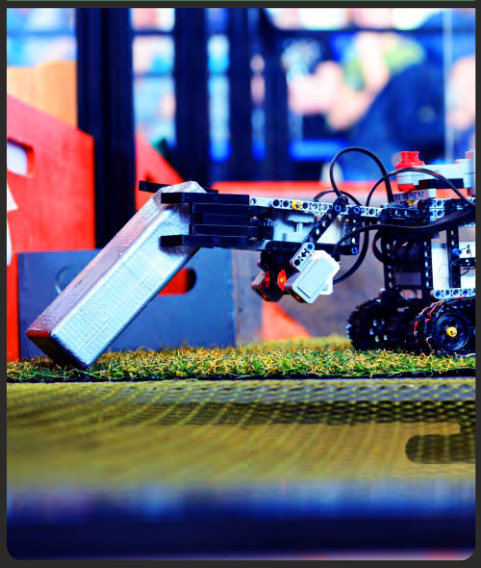
Goals:
The test is intended to verify the accuracy and degrees of freedom of the manipulator.

Rationale:
Simulation of work in emergency conditions in buildings, communications and technological equipment of industrial facilities.

from 2 to 10 points

- more than 6 points

Wreckage



A task located in any part of the polygon, representing objects of different weights, sizes, shapes, textures. Materials: plastic, wood, rubber, foam rubber.
The dimensions of the wreckage range from 160 to 35 mm, weight up to 100 g.

Tasks:
Collect items in a basket (basket height - 90mm). For the capture and delivery of each item, points are awarded separately.

Goals:
Demonstration of the accuracy and maneuverability of the robot and the functionality of its manipulator.

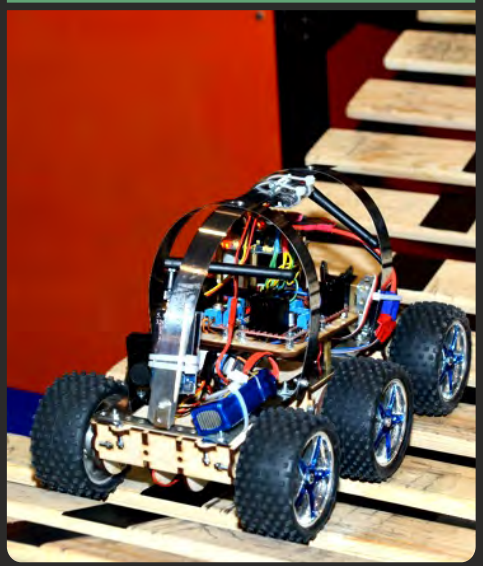
Rationale:
Simulation of work in emergency conditions in buildings, communications and technological equipment of industrial facilities.
Simulation of the elimination of the consequences of accidents with the release (threat of release) of chemical hazardous substances.

capture - 4 points

delivery - 3 points

- for any 3 actions

Suspension bridge



The suspension bridge is assembled from wooden planks 300x65x12 mm, fixed on slings 30 mm wide. The gap between the planks is 15-20 mm. The length of the bridge is variable, the width is 300mm.
In addition to passing the test routine, the robot can autonomously drive along the black line located in the center of each wooden plank.

Tasks:
Overcome the challenge.

Goals:
This task is intended to demonstrate the robot's patency on surfaces with variable geometry, and the capabilities of the suspension.

Rationale:
Simulation of work in emergency conditions in buildings, communications and technological equipment of industrial facilities.

overcoming - 4 points

autonomously - 12 points

Mini-tower

The pedestal, which is a miniature copy of the special test "Tower", with overall dimensions - 160 mm high and 90 mm in diameter. A standard beacon is installed on it.

Tasks:
Capturing and lifting the lighthouse from the minitower, and delivering it in any way to the area corresponding to the color (plastic colored field, base, multi-colored field). Delivery is optional.

Goals:
Allows you to evaluate the accuracy and maneuverability of the robot and the functionality of its manipulator.

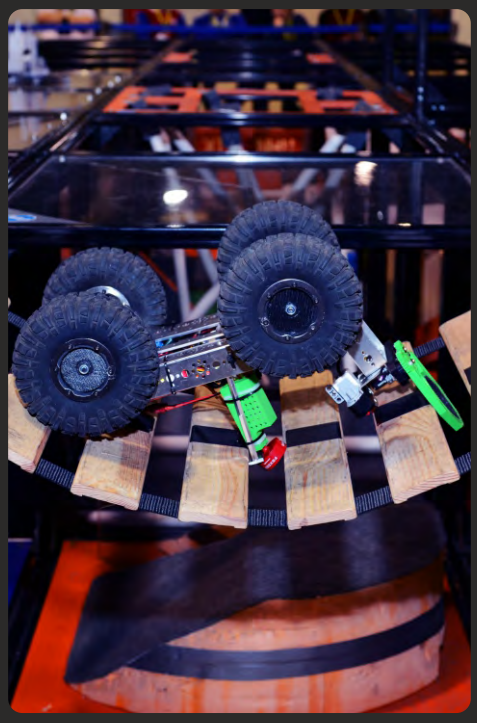
Rationale:
Simulation of the elimination of the consequences of accidents with the release (threat of release) of chemical hazardous substances.

capture - 10 points
autonomous capture - 20 points

***points for capturing a beacon from a mini-tower are not cumulative with points for a standard beacon**

- for any action

Coup



The robot, overturned on board or turned upside down, returns to its original state (stands on "wheels").
After the coup, the robot is able to continue moving without repair.
The flip does not count from the upright stance, i.e. when the robot is leaning on its front or back.
Flip points are awarded only once per attempt.

Controlled coup
The robot performs the task without operator intervention, using a remote control, in accordance with the conditions:
· If a robot flips using a manipulator or similar device, the team will receive credit in the manipulator category.
· If the robot rolls over only with the main chassis (for example, as a result of a collision with a wall), the team does not receive credit in the manipulator category. The case when the robot turns over spontaneously, without control, only due to its design (for example, a rounded body), falls under the same variant.

Autonomous coup
A coup is counted if the robot completes the task automatically, without operator intervention and without the use of remote control, and with the help of sensors that determine the position of the robot in space, the team gets credit in the category of autonomy.

The team is obliged to warn the referee before starting the attempt about the intention to perform the coup autonomously.

Options for completing the assignment:

The first option: the robot can start trying to complete this task, right on the "start" field. In this case, in the starting position, the robot must be overturned on board or turned upside down by the participant himself. The execution of the task begins after the start time of the attempt.
To perform an autonomous coup, it is allowed to turn the robot on board or upside down manually immediately after the "start" command. In this case, the operator can use the help of the team members.

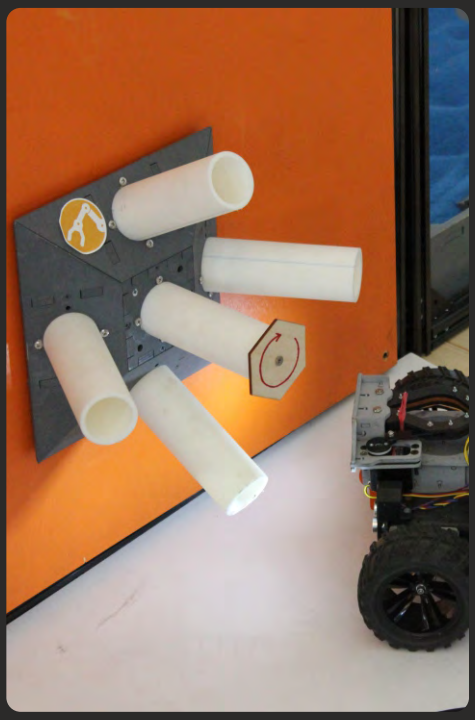
Second option: the robot performs the task during the attempt. In this case, the robot can only tip over the side or turn upside down with the help of a remote control.

In both cases, if the robot cannot complete the task and carry out a roll over to the starting position, the standard rules apply: the participant can take a penalty and intervene in the control (see the "Penalties" section).
The position of the robot (before and after the coup) is assessed by the judge.

controlled - 12 points
autonomous - 24 points

- for any action

Pipes



The task is a structure made of plastic pipes suspended from the wall of the cell. Each tube is terminated with a 40mm hexagonal cap. The length of the movable pipes is 60mm.

Tasks:
A number of tasks can be completed with each pipe:
Remove: a tube with a smaller diameter is inserted into the pipe. The robot must grasp and remove the tube completely.
Turn: a tube with a smaller diameter is inserted into the pipe. The robot must rotate the tube around its axis, 360/180 degrees, without pulling it out of the main tube. One tube can be rotated no more than one full turn (360 degrees). Further turns of this pipe do not give points.
Explore: inside the pipe, a letter / number is written on the bottom. The operator and the judge must clearly see the symbol on the bottom of the pipe. The task is intended only for the "Extreme" nomination.

Goals:
Demonstration of the accuracy and maneuverability of the robot and the functionality of its manipulator.

Rationale:
Simulation of work in emergency conditions in buildings, communications and technological equipment of industrial facilities.

extract - 5 points
explore - 5 points
rotate 180 ° - 9 points
rotate 360 ° - 12 points

- for any action

3. Special challenge "Tower»

Tower

The tower with an elevator is a structure built on the basis of three standard cubes, equipped with buttons for typing a combination of symbols, and an elevator. The height of the tower is 2400mm. The structure has ramps 400mm wide and 360mm high, with rounded or truncated corners. The number of entries varies depending on the landfill assembly and test location. The main entrance to the tower is located on the second tier of the polygon.
On the upper tier of the tower there is an inclined springboard for the robot to "jump" from the tower.

Elevator

A lifting structure set in motion when the robot enters a combination using buttons. Platform dimensions - 720x600 mm. Serves for lifting the robot to the upper tier of the tower, from where the robot can perform the task "Leap of Faith". The elevator cannot descend to the first tier of the labyrinth.

Tasks:
Enter the elevator platform for further dialing of the combination using the buttons and ascent to the upper tier of the tower.

Goals:
Demonstration of the accuracy and maneuverability of the robot.

Rationale:
Simulation of work in emergency conditions in buildings, communications and technological equipment of industrial facilities.

ascent to the 4th tier - 30 points
descent by elevator - 4 points
first tier (exit) - 3 points

Leap of Faith

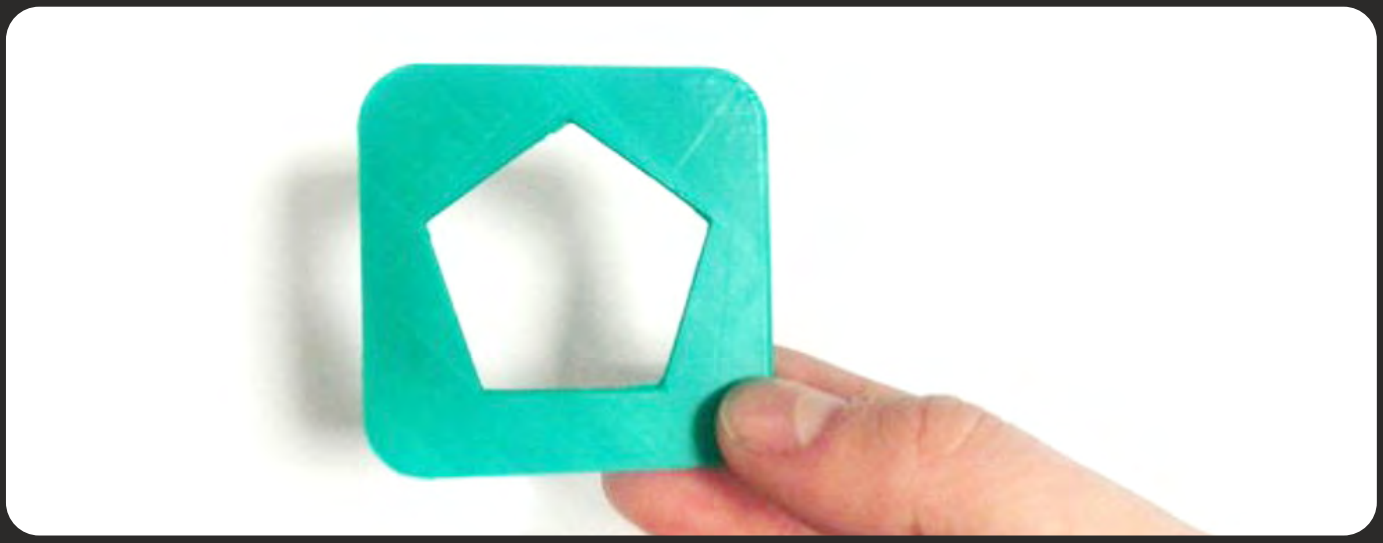
The "Leap of Faith" is performed from a springboard on the upper tier of the tower (height above the floor - 2500mm). The springboard is an inclined 350 mm wide, set at an angle of 30 °. On the floor in the jump zone there is artificial grass with a foam backing.

jump - 15 points

descent in any other way (not an elevator or a jump) - 30 points

continuation of movement after a jump - 30 points

Tower buttons



Three household switches with latching and one non-latching (non-latching switch, marked with a yellow checkmark), attached to the side wall of the elevator. Three buttons have symbols (two geometric shapes each). Thus, a symbol corresponds to each switch position. The fourth button (with a check mark) is a button to confirm the entered combination of characters.
The symbols that make up the combination in this attempt are given to the competitor in the form of tokens.
Tokens are awarded when completing challenges marked with special triangular plates at the top of the cube. There are seven or more such tests at the test site. The token can be obtained for any of the designated challenges. In total, the participant must receive three tokens in order to find out the whole combination.
Tokens are issued at the request of the participant during the attempt as the test progresses. If the participant has not requested the tokens himself, the judge will issue all three tokens at once (if three tests have been passed).

Tasks:
After receiving three tokens, a robot entering the elevator can enter a combination using the buttons, then press the button with a checkmark, which will activate the elevator. Then the elevator reaches the third tier. Further, there are two options for further actions:
1. The combination is typed correctly:
The elevator travels to the fourth tier, and the robot is on the top tier of the tower. The robot can either perform a Leap of Faith or press the checkmark button again to lower the elevator down.
2. The combination is typed incorrectly:
The elevator platform falls under the robot, and the robot falls from the height of the 3rd tier (1800 mm) into the basement of the tower, onto the foam rubber floor. You can leave the basement and find yourself at the level of the first tier of the landfill.
Note: if the participant did not earn tokens or did not earn all three, he has the right to enter a combination at random.

Goals:
The test is intended to demonstrate the capabilities of the robot's actions in a confined space and the properties of the robot arm: accuracy, effort.

Rationale:
Simulation of work in emergency conditions in buildings, communications and technological equipment of industrial facilities.

entering a combination (not even correct) - 5 points

4. Penalties

Transfer attempt	
Transferring a try one try before Only 1 time	5 points

Вмешательство в управление	
Repair and / or rearrange the robot Only 1 time	7 points

Отвалившаяся деталь	
For every part that falls off the robot Any number of times	3 points

Перевод в автономный режим	
By pressing a button on the robot to go offline 2 times (1 cycle on and off)	1 point

Подрыв на мине	
Активация одной мины какой-либо частью робота («подрыв» на мине) По количеству мин на полигоне	1 point

*** If the limit of penalties is exhausted, then the attempt is considered completed.**

5. Additional information

Any test at the range can be passed autonomously, for which it is allowed to use sensors, encoders and rangefinders. For passing the test autonomously, the points for the test are doubled (except for some tests indicated in this annex). Moving along the wall outside the polygon does not score.

The configuration of the training ground and the location of obstacles become known to the participants on the day of the competition, directly in training.

The final list of possible obstacles and the points awarded for them become known to the participants at least one week before the start of the competition.

Some individual details, obstacles and their location may be changed and added immediately before the start of the competition due to unforeseen circumstances.