



World Robot Olympiad 2021

WeDo Open Category Game Description, Rules and Evaluation

FOREST FIRES

International Version: January 15th

Note: for the 2021 season WRO Association has decided to re-use the WeDo Challenges from 2020 instead of making new game rules.

Important to know

These Game Rules are an example of what the WeDo competition could be.

The WeDo age group is only offered as a national competition.
There is no qualification to an international final.

This is why every WRO National Organizer can adapt these international game rules to fit the situation in their country. The WeDo rules in your country could be different from this international version.

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Introduction

Forest fires are a problem in many places in the world every summer. They destroy large parts of the forests and sometimes come to close to areas where people live. Those people have to be evacuated to safe areas. Fires occur and spread in hot and dry weather. Climate change causes longer summers, which are very dry. The countries affected by forest fires have to do something about the growing danger.



Photos from: <https://wildfiretoday.com/2015/12/11/firefighting-robots/> and <https://autonomicvehicles.eu/2018/11/01/autonomous-robot-planting-trees-assist-environmental-protection/>

This year, the challenge is to make a robot that can fight forest fires and supply the firefighters with water for the firefighting. In addition, the robot must also be able to plant new trees to replace the burnt trees.

1. Challenge Description

The WeDo Open Challenge is for each team to use WeDo 1.0/2.0 elements to construct a model of a driverless rescue vehicle (the robot) that the team can use to illustrate, explain, and demonstrate how a rescue vehicle can help us in the event of a forest fire. The robot must transport water tanks to a forest fire and help plant new trees in the forest.

The rescue vehicle must be placed in an exhibit booth and the team must be ready to demonstrate it for visitors and judges. The following illustration gives an example on what a booth could look like, regardless of the theme.



2. Challenge Tasks

Each team must complete a series of tasks in the process of making an exhibit. Each task in the sequence must be documented with pictures/video/text displayed in the exhibit.

Task 1 - Autonomous Braking

A rescue vessel is moving strongly and therefore it is important that it can detect an object in front of the vessel so that the vessel can stop automatically to avoid a collision:



In Task 1, the team will use WeDo and other LEGO elements to build and program a robot with a motor and a motion sensor – for example in the style of the Milo the Science Rover.



The team must use the robot to demonstrate what autonomous braking is. The WeDo robot must be programmed to autonomously drive forward until the motion sensor detects an object in front of the robot. When an object is detected, the robot must stop. The robot must be controlled by a sequence of WeDo commands that, once activated, make it drive on its own, i.e. the robot must not be remotely controlled.

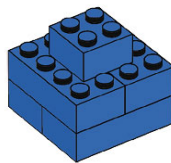
When the robot is built and programmed, the team must make a video that shows how it performs autonomous emergency braking. The video must be shown in the exhibit, together with the program that controls the robot.

Task 2 – Transport of water tanks

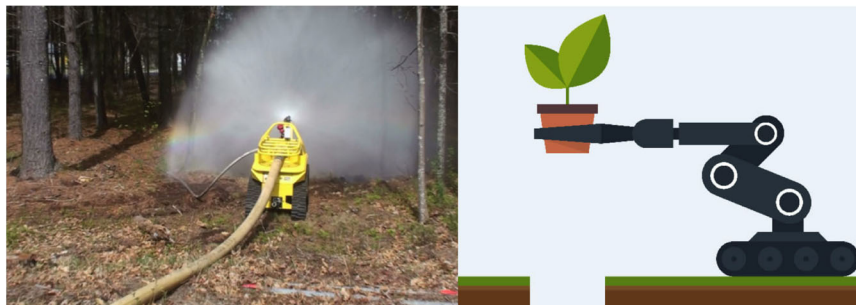
In Task 2, the team will use the WeDo and LEGO elements to build and program a rescue vehicle to transport water tanks from a storage area to the forest fire.

The water tanks are built of a minimum of 3 Lego blocks and the transport can be done by pushing or lifting them. It is important that the tanks do not tip over as the water will go to waste.

The team can design their own water tanks. Here is an example of what they could look like.



Once the rescue vehicle is built and programmed, the team will make a video showing how it transports the water tanks from the storage area to the fire. The video must be displayed in the exhibition along with the program that controls the rescue vehicle.



Images: <https://wildfiretoday.com/2015/12/11/Firefighting-robots/> & <https://autonomicvehicles.EU/2018/11/01/Autonomous-robot-Planting-Trees-Assist-Environmental-Protection/>

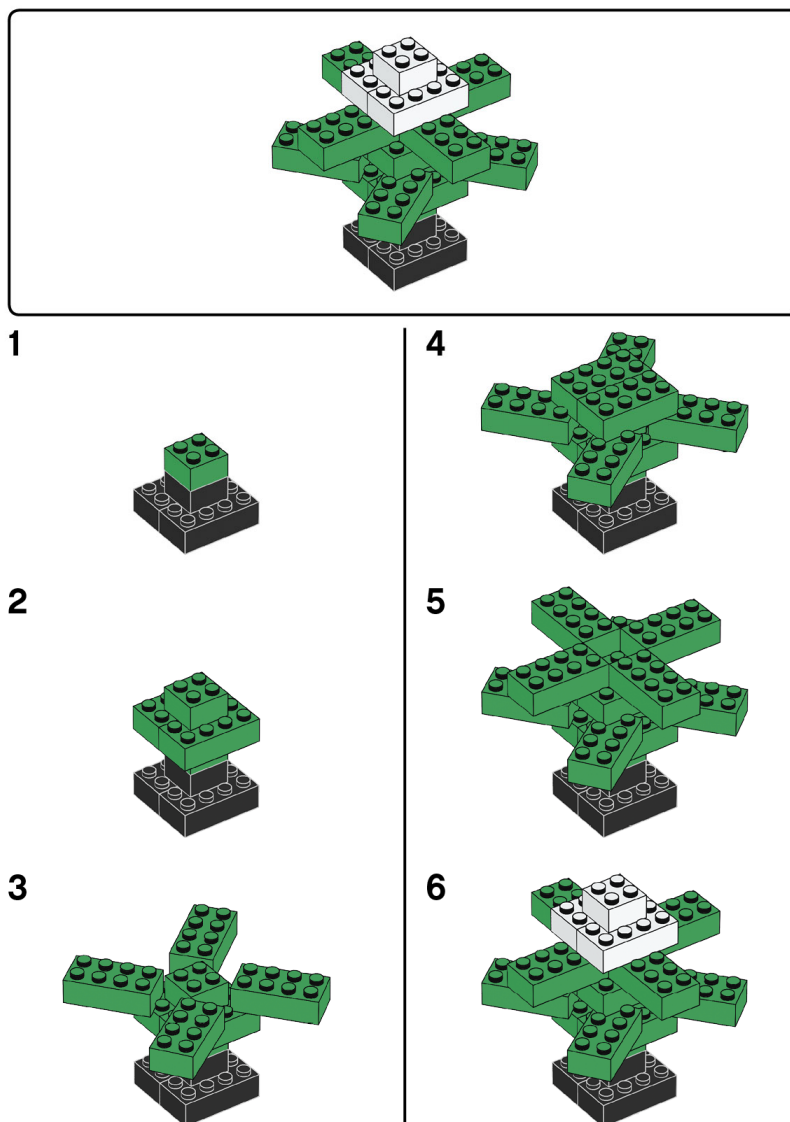
Task 3 – Plant new trees

When the forest fire is extinguished, new trees must be planted.

In task 3, the team will work on how their rescue vehicle should be equipped and how it plants the new trees. Consideration must be given to how the planting takes place, how large a space should be between the trees and between the rows.

In the workflow of imagining how to do this, the team can use text, images, drawings and models to show their ideas. Everything must be displayed as part of the exhibition.

The trees can, for example. look like this.



Task 4 – Forest environment

As part of the exhibition, the team must create the environment in which a WeDo rescue vehicle does its job. The environment can be freely made from any material to create forests, evacuation areas, access conditions, water depots etc. There must be elements in the surroundings that the team can use to demonstrate how the rescue vehicle moves around.

3. Challenge Rules

Each team has two or three team members and is assisted by a coach. The age of the team members is up to 10 years old.

Information about our WRO Guiding Principles and WRO Ethics Code:

- By competing in WRO, teams and coaches accept the WRO Guiding Principles that can be found at: <https://wro-association.org/competition/wro-ethics-code/>
- Every team needs to bring a signed copy of the WRO Ethics Code to the competition and hand it to the judges before the start of the competition.

1. Material

The organizer will describe what kind of booth and materials are available at the competition.

An example:

- 1.1. The size of the exhibit booth provided to teams will be 2m × 2m × 2m. (Each team will be provided with three (3) vertical display surfaces within the booth, each 2m × 2m or as close as possible).*
- 1.2. All elements of a team's display must remain within the allotted 2m × 2m × 2m booth area. Team members may be outside this space during a presentation, however, unless requested by judges, robots and other display elements must remain within the allotted area.*
- 1.3. Teams will be provided with the option of using a table. The size of a table will be 120cm × 60cm (or as close as possible). Table sizes will be consistent across teams. Tables must be placed within the 2m × 2m floor space allocated to the team. Teams will be allocated four (4) chairs in their booth area.*

Regulations about the exhibit

- 1.4. There is no restriction on the balance between LEGO elements and other materials used in the exhibit.
- 1.5. The controllers, motors and sensors used to assemble the robots must be from the LEGO Education WeDo 1.0/2.0 Core Sets. Any number and combination of controllers, motors, and sensors is allowed. Any LEGO branded non-electrical/non-digital elements can be used in the construction of the robot and the environment.
- 1.6. The robots can be controlled by any compatible device or with a remote controller built from WeDo 1.0/2.0 elements. The teams can use any software.
- 1.7. Robots may be preassembled and programs may be pre-made.
- 1.8. Teams must decorate the booth with one or more of **their own** texts/sketches/drawings/photos or any other way to show their creative process and suggested solutions. The decoration of the booth must include the team name, introduce the team members, document the robots constructed (e.g. with sketches/pictures of **their** building process and **their** programming attempts), and show the programs used in the robots.

2. Presentation

- 2.1. All team displays must be completed and teams ready to present to judges and the general public by the allotted time. (Schedule and deadlines will be provided by the Local or National Organizer).
- 2.2. Teams must maintain a presence within the team's booth during competition hours in order to present to members of the general public and judges at any time. Teams will receive a warning of not less than 10 minutes prior to evaluation taking place.
- 2.3. Teams will be allocated approximately 10 minutes for evaluation: 5 minutes to explain and demonstrate their robots, the remaining 5 minutes to respond to questions from the judges, e.g. about their understanding of their WeDo programming.
- 2.4. The official language for all presentations is the native language of the team members. Interpreters are allowed if judges do not speak the native language of the team members.
- 2.5. The Local or National Organizers decide how the achievement by the exhibiting teams could be rewarded e.g. with a diploma for each team or with special awards for some teams based on criteria given by Local or National Organizers.

4. Challenge Evaluation

Each team must prepare a 5-minute presentation in front of judges. The presentation must include:

- For each of the challenge tasks 1 and 2 show the video of the team's solution.
- For each of the challenge tasks 1 and 2 explain the program that controls the robot on the video.
- Describe the equipment of the rescue vehicle and the way it will plant the trees based on the findings in task 3.
- Demonstrate the rescue vehicle in the exhibit and explain the mechanics/programs of the vehicle.

After the presentation, each team must be prepared to participate in a 5-minute dialog with the judges, answering questions from judges in relation to their presentation, but also questions such as:

- What part of the team's results is the team most proud of?
- If the team had more time to work on the exhibit, which part of the exhibit would the team try to improve and how could the improvement be made?

For the team, the overall purpose of the evaluation is to demonstrate that they understand what they have been doing.

For the judges, the purpose is to help the team reflect on their process and product, and to provide feedback through their questions to the team on the strong and weak points in their process and product.

For the judges, the purpose is also to ensure that **all team members have had a fun, age appropriate learning experience where they have tried things out themselves**, and perhaps got inspired by others (as facilitated by a coach).

The following table can be used to evaluate the teams. For each entry in the table, a smiley from a four-level smiley scale is chosen as the evaluation of the task in question.

A sad smiley is only ticked off when the task in question is not present in the exhibit.

Tasks				
	0	5	7	10
Autonomous braking:				
- The team has created a video that shows a WeDo robot performing emergency brake	☐	☐	☐	☐
- The team understands the program performing a brake	☐	☐	☐	☐
Automatic transport of water tanks:				
- The team has created a video that shows a WeDo robot transporting a water tank	☐	☐	☐	☐
- The team understands the program performing the transport from the storage area to the fire	☐	☐	☐	☐
Fire Environment:				
- The exhibition shows what the area around the forest fire looks like and how the rescue vessel comes from the storage area to the fire area itself	☐	☐	☐	☐
The rescue vehicle is well designed and mechanically stable	☐	☐	☐	☐
The rescue vehicles functions are successfully demonstrated	☐	☐	☐	☐
The team can explain how the forest is newly planted by the rescue vehicle	☐	☐	☐	☐
Booth decoration, photos, drawings, etc. (This should be, age appropriate, not made by adults)	☐	☐	☐	☐
Presentation and dialog with judges showed that the team have done things themselves	☐	☐	☐	☐
In total				