World Robot Olympiad 2017

WeDo 2.0 Pilot

Regular Challenge

Game Description, Rules and Scoring

Sustainabots [Robots for sustainability]

Sustainable Tourism

Version: Final Version March 10th

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Introduction

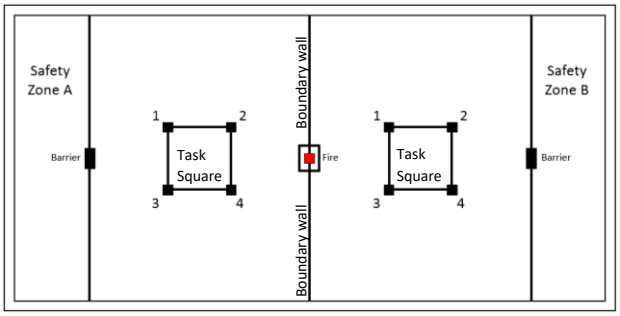
As one of the richest countries in biodiversity, a lot of different ecosystems can be found in Costa Rica. There are areas open to the public, many national parks, mountain ranges, and protected reservoirs that have been established to protect Costa Rica's natural resources. It is important to preserve habitats of the many endangered species, to prevent them from becoming extinct. National Park Rangers work every day to not only help preserve Costa Rica's natural wonders but also help tourists (hikers and other visitors) experience natural wonders in a sustainable way. Park Rangers teach tourists to lessen their impact by following specific trails and seek the assistance of local expert guides.

The Elementary WeDo 2.0 Regular Challenge is to make a robot that plays the role of a National Park Ranger. Rangers help visitors explore and investigate the wonders of nature without disturbing it. In this challenge, each team will build and program a robot ranger to keep the park tidy of litter, help contain a forest fire, pick up a visitor, and aid an animal. Just as it happens in Costa Rica, teams will each operate in their own national park working to do as much good work as possible in the 2 minutes of the competition.

1. Game Description

Two teams will work in their own area (national park) on the Game Table. The national parks are separated by a boundary wall that runs across the middle. Each team will use their robot ranger to complete a series of tasks inside 2 minutes.

Game field:

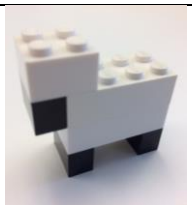


There is a 300mm deep Safety Zone at either end of the table, separated from the rest of the field by a black line. There is a small black rectangle (8mm x 4mm) on the black line. One robot will start in Safety Zone A and the other in Safety Zone B.

The task square sits in the middle of each half of the game field. Each square is 250mm x 250mm. There is a small black square (4mm x 4mm) on each corner.

Task objects:

There are six task objects that need to be built by each team. The two Litter Blocks, Fire block and barrier should be built as shown below. The visitor and animal can be built using any LEGO bricks and must fit completely within the squares (4mm x 4mm) as shown on the corners of the task square on the game field. Below are examples for the visitor and animal.

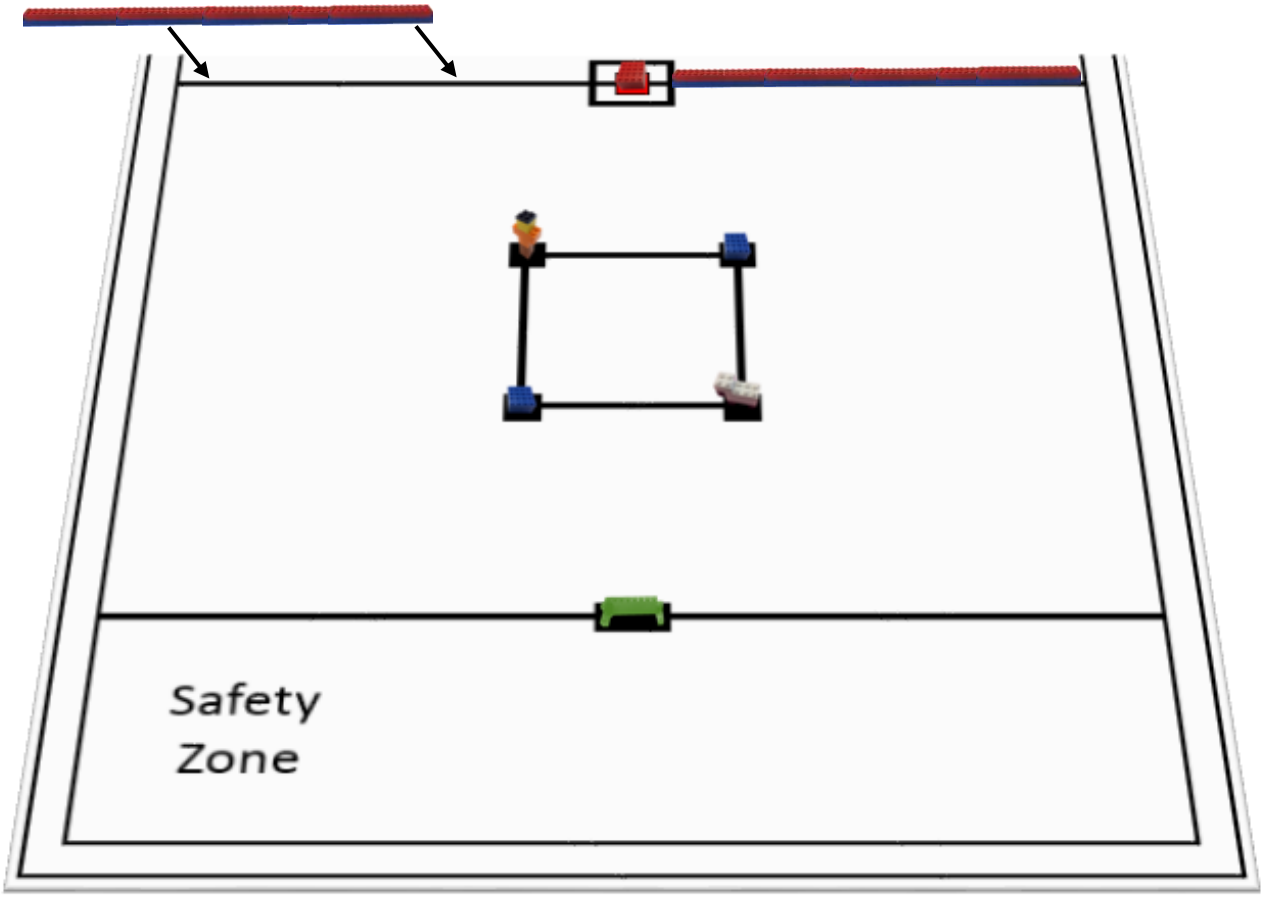
Litter block (x2)	Fire block	Visitor (example)	Animal (example)	Barrier
				

Game tasks:

During the competition, each team will use their robot ranger to:

- Collect the two LEGO Litter blocks by pushing/placing them into their Safety Zone.
- Pick up a visitor by pushing/placing them into their Safety Zone.
- Aid an animal by pushing/placing them into their Safety Zone.
- Contain the forest fire by pushing/placing a barrier in front of the fire.

Game field set up:



The four task objects (not the Fire block or barrier) will be set up, randomly, on one of the four corners of the task square, so that they are completely within the black squares. An example lay out is shown above.

The Fire block is placed on the red square on the park boundary, so that it is completely within the red square.

The barrier (shown in green in the example above) is placed on the Safety Zone line, so that it is completely within the black rectangle. The barrier can be built of any colour bricks.

Either side of the Fire block is a wall (shown in blue and red bricks in the example above), built of LEGO bricks 2 studs wide and at least 2 bricks tall, to separate the two teams. The teams should build their own walls and bring them to competitions. This wall should touch the sides of the game area and end touching the larger black box around the fire space. It can be decorated with trees and other LEGO elements so that it represents a forest. The wall can be built of any arrangement and colour bricks.

2. Game Rules

The mission is completed when either, a) a robot is within their Safety Zone and all tasks have been completed, or b) the two minute time limit has expired.

To start the game, the robot is placed in the Safety Zone so that it does not touch the black line or any LEGO game object.

During the game, the robot may be moved either autonomously or by remote control, or using a combination of both methods. Any combination of WeDo 2.0 hubs, motors and sensors is allowed and the robot ranger can be controlled by any compatible devices using the WeDo 2.0 software or with a remote controller built from WeDo 2.0 hardware.

Only one block, litter, animal, visitor or barrier may be moved at one time. A robot ranger may not sweep up two or more blocks in one go. Each block, litter, animal and visitor is treated as an individual task and scored as such. If a robot ranger moves multiple game pieces into a Safety Zone at the same time the team will score the lowest of the possible scores.

If a task object is broken, but both parts are in the Safety Zone, they may be repaired and put back in the Safety Zone.

If the red Fire block is pushed so that part or all of it is outside the red box (and therefore inside the opponent's side of the field) the team who pushed the block will score 0 points for that task. The opponent will score 10 points, regardless of where their barrier is at the end of the 2 minute game.

For the duration of the 2 minute game, a team is permitted to touch their robot while it is within their Safety Zone. They may do this to reposition the robot within the zone, or attach or detach appendages. As long as the robot is within the Safety Zone, no penalty points are incurred.

For the duration of the 2 minute game, a team is permitted to touch their robot while it is outside their Safety Zone only to pick it up from the field and place it back into their Safety Zone. If they touch the robot in this way, then the team will score a 1 penalty point. They must not touch the robot for any other reason (e.g., to reposition the robot on the field).

Additionally, any time the boundary wall of LEGO bricks is pushed off the black line, the team will score a 1 penalty point. The referee will replace the wall back on the line.

If there is an uncertain situation during the robot competition, the judges will make the final decision.

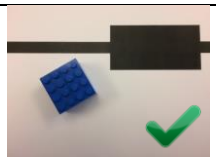
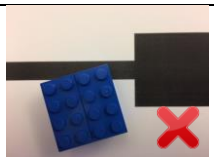
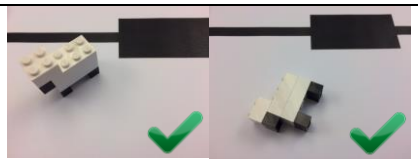
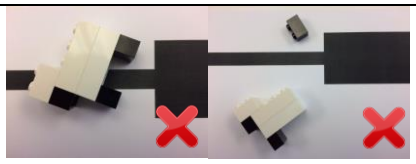
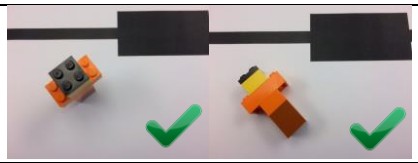
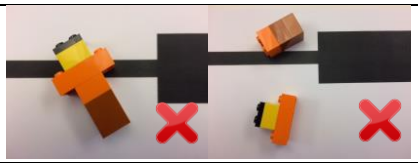
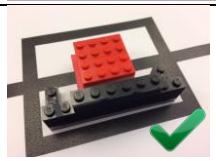
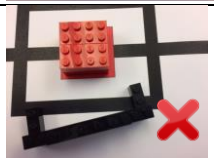
3. Completing tasks and Scoring

a. A score will be determined when all tasks have been completed or when time expires.

b. Maximum score = 80. If a team has a negative score after 2 minutes, the referee shall score them as 0.

c. If multiple pairs of teams have the same score, ranking is decided by the shortest time recorded.

The following table shows how to successfully complete each task, what will count as complete, what will not count as complete, and the points given for each task completed.

To complete the task	Complete – when a task can be scored	Incomplete – when a task is not scored	Score
A blue Litter block is completely within a Safety Zone			**10**
The animal is completely within the Safety Zone			**15**
The visitor is completely within the Safety Zone			**15**
The red Fire block has a barrier within the black line			**10**
The red Fire block is pushed out of the red box by one team and into the opponents side of the field.		The team who pushes the Fire block out of the red box and into the opponent's side of the field will score 0 points for that task. The opponent's will score 10, regardless of where their barrier is placed.	**10**
The robot completes all tasks in their park in less than 1 minute			**10**
Bonus points for good sounds added			**5**

Bonus points for using the LED colours			**5**
Penalty for each incident of touching a robot outside of the safety zone			**1**
Penalty for each incident of pushing the central wall off the black line			**1**

4. Table Specifications

a. The internal dimensions of a game table are 2362mm x 1143mm.
b. The external dimensions of the table are 2438mm x 1219mm.
c. The primary colour of a table surface is white.
d. Height of the borders: 70 ± 20mm.

5. Game Area Specifications

a. All black lines are 10 ± 1mm.
b. Dimensions may vary within ± 5mm.
c. The game area has been designed to allow teams to measure and mark the appropriate lines on their practice table. A marker pen or black electrical tape are recommended for marking the lines and boxes. The task square could also be printed onto A3 paper (or equivalent size) and printed using black ink. A pdf of the entire game field is available.

6. Game Object Specifications

There will be five task objects **per team** and 1 shared task object:

a. 1 red block with 4 red 2x4 LEGO bricks (shared).
b. 2 blue blocks with 4 blue 2x4 LEGO bricks.
c. 1 animal.
d. 1 visitor.
e. 1 barrier.
f. 2 boundary walls (to be built by teams during practice sessions, each team can supply one boundary wall for each competition game).