Task No. 1. Search And Rescue

Task Description:

Moving strictly along the black line with intersections, a robot must find and move the "victims" (plastic cubes with a size of at least 30 mm) to the safe area. The line is at least 20 mm wide. The robot must not exceed the dimensions of 200x200 mm, and must fit in the starting area on the field, without any part of the robot projection crossing the dotted green line of the starting area. The safe area is located at the end of the route, also marked with a green dotted line. There will be "dangerous" objects on the field that cannot be moved (for example, red cubes). An object is considered to be moved if any part of its projection has gone beyond the marked line. If the robot moves such an object, it will receive 15 penalty points. Within the field the robot is prohibited to cross more than one square without the calibration along the black line.

Rules:

- The robot gets 5 points for each "victim" moved to the safe zone.
- The robot gets 15 penalty points for moving a dangerous object
- ATTENTION: The robot is prohibited to cross more than one square of the field without the calibration along the black line. If the robot crosses more than one square without the calibration along the black line, the task is stopped and the sum of points is calculated.
- The task is considered completed when all "victims" have been moved to a safe area or the time for completing the task has expired.
- · Task completion time: 180 seconds.
- If the robot completes the task completely, the remaining seconds are divided by 10 and added to the total points.
- The "victim" is considered to have been delivered to a safe area when any part of its projection enters a safe area. The delivered cube is allowed to be removed from the safe area when the robot leaves it.
- Before each attempt the robot is placed in a 200x200 mm calibration zone to check its dimensions.
- The time of the attempt begins with the command "start" given by the judge.
- The participant may stop the attempt at any time by clearly commanding "stop attempt"

Objective of the Task:

To test the participants' ability to work with different types of sensors, program the logic of moving objects and avoiding obstacles, as well as route optimization.



Search and Rescue Field

Task No. 2. Safe Box

Task Description:

Moving strictly along the the black line with intersections, the robot must scan the intersection cards that are located on the route from start to finish. An intersection card is a section of a field with a black line on which there can be from 0 to 4 intersections. The robot must drive along this card and memorize the number of intersections. Having reached a certain area, the robot must approach the first safe box with a round rotating disk located on the wall.

Depending on the number of intersections, the robot must turn this round disk clockwise or counterclockwise to the appropriate position, determined by the card and the mark on the disk itself. The disk turning zone is divided into 4 areas: I, II, III and IV, which corresponds to the card with the number of intersections. After turning the disk into a certain area, the robot must stop for 3 seconds, fixing the disk in the correct area. Simultaneously with stopping, the robot must give a sound signal, by which the judge checks the correctness of the attempt. The size of the disk is at least 50 mm in diameter, and in its lower part there is a weighting device that returns the disk to its initial position. The way of rotation of the round disk is determined by the participant.

Before the start of movement the robot must not exceed the dimensions of 200x200 mm and must fit in the starting area on the field in such a way that no part of the robot projection crosses the dotted green line of the starting area.

The robot has an unlimited number of attempts to set the disk to the right position within the time allotted for the task. However, each subsequent retry reduces the number of points by 5. The robot independently determines the right position of the disk using any methods and accessories from the provided kit. Interference with the robot is prohibited.

Rules:

- 15 points are awarded for the right positioning of the first disk, 20 points for the second one, 30 points for the third one.
- The number of points is reduced by 5 for each retry to set the disk to the right position within the attempt.
- The task is considered completed if all of the safe boxes are set to the right positions, and the robot has entered the finish area with all parts of its projection.
- Task completion time: 180 seconds.
- The robot can use any sensors or software methods to check the right position of the disk.
- · Interference with the robot is prohibited.
- Before each attempt the robot is placed in a 200x200 mm calibration zone to check the dimensions.
- The time of the attempt begins with the "start" command given by the judge.
- The participant may stop the attempt at any time by clearly commanding "stop attempt"

SAFE BOXES INSTALLATION LINE

Safe Box Field

Objective of the Task:

To test participants' ability to work with various sensors, program the logic of scanning and memoring data, as well as perform tasks of manipulating objects with precise control.

Task No. 3. Smart Manipulator

Task Description:

The robot must move along a black line and scan objects located in a certain area on both sides of it. The objects are arranged in a chaotic manner at different distances from the robot's line of motion. The robot's task is to detect objects, determine which of them can be moved and move them from their places so that their projection completely goes beyond the installation area marked with a thin orange line. The objects have a width of at least 30 mm and a height of at least 10 mm. The size and shape of the objects can be different, but not more than 50 mm wide and 100 mm high. The locations of the objects are numbered and placed according to the draw card. The upper part of the objects is divided by color – black or white. White means that this object can be moved, black color prohibits moving the object.

To move objects the robot must stop - its body must remain stationary. The objects must be moved with the help of a manipulator assembled by the participants and mounted on the robot. It is forbidden to move objects while the robot is moving along the black line. The size of the robot is not limited.

The task is completed when the robot reaches the finish area.

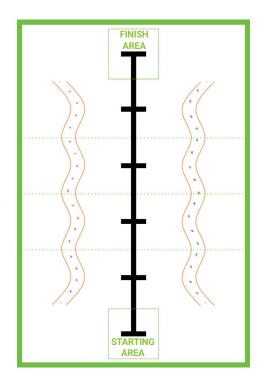
The robot can perform an unlimited number of attempts to move objects within the allotted 180 seconds. The objects can be moved in any direction.

Rules:

- 5 points are awarded for each correctly moved object with a white cover.
- 10 penalty points are awarded for each incorrectly moved object with a black cover.
- The task is considered completed when the robot completes its work and stops in the finish area.
- The robot can make an unlimited number of attempts to move objects within 180 seconds.
- It is not allowed to move objects while the robot is moving along the black line.
- · The size of the robot is not limited.
- The participant may stop the attempt at any time by clearly commanding "stop attempt"

Objective of the Task:

To test the participants' skills in creating manipulators, programming motion control and object recognition, as well as in controlling the movement of objects, taking into account the limitations of space and environment.



Smart Manipulator Field