Internet Robots Competition Regulation
Technical University Sofia – Musashi Institute of Technology
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1. Goal of the competition

The goal of the competition is to build an original autonomous mobile wheel robot, witch can move quickly and accurate on the field, to find and grip an object and to transport it to specified location.

2. Field

The field size is 2000x800 mm. It consists of 40 square segments sizing 200x200mm each, placed in main coordinate system Oxy. The line thickness is 20mm. The field has 55 main points A(i,j), i=0,1,…10, j=0,1,… 4 and 40 fields **A(i,j)**, i=1,…10, j=1,… 4. Right from the field there is service area (Fig. 1).

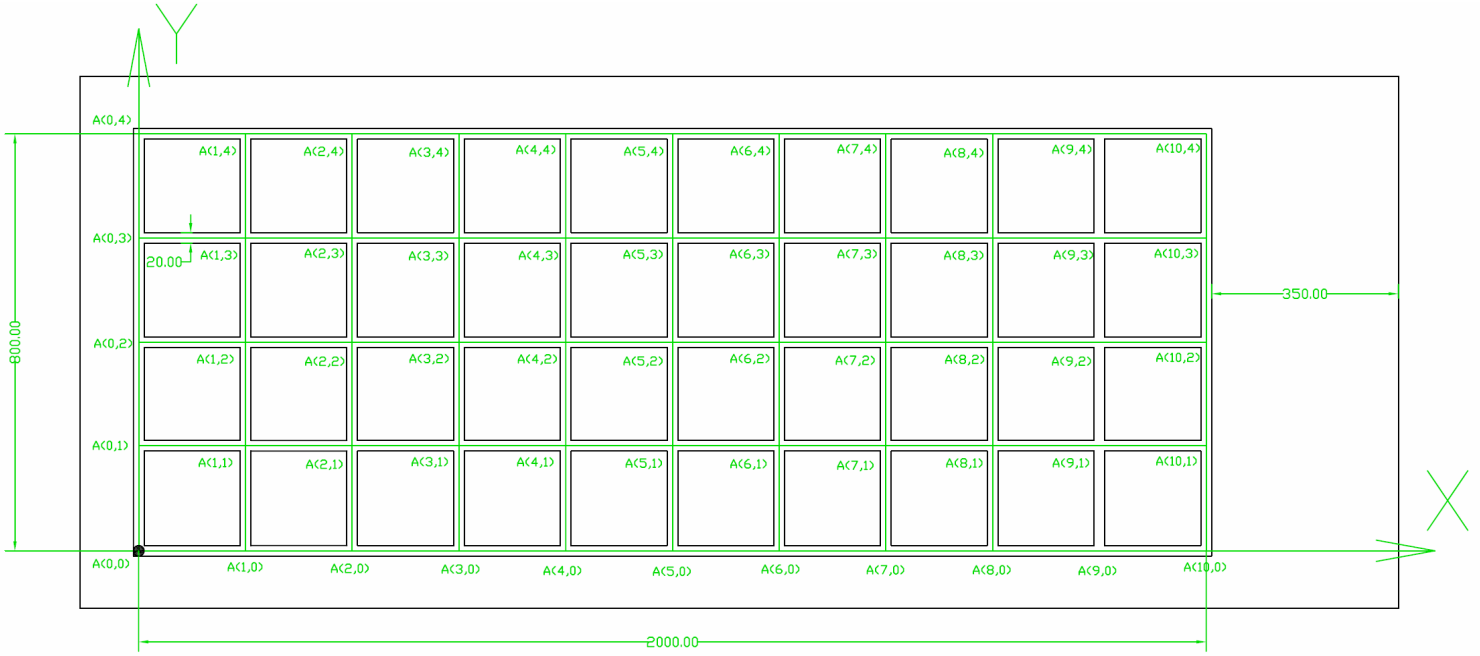

Fig. 1

3. Robots

The teams can participate in the competition with original wheel mobile robots, made of standard modules or with self-made mobile wheel robots. The maximum allowed circumference of the robot is 1200mm and the maximum height is 350mm. The robot must have at most 3 motors and 3 encoders. The robot kinematics is free. The robot has an active or passive gripper. The main properties of the allowed robots are placed in the table below:

Table 1

Type	Wheel mobile robot
Kinematics	No limitations
Active/Passive wheels count	No limitations
Motors	Maximum 3
Sensors	Encoders (Max 3), Light sensor etc…
Gripper	No limitations
Size	Circumference 1200mm, height 350mm
Weight	No limitations

4. Programming

The robot must be programmed to do a specific task. There are no limitations in the programming language. The program must have a time measuring algorithm witch measures fair the time form the program's start to its end.

<For example:

```
---------------------------------
[RCX varsion]

#define ...

task main()
{
CreateDatalog(1);
Timer (1);
ClearTimer (1);

  ...

  <main program>

  ...

AddToDatalog(Timer(1)).
}
---------------------------------
```

```
---------------------------------
[NXT version]

int startTime;
int endTime;
int totalTime;

task main()
{
startTime=CurrentTick();

….
<main program>
…..

endTime=CurrentTick();
totalTime=endTime-startTime;
NumOut(0,LCD_LINE1, totalTime);
}
---------------------------------
```

5. Object

The object must be gripped and transported. Its dimensions are 75x55x40mm / L,W,H/ (Fig. 2, Fig. 3). The object's approach direction is perpendicular to its longer side (showed by the arrow). The center of the object the crossing point C of the diagonals of the object in its horizontal projection. The maximum weight of the object is 100 grams.

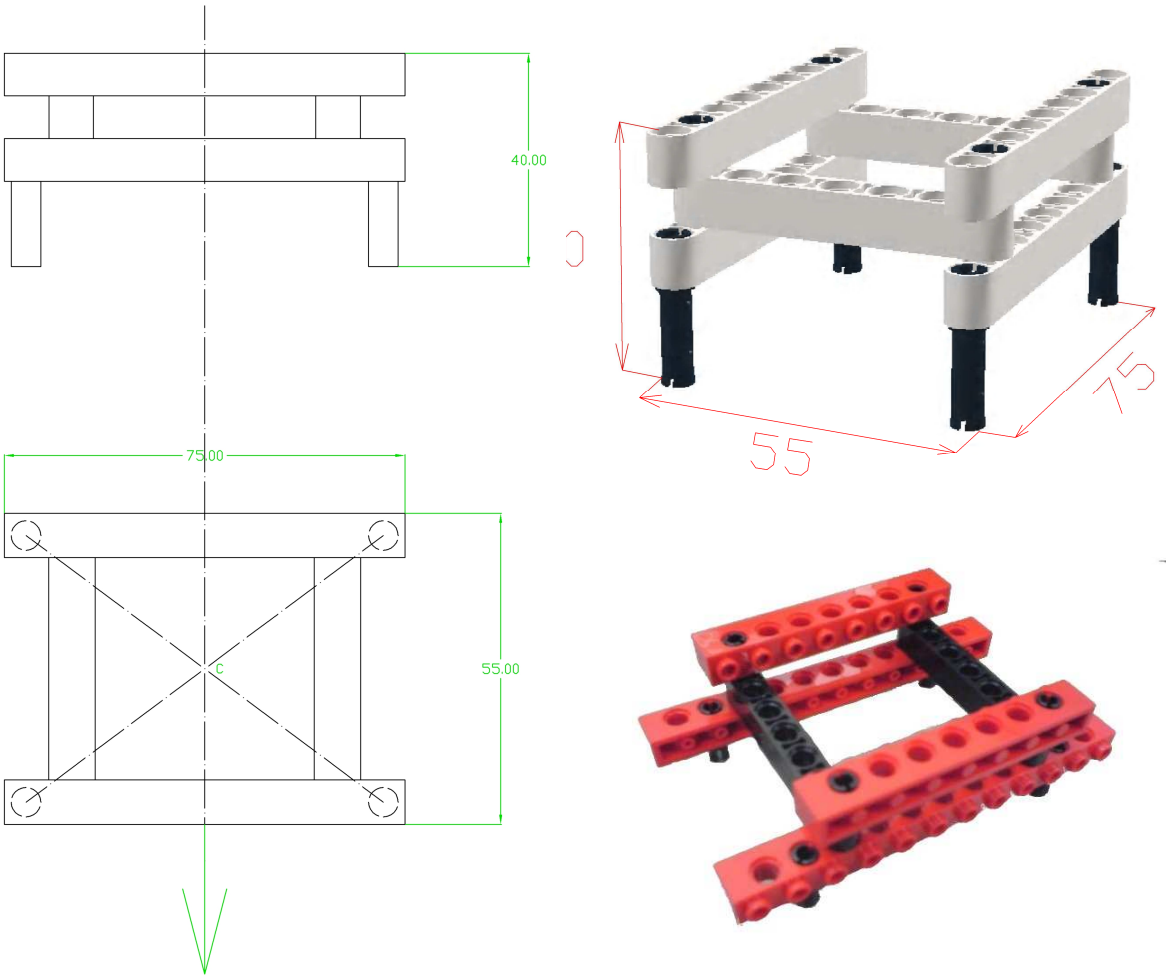

Fig. 2

6. Competition

The robot starts from the start point A(0,0) and moves around the field by following a line (using the light sensor), reaches the point in witch the object is placed (gripping point), grips the object and delivers it into a specific point with exact coordinates (goal point). The robot must follow line form the start point to the gripping point. The robot trajectory after the gripping point is determent by the team. The goal point must be far by the x-axe towards the gripping point. The object orientation in the gripping point is by the x-axis.

7. Start preparations

Before the competition starts the teams choose the following points on the field:

- Starting point – constant point with coordinates A(0,0)
- Gripping point – the point, where the object is, A(i,j)
- Goal point – the point, where the object must be delivered (x,y) [mm]

These points are programmed in the robot. At the beginning the robot is placed precisely in the starting point and is oriented by the y-axis. The two teams have to play two same games (with the same starting, gripping and goal point each). The coordinates for the first game are defined by Team1, the coordinates for the second game are defined by Team2. The first playing team is determined by a lot. The two teams have to declare their coordinates before the start of the competition.

8. Competition start

After the preparations the start signal is given, the program is started and the robot begins to move and to measure time. After the end of the program the robot can't be touched until the required measurements are made. The time for the task completion must be visualized with 10 milliseconds accuracy.

9. Measurements

The measurements are made by a jury, witch is not part of any of participating teams. The jury measures the distance between the center of the object and the goal point with a ruler.

10. Competition results

The winner form the competition is the team with the most points. The points are given for:

- 1 point for successful object gripping
- 1 point for faster performance
- 1 point for more accurate object delivery

The maximum points for a single competition are 3. In case of draw, the winner is the team witch has a smaller total accuracy error. In case of more than two teams are participating in the competition, the following playing scheme is used (Fig. 4).

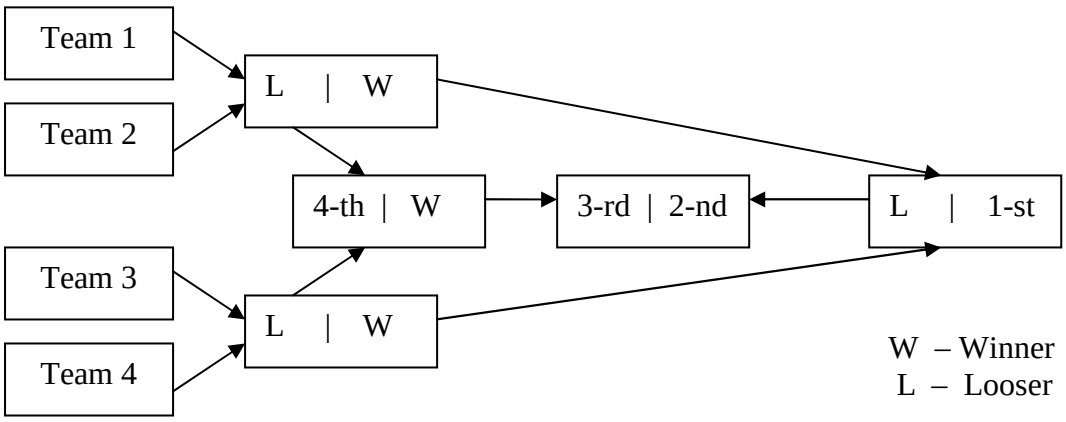

Fig. 4

11. Competition results cancellation

The competition results can be cancelled by the following circumstances:

- When somebody touches the robot or the object before the execution of the program is not finished.
- When somebody moves the robot or the object before the required measurements.
- When the program is running more than 5 minutes.
- If one of the teams decides, that the current result is unsatisfactory, the team leader can cancel this particular result. Than the team makes another run. Every team can do this only 2 times.