RoboSTEAM 2018

Rulebook

Outline of the game

Let's clean up the mountain path!

Build a robot that collects trash dumped in the mountains. Dumped trash not only damages the beautiful landscape, but also pollutes the environment with harmful substances and has a bad influence on the lives of plants and animals living in the mountains. After leaving the starting point, your robot is given a mission to run along the mountain path, collect the dumped trash and toss it in the trash disposal container located at the trash collection site.

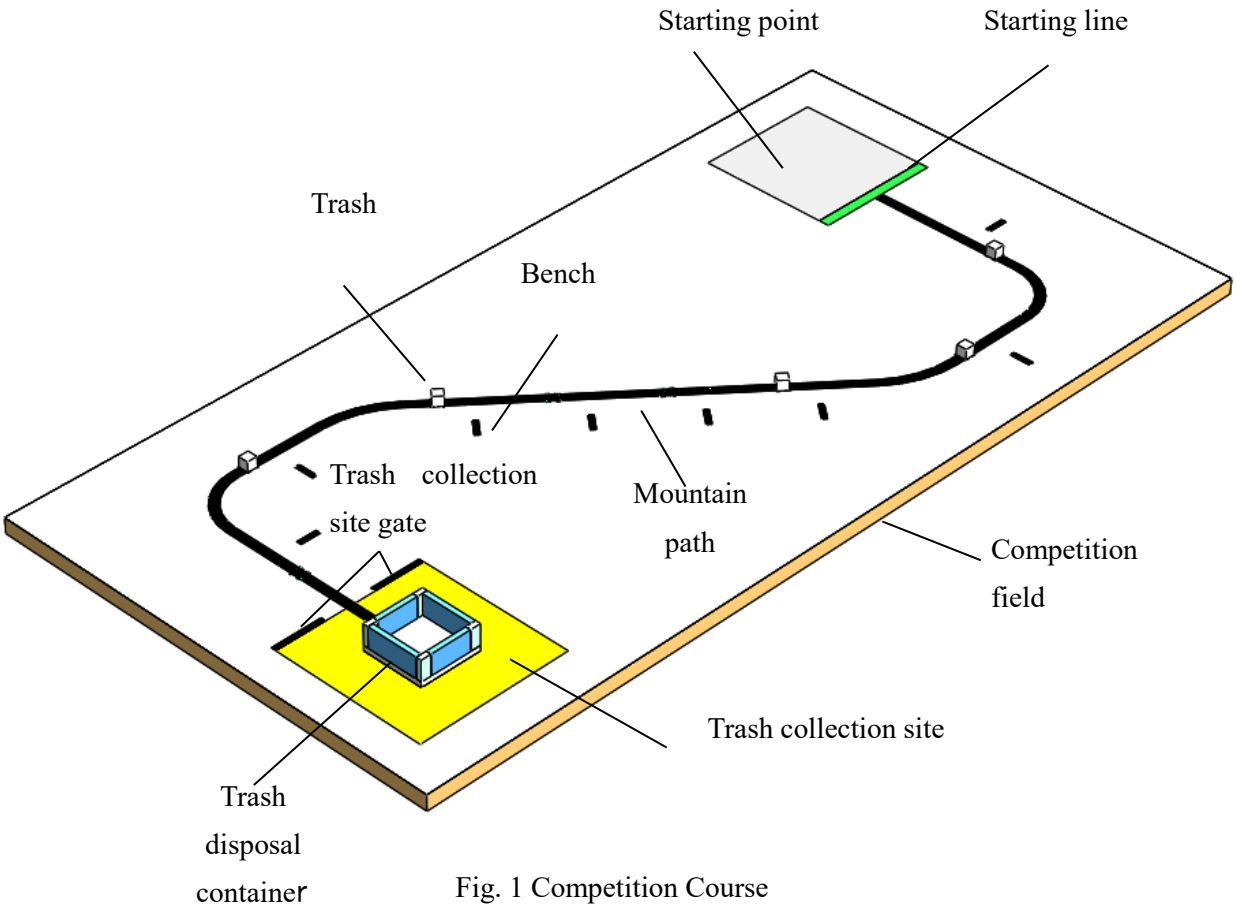


Fig. 1 Competition Course

1. Details of the Game

○ Mission

After leaving the starting point, the robot must collect the trash along the mountain path, and carry it to the trash collection site at the end of the path. Once the robot has put the collected trash into the trash disposal container located at the center of the trash collection site, the robot is required to end the operation, and light the end-lamp (LED) to finish this mission.

○ Robot requirements

- To move autonomously from the starting points until the completion of the task.
- To run along the mountain path, collect as much trash as possible and carry it to the trash collection site.
- To put the trash, carried to the trash collection site in the trash disposal container.
- To accomplish the mission in as little time as possible.

○ Trash

From the results of previous surveys, we have identified 8 places where trash is often dumped. From the information provided by hikers, we are aware that trash has been dumped in 5 places, however we have not been able to identify where those five places are, within the eight locations.

A combined Artec Block as shown in Fig.2 will be used as trash. All trash on the course should be of the same shape.

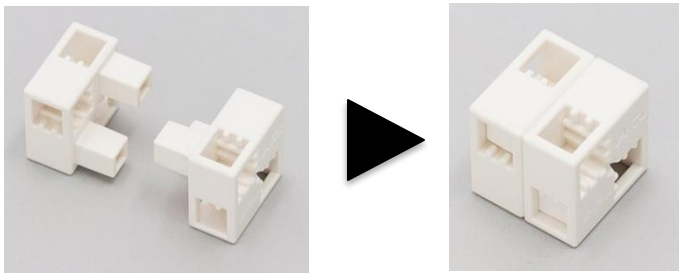


Fig.2 How to assemble a piece of trash

The places where trash is often dumped are numbered from 1 to 8, and are marked on the mountain path. Trash is placed on marked places. Also, benches for rest are placed near the places where trash is dumped.

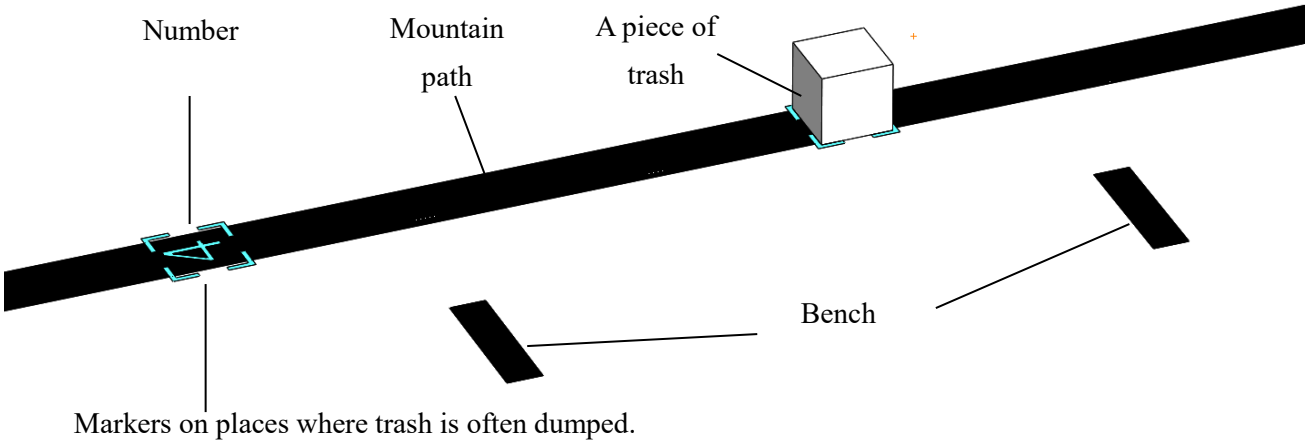


Fig.3 Locations where trash is often dumped.

○ Trash collection site

The yellow area (including the mountain path, but not including the gates) at the end of the mountain path is the trash collection site.

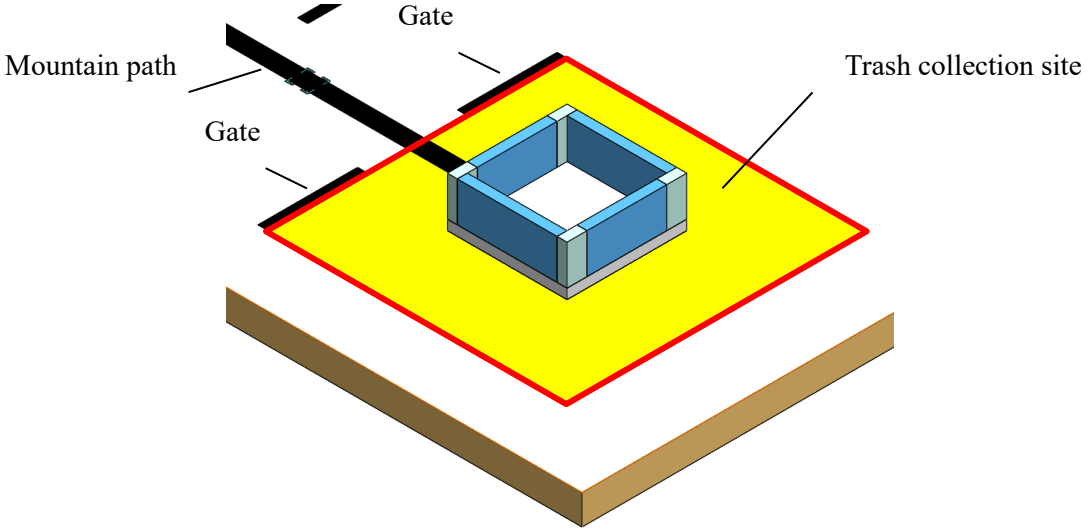


Fig.4 Trash collection site

○ Trash disposal container

A combination of blocks as shown in Fig.5 will represent the trash disposal container. The trash disposal container is located in the center of the trash collection site. Also, since the trash disposal container is not fixed, be careful not to bump into it with the robot and move it out of the trash collection site.

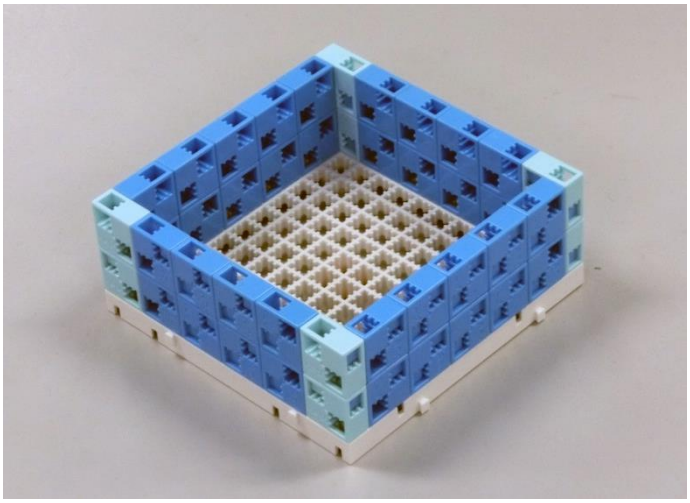


Fig.5 How to assemble the trash disposal container

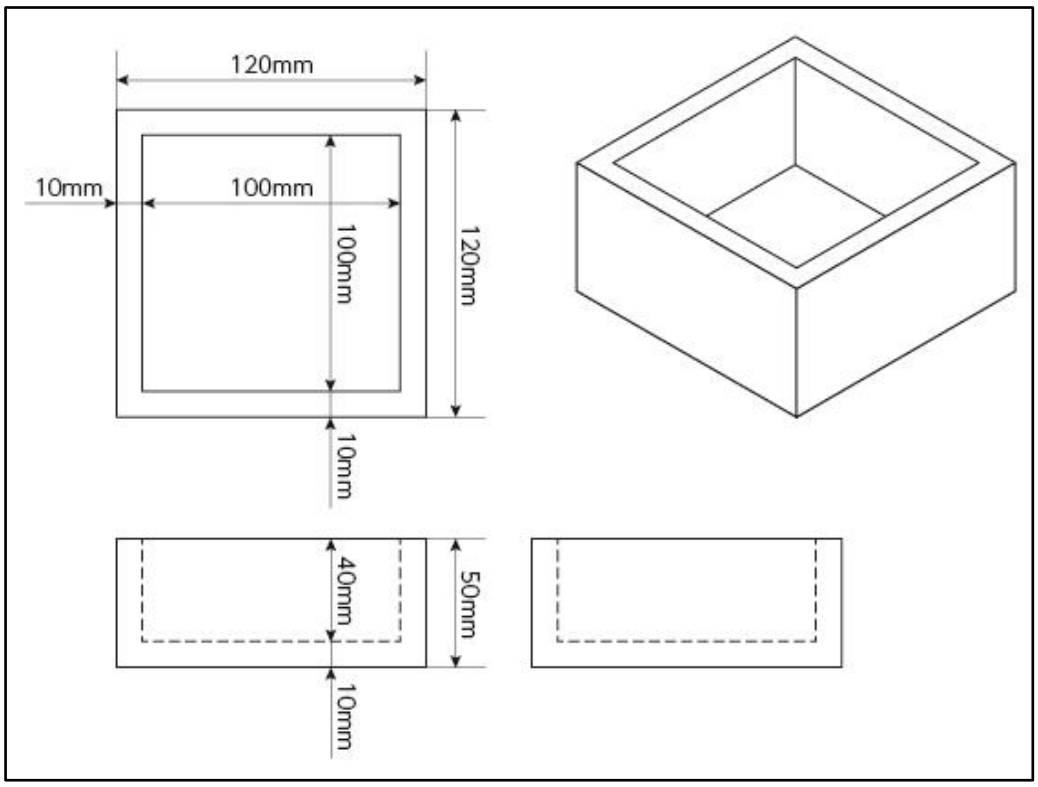


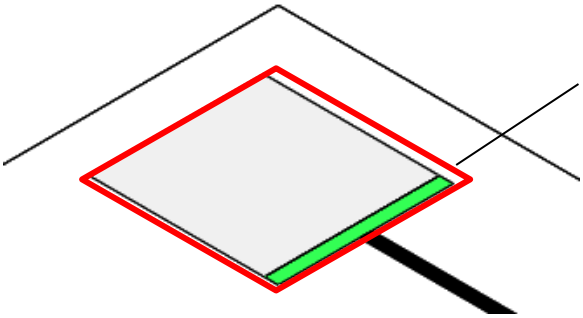
Fig.6 Size of the trash disposal container

2. Rules

1) The Competition time is 300 seconds (5 min).

2) Set the robot at the starting point and start after hearing the whistle of the referee.

3) Robots are not allowed to cross the starting point (including parts in suspension) before the competition starts.



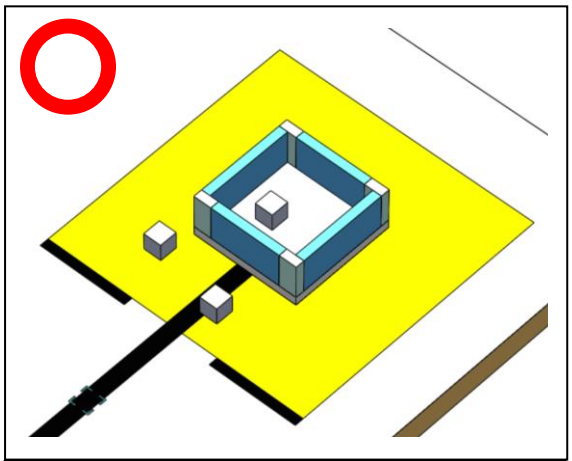
Starting point

4) Once you start, touching the robot is not allowed until the competition ends.

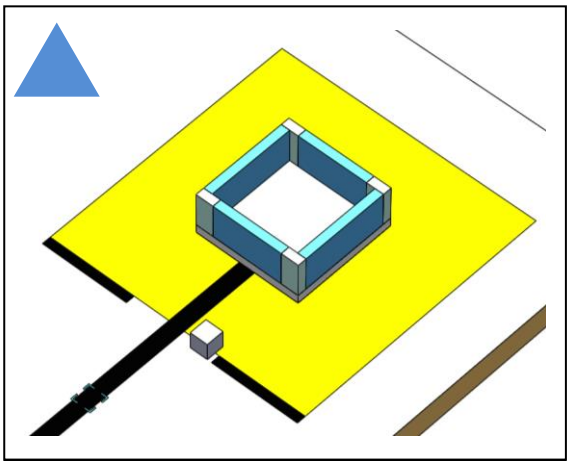
5) Restarting in the middle of the competition is not allowed.

6) Trash will be placed in 5 places selected from the locations 1 to 8. (refer to Fig.8 on page12 for locations of each number) The number of the locations would not be revealed until the day of the competition. They will be fairly chosen by lottery by the chief judge at the venue.

7) Points are given for each piece of trash carried to the trash collection site. However, points would only be given when the trash has direct contact with the trash collection site (yellow area). For example; if the robot ends the competition, still carrying the trash, a point would not be awarded. Also, in case the trash is not completely in the trash collection site, only half a point would be awarded.



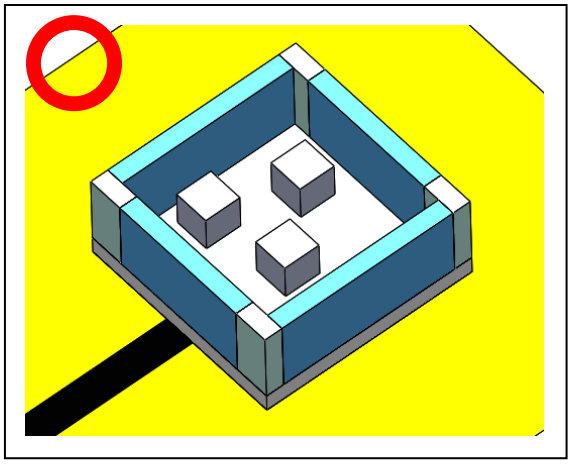
All the points are awarded.



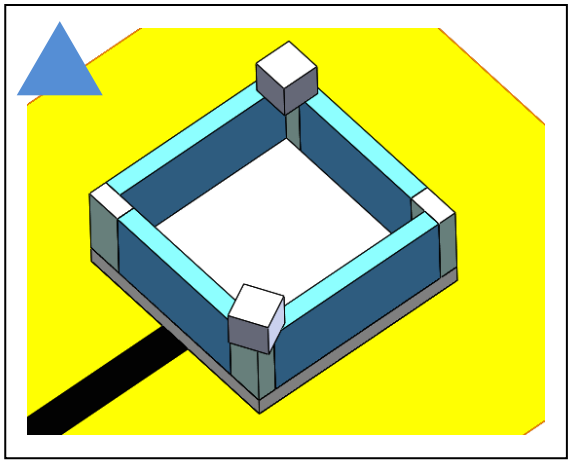
Half points are awarded.

”An example of the scoring method is on posted on page 9"

8) In addition to the standard points awarded as explained in 7), additional bonus points will be awarded in case the robot would succeed in placing the trash inside of the trash disposal container. However, points would not be given in cases when the trash is not in direct contact with the trash disposal container or when the trash bounces out of the trash disposal container. Also, only half of points would be awarded in case the trash is on the edge of the trash disposal container.

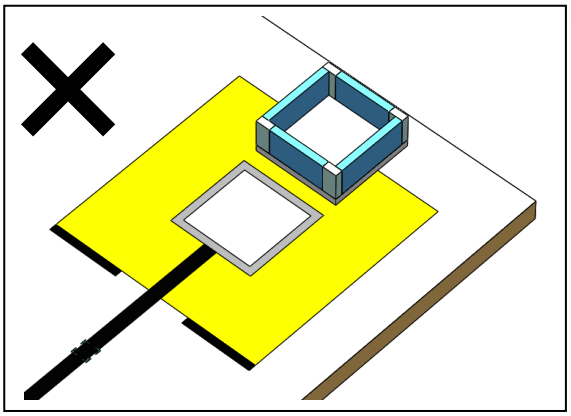


All the points are awarded.

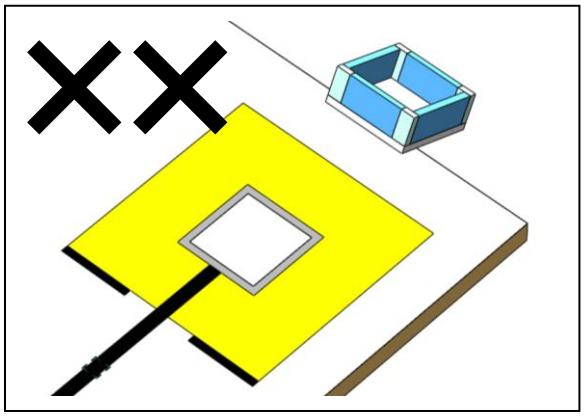


Half of the points are awarded.

9) Points will be deducted if the trash disposal container is partially moved outside of the trash collection site (yellow area) by the robot. Additionally, further (larger) point deduction would occur, when the trash disposal container is completely moved outside of the trash collection site, or when the trash disposal container falls from the competition field.



Points would be deducted in case the trash disposal container has been moved somewhat out of the trash collection site.



Even more points would be deducted in case the trash disposal container is moved completely outside of the trash collection site.

10) Light the end-lamp (LED) after completing the challenge. Also, the color of the end-lamp (LED) should be BLUE. Points will be deducted in case the end-lamp lights up before the challenge has been completed.

11) The competition will end in the following cases.

- When the end-lamp (LED) lights up.
  However, in case the end-lamp lights up before the mission is complete, the competition will end at the time when the mission has been completed.
- When the competition time has finished.
- When the robot falls off of the competition field and cannot return on its own.
- When a competitor wishes to stop the competition and proclaims "STOP".
- When the rules are broken.

3. The competition flow

1) The competition would be done twice. The higher score among the two competition results would be chosen as the final score of the team. This score would be used to decide the ranking.
2) Prior to the competition, each team will be given 10 minutes x 2 times to test-run the actual course. Each team shall use this time for robot and program adjustments. The order of the test-run would be chosen by lottery by the tournament headquarters in advance.
3) The competitors are free to use the practice course to adjust their robots and programs while other teams are using their test-run time.
4) After all the teams have finished their test-runs, all of the robots shall be checked by the inspectors. Touching the robots would not be allowed after the robot passes the inspection and is placed in the designated area. As any changes to the robot are not allowed after the inspection, the program should be transferred to the robot before the inspection.
5) The first competition will be held in the order chosen by lottery by the tournament headquarters in advance. The competitors will go and get their team's robot after their team has been announced, and they shall wait at the designated area until the competition starts. It is not allowed to change the robot or the program during the waiting period.
6) After finishing the first competition, each team shall promptly place their robot in the designated area

and wait until the second competition. It is not allowed to change the robot or the program during the waiting period.

7) After all teams have finished the first competition, the second competition will be held in the same manner as the first one.

8) After all the competitions are finished, the results would be calculated and the rankings would be determined.

4. Competition Robot

1) One robot per team.

2) Only the parts for ArtecRobo outlined in Document 1 on Page 13 and Artec Blocks outlined in Document 2 on Page14 are allowed to be used to build the robot.

3) Only one Studuino controller is allowed to be used. There are no restrictions for other parts.

4) It is not allowed to use modified versions of parts outlined in point 2).

5) It is not allowed to reinforce the robot with parts such as screws, adhesives and tapes etc. with the exception of parts outlined in point 2) above.

6) The size of the robot must be within W 25 cm, L 25 cm, H 40 cm at the starting point.

7) The weight of the robot is not restricted.

8) After the start, robots are allowed to transform (ie change shape), but are not allowed to separate into multiple parts.

9) The program for controlling the robot should be created by one of the following three software.

- Studuino Icon Programming Environment
- Studuino Block Programming Environment
- Arduino IDE

10) After the start, the robot must operate autonomously.

11) After the start, the robot cannot be operated by a person.

12) As for batteries, three AA alkaline batteries must be used.

13) Each competing team must bring their own parts and computers that they will use to adjust robots and programs during the test-run time before the competition. It would not be possible to borrow anything from the tournament headquarters.

14) It is not permitted for anyone other than the team-members who have entered the competition to build

a robot or to make a program.

5. Scoring

1. 10 points are awarded for every piece of trash carried to the trash collection site.

   However, if a part of the trash is out of the trash collection site, only half of the points (5 points) are awarded given.

2. 40 points are awarded for every piece of trash thrown into the trash disposal container in the trash collection site.

   However, if the trash is on the rim of the trash disposal container, only half of the points (20 points) are awarded.

3. In case a part of the trash disposal container is partially moved outside of the trash collection site, 50 points would be deducted.

   In case the trash disposal container is completely moved outside the trash collection site, or when the trash disposal container falls from the competition field, 100 points would be deducted.

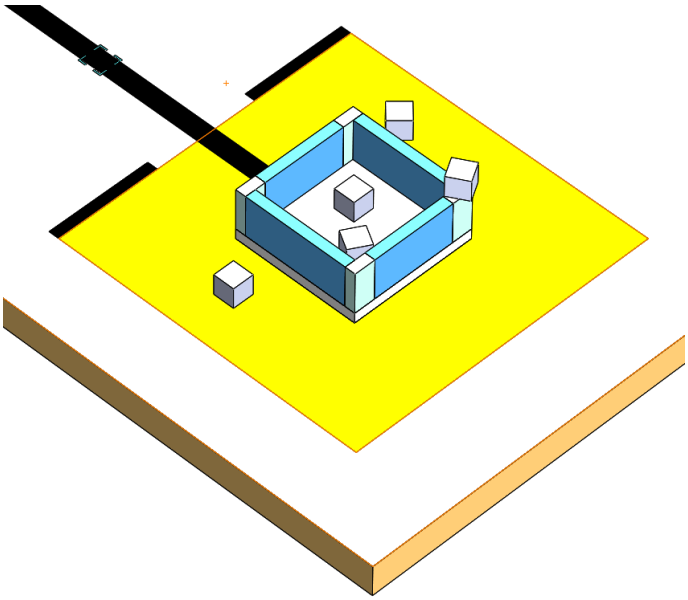
4. In case the end-light (LED) lights up before the completion of the mission, 30 points would be deducted from the total score.

5. Additional points would be awarded depending on the time needed to complete the mission, according to the following formula.

   Additional points = Time limit (sec.) - Time needed to complete the mission (sec.)

6. The sum of points awarded as per rules outlined in 1～5 above, shall be the official competition score.

(Scoring example)



○ Collected Trash

- 5 pcs on the trash collection site ⇒ 10 points x 5 pcs = 50 Points
- 2 pcs inside of the trash disposal container ⇒ 40 points x 2 pcs = 80 points
- 1 pcs on the rim of the trash disposal container ⇒ 20 points x 1 pcs = 20 points

○ Time required to complete the mission

- 180 sec. ⇒ 300 sec. - 180 sec. = 120 points

Total Competition Score: 270 points

5. Competition Course

A set consisting of a competition course and block sets representing trash and trash collection site identical to the one used during the competition will be given to each team upon official confirmation of their participation.

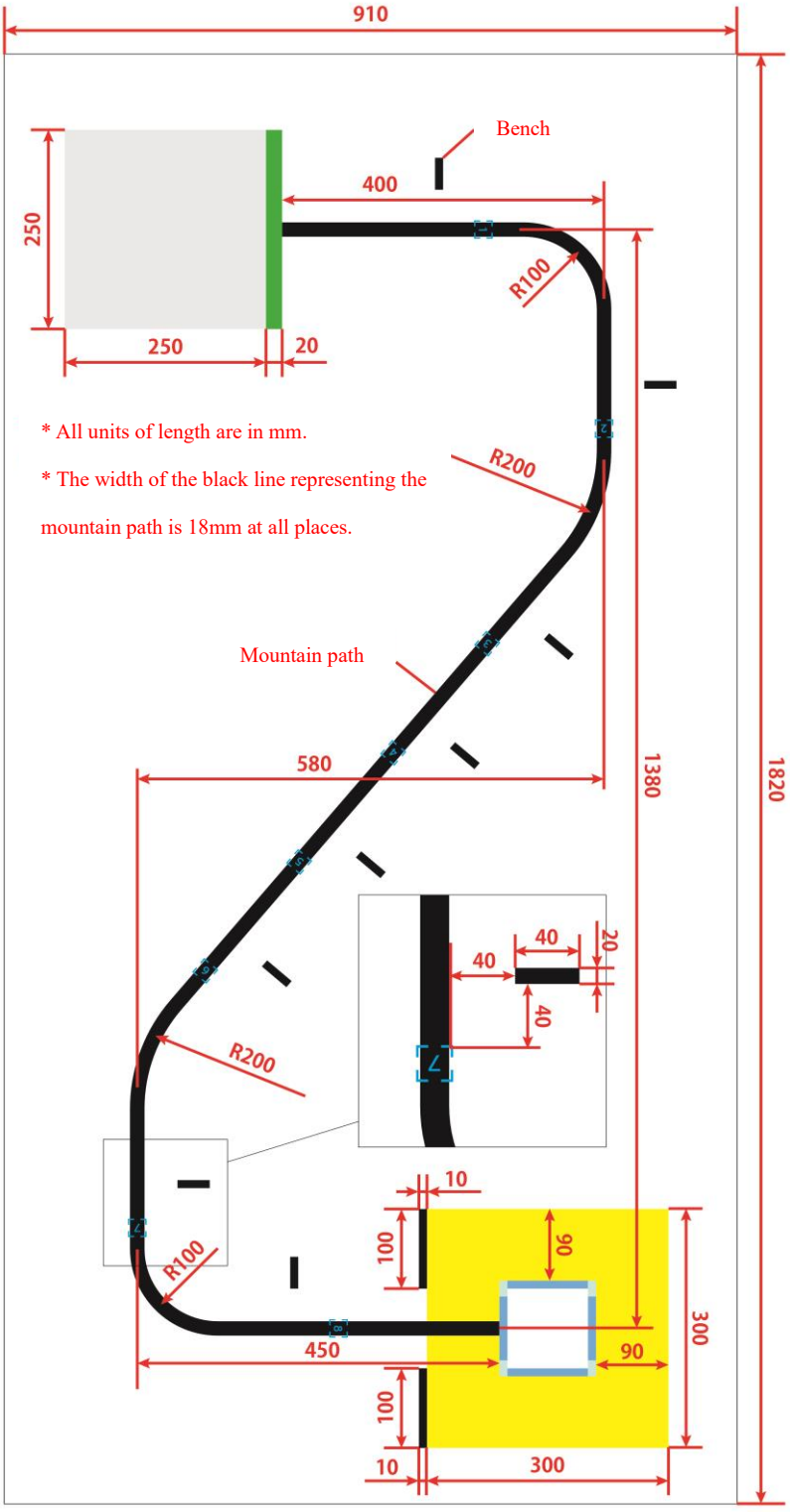


Fig.7 Competition course size

* Refer to Fig.6 on Page 4 for the size of the trash disposal container.

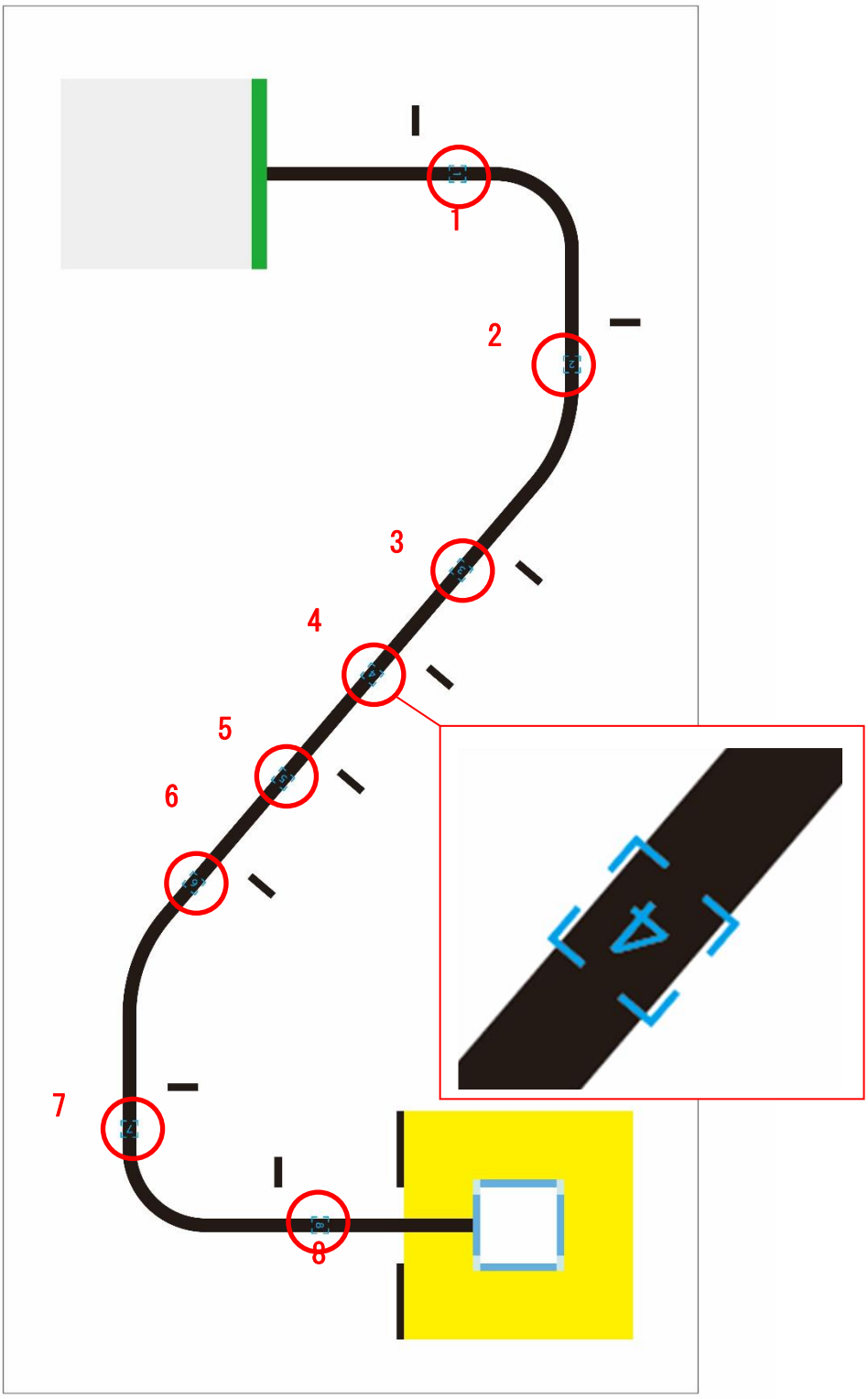
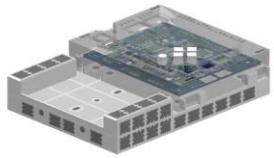
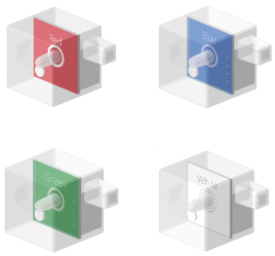
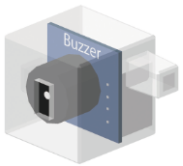
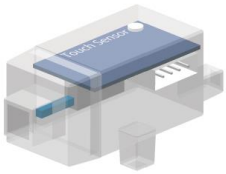
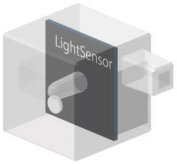
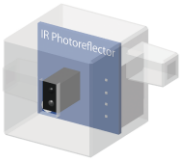
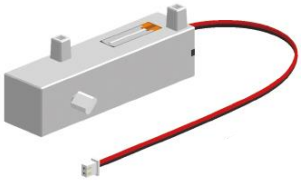
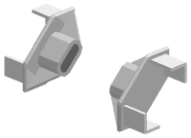


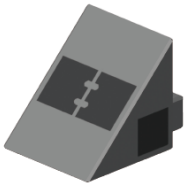
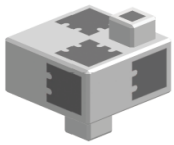
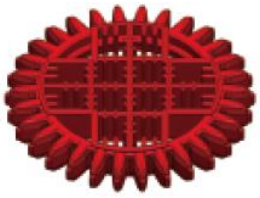
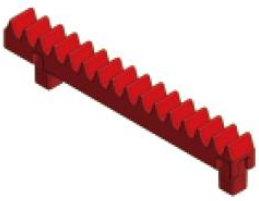
Fig.8 8 Locations, where trash is dumped often

Document 1 List of permissible ArtecRobo parts

Studuino	Battery Box	LED (Red, Blue, Green, White)	Buzzer
			
Touch Sensor	Light Sensor	Sound Sensor	IR Photoreflector
			
Accelerometer	Servomotor	DC Motor	Connecting Parts for DC Motor
			
Sensor Connecting Cable (S) (3-wire, 15cm)	Sensor Connecting Cable (M) (3-wire, 30cm)	Sensor Connecting Cable (L) (4-wire, 50cm)	Extension Cable for Servomotors
			

Document 2　List of permissible ArtecBlock parts

*Blocks of any color can be used.

Basic Cube	Triangle	Half A	Half B
			
Half C	Half D	Axle	Wheel
			
Beam	Disk	Gear Block L	Gear Block S
			
Drive Rail	O-ring		
			

*Tires for Gear Blocks cannot be used.