

# RTC CUP MINI Challenge Rulebook

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**Appendix No. 1.** Proving Ground: Description, Technical Features, Configuration.

«RTC Cup Mini» Challenge is a smaller version of «RTC Cup» Challenge: the «RTC Cup Mini»'s proving ground is 4 times smaller, then the «RTC Cup»'s proving ground, but the tasks and obstacles are the same.

In «RTC Cup Mini» Challenge the robot shall pass through the proving ground within the specified time. The proving ground is a reconfigurable obstacle course, a maze, made of cells. The maze made to resemble different indoor and outdoor terrains and obstacles, for search and rescue scenario. For each cell robot gain points, the number of points depend on difficulty of the task, located in the cell.

In addition, when passing the proving ground the robot shall collect special «cans», and deliver them in special colour zones according to the «can» colour, to gain more points.

Robot can demonstrate some autonomy in the area with the black line on the white field (for this task points are doubled, compared to nonautonomic tasks).

## 1. Maze

The Maze allows assessing functional capabilities of a robot in enclosed space and low visibility conditions.

Figure 1 shows the Maze that consists of 6 cells, the dimensions of which are 340x340x340 mm.

The Maze involves various tests, obstacles and tasks to pass on the way to the exit. All tasks in the Maze vary in complexity and passage method, each task employs robot's certain capacities.

Cell quantity and connection order, as well as tasks arrangement, may be changed before the competition.

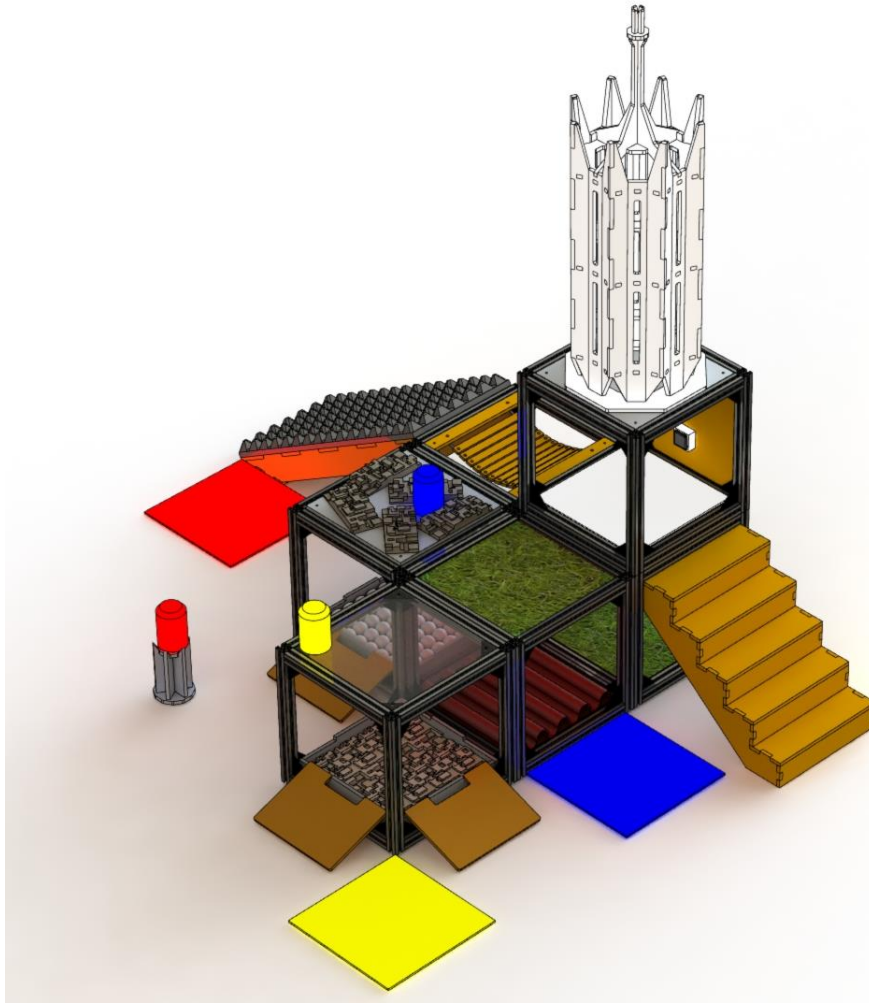


Figure 1.1 Example of the Maze Assembly and Tasks Arrangement

1.1. **Tests and Tasks in the Maze**

- 1.1.1. The **Grass** is a sector with artificial grass made of polypropylene, the pile length is 40 mm (Figure 2). The coating is affixed to a plywood sheet. Sector dimensions are 340x340x50.

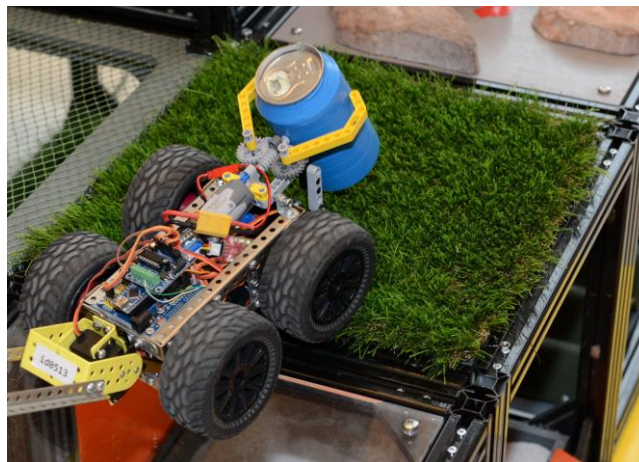


Figure 2. Grass Sector

- 1.1.2. The **Stones** sector consists of plywood with pieces of broken stones attached to it. The stone pieces have sharp angles and significantly vary in height (Figure 3). The average height of stone layer is 40 mm. Sector dimensions are 340x340x50.

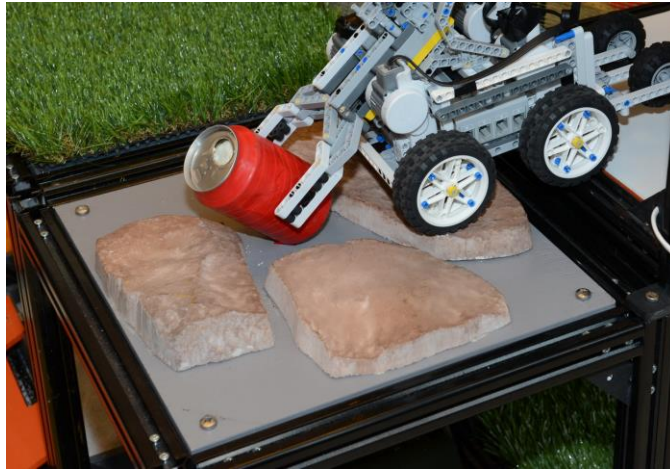


Figure 3. Stones Sector

- 1.1.3. The **Button** is a standard switch for a lamp (Figure 4). When switched on, the lamp in the Fog sector flashes on. The Button is placed 100 mm above the floor.



Figure 4. Button

- 1.1.4. The **Ball box** is a box filled with ping-pong plastic balls (40 mm in diameter). Box dimensions are standard: 340x340x50.



Figure 5. Ball box

- 1.1.5. **Expanded Clay** is a sector consisting of a box filled with 10-20 mm fractions of expanded clay. Box dimensions are 360x360x50. The height of expanded clay layer varies from 20 to 30 mm. Inclined ramps are mounted inside the box and inclined surfaces are affixed outside the box.



Figure 6. Expanded Clay

- 1.1.6. The **Sand** sector is a box filled with silica sand fractions of 0.2 - 2.5 mm (Figure 7). Box dimensions are 340x340x50. The height of sand layer varies from 20 to 30 mm. Inclined ramps are mounted inside the box and inclined surfaces are affixed outside the box.

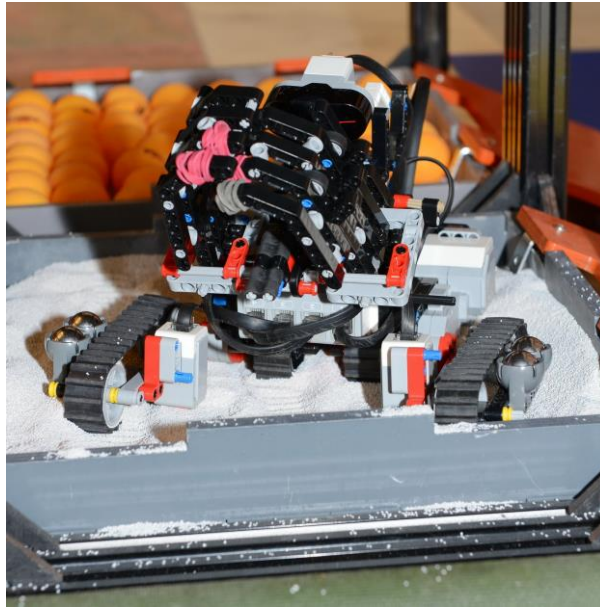


Figure 8. Sandbox

- 1.1.7. The **Net** sector consists of 340x340 mm frame with a net stretched on it (Figure 9). Tension is weak and net sags slightly. The mesh size is 1 sq cm. The Net is made of thin kapron cord by knot weaving.

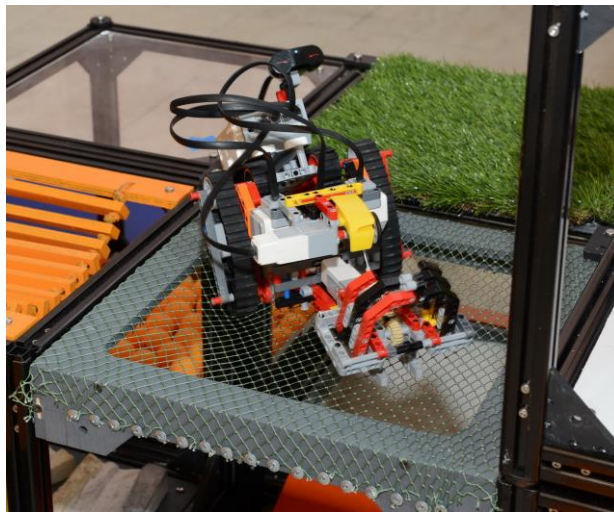


Figure 9. Net

- 1.1.8. Figure 23 shows **30° Inclined Surface** and slope angle of 30°.



Figure 10. 30° Inclined Surface

- 1.1.9. Figure 30 shows the **Staircase** with the steps are 75 mm high and 90 mm wide.

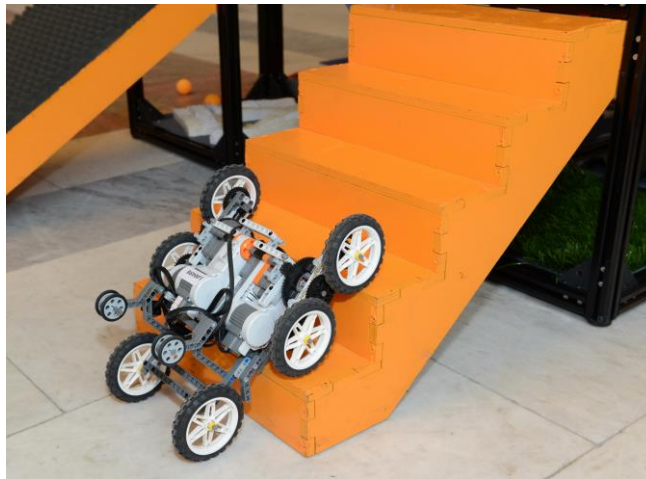


Figure 11. Staircase

- 1.1.10. The **Bridge** – sector consists of 340x340 mm frame with a wood sticks on the railing ropes. Tension is weak and bridge sags slightly.



Figure 12. Bridge

1.1.11. The **Roof** – sector consists of 340x340 mm roofing plate.

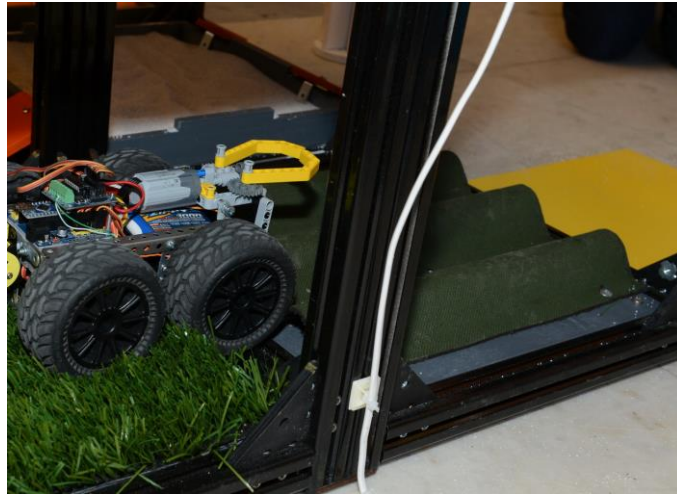


Figure 13. Roof

1.1.12. For the Beacons Collection 0.33 l aluminum cans are used. Cans are painted in one of the following colors: red, blue, yellow, white. The robot's task is to grip and lift the beacon or carry it to the respective color zone in any other way. The color zone is marked with a whole-colored rubberized cloth of red, blue, yellow or white color spread on the floor.

Possible variation of beacons and zones allocation in the Maze is shown in Figure 14.



Figure 14. Beacons delivering

1.1.13. **High Beacon** is a standard beacon located at an elevation representing a miniature copy of the Tower: 160 mm in height and 90 mm in diameter (Figure 15).

Beacon's displacement from the tower proves the high functionality of the robot's manipulator.

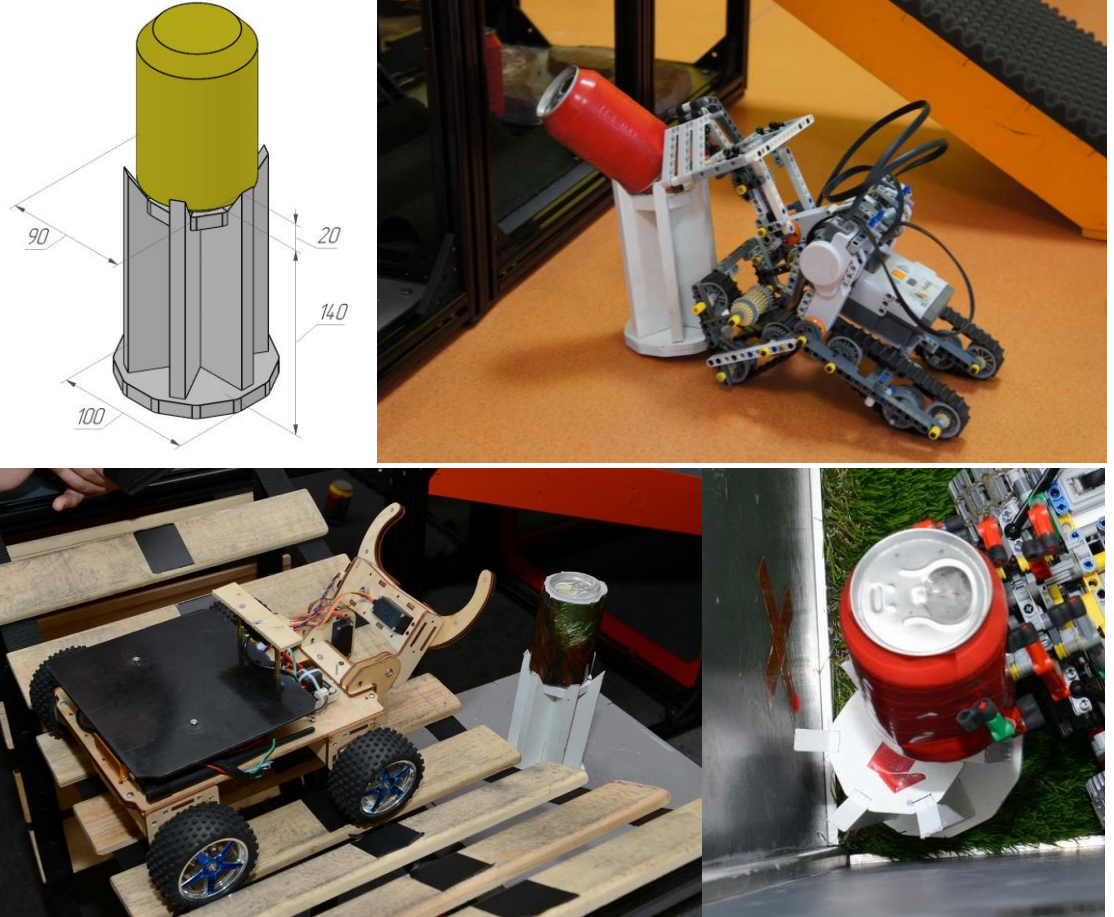


Figure 22. Tower with Beacon