Robotics with LEGO® WeDo

An introduction to robotics for the youth with LEGO WeDo

By Diego Gálvez

If we talk about LEGO® robotics, the first thing that is likely to come to our mind is the LEGO MINDSTORMS® set. While this set has been the pillar of LEGO robotics (even from the RCX version) in 2008 LEGO presented LEGO WeDo.

LEGO WeDo is an innovative alternative that allows you to get started with robotics, building different prototypes using the materials included in the kit (construction parts, motors and sensors) and program them through intuitive software.

MINDSTORMS or WeDo?

In the attached comparison chart you can see that the MINDSTORMS set is much more complete and therefore allows for more complex prototyping.

This doesn't mean that WeDo isn't useful, quite the contrary, WeDo is a great opportunity for developing ingenuity and creativity. At first glance it might appear to be designed just for kids due to the limited set of construction elements, but that should not be seen as a limitation but rather as a challenge: how to develop prototypes that are equally complex as those built with MINDSTORMS? As an example I can tell you that this set allows you to build a line follower, and that while there is no light sensor in this set (the sensors that are included are for inclination and distance).

MINDSTORMS 9797	WeDo
437 piezas	158 piezas
3 Motor	1 Motor
5 sensores	2 sensores
1 Controlador	1 Hub USB

Taking the LEGO MINDSTORMS 9797 Educational set as a reference

Another point to evaluate is the software, which in both cases uses icons. The WeDo software is a lot easier to use than the MINDSTORMS software. This doesn't mean no advanced programming structures can be made (if, for, while, etc.), using the right combination of programming blocks these structures can be implemented in the WeDo software without these blocks being part of the environment as is the case in the MINDSTORMS software.

29

Tilt sensor

The tilt sensor is capable of recognising 5 different positions

Distance sensor

Detects objects at a distance of up to approximately 15cm.

LEGO® WeDo

Speaking about the actual set, it contains construction elements, electronic elements (a motor, sensors and the USB hub).
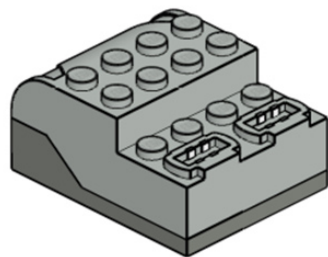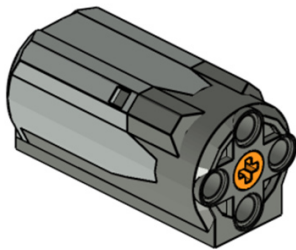
The USB Hub

The USB hub is the device that allows communication between the computer and the different actuators and sensors in the WeDo kit. A maximum of 2 actuators or sensors can be connected to a hub.
Although the set comes with a single hub, up to three hubs can be connected to a single computer with the software provided by LEGO.
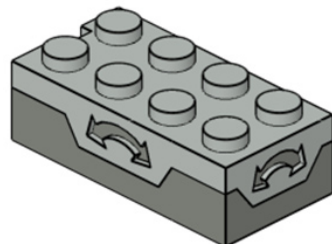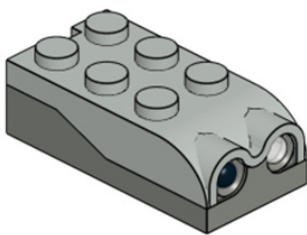
Motor

The WeDo motor first appeared in the Power Functions theme in 2007. A year later it was included in the LEGO WeDo robotics kit.

An important difference between both "versions" is that in the Power Functions theme the motor is connected to a 9V power source (6 AA batteries). In the WeDo kit, however, it is connected to the USB hub which can provide a maximum of approximately 4.7V. As a result, the speed and power of the motor is a lot less.

Lights

Although no lights are included in the WeDo base set, The hub (and the software) also allow the use of Power Functions LED lights.


After having a look at the elements, it is time to take the next step and build and program your own prototypes. Inside the software, instructions for several models are included to help you get started.
In addition, I have designed some 40 new models[1]. For these models I have used the following stages of development.

Motor   Hub USB

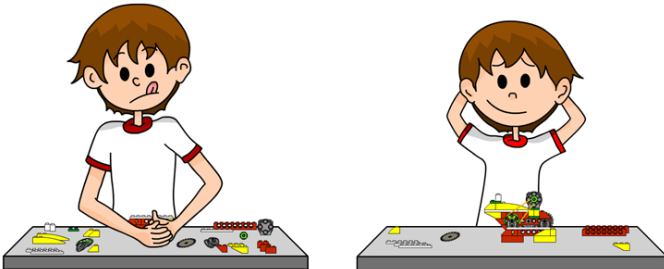Distance sensor   Tilt sensor

30
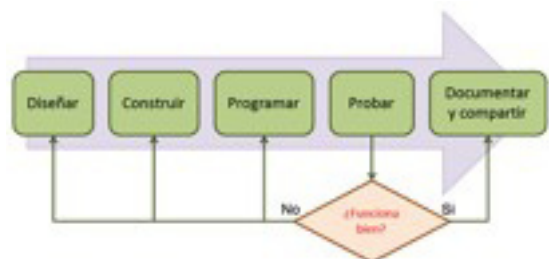
Design

Real life examples can be used (imitation).
Use your imagination to create something new. These ideas need to be translated to a physical medium (drawing on paper).
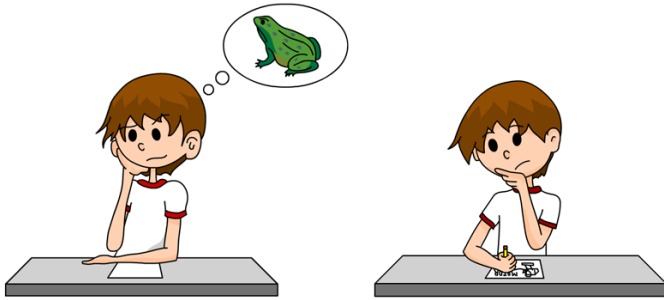
Build

Based on the proposed design you begin to build the prototype, using the elements, connectors, sensors, etc.

Program

What will the prototype do? This is achieved by means of a program, in the case of WeDo, the software that comes with the set.

Test

Visually verify that the prototype works as expected. This step is one of the most important ones as here we check if the result is as expected and we try to define what aspects of the design need to be changed in case it doesn't work as expected.

Document and share

After testing the model and making sure it works as expected, the next step is to document the result. This can be done using specialised software (MLCad, LEGO® Digital Designer, etc.) or taking detailed pictures.

As a first activity you can test your creativity designing an original model following each of the steps explained above. In the next article we will have a closer look at the WeDo programming environment, as well as some basic examples.

At notjustbricks.blogspot.com you can find multimedia materials (images and video) of the creations of the author, some of which include building instructions.
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