Open Roberta Lab, an alternative to EV3-G

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The time when digital devices were limited to desktop and laptop computers is well past and Little by little it is becoming more usual to run applications from within a browser or on a mobile device with files that are stored in the cloud. Among other things, this favors collaboration and sharing the development of projects.

In This context, LEGO® have maintained is focus on locally installed software on computers with Windows or Mac OS X operating systems, a paid version in the case of the Education software. At the beginning of this year they presented an iPad version that was associated to the Education license and in the month of November the LEGO MINDSTORMS Programmer app, a mobile version of the EV3-G programming environment was made available for both iPad and Android. This is, however, not a full version of the software as the palette of programming blocks is limited.

Project Open Roberta

Roberta is a project that emerged in Germany in 2002. Its goal, as noted on its web page, is to foster in both boys and girls a long lasting interest in STEM (science, technology, engineering, and math). They make a special emphasis on the involvement of girls.

This project has been financed both by Germany's ministry of education and investigation as well as the UE between 2005 and 2009. Currently it is financed by several German federal states in collaboration with various companies and foundations.

In 2012, tenth anniversary of Roberta, an idea came about to create a cloud based software to program LEGO MINDSTORMS™ robots. Two years later, in November of 2014 Open Roberta Lab was presented, an initiative that has received funding of one million Euros from Google.

Open Roberta Lab is a graphical programming environment with the same set of programming blocks that can be found in App Inventor, Code.org, and others. Installment is not necessary given that it is cloud based, and it is also not dependent on the devices operating system. Thanks to that, it can be used on any device, be it a computer, tablet, or smartphone.

Open Roberta is an open project, the code is available on its servers and collaboration from fellow programmers is welcome.

How to begin

To be able to program the EV3 using Open Roberta lab, first you need to prepare it. This is because Open Roberta Lab needs an operating system different from the standard one offered by LEGO. This new system is installed on a MicroSD card, so it does not at all affect the system installed on the EV3. Not even the programs that can be stored on the EV3 are affected. If you want to recover the original EV3 system and program EV3-G, all you need to do is turn it off, remove the MicroSD card, and when restarted the original system will reappear.

To begin, you need a MicroSD card with a capacity of between 2 and 32GB as well as an adaptor for MicroSD cards. Using a computer connected to the internet you have to download the Open Roberta operating system and Java Runtime environment. The steps and links to download the files can be found in the EV3 Open Roberta setup section.

Once ready, the MicroSD card is inserted in the EV3 and will turn on. If you are going to connect the EV3 with the computer via Wi-Fi, it is recommended that you first connect the skewer Wi-Fi. After a few minutes the installation will be complete and you will be able to begin programming with NEPO.

Programming with NEPO

NEPO, within months has gone from only being available in German and English, to being available in several other languages, among them is Spanish.

The first step to program the EV3 with NEPO is to define the robots configuration: what sensors and motors are connected to which ports, as well as the wheel diameter and distance between wheels on robots with a differential steering system.
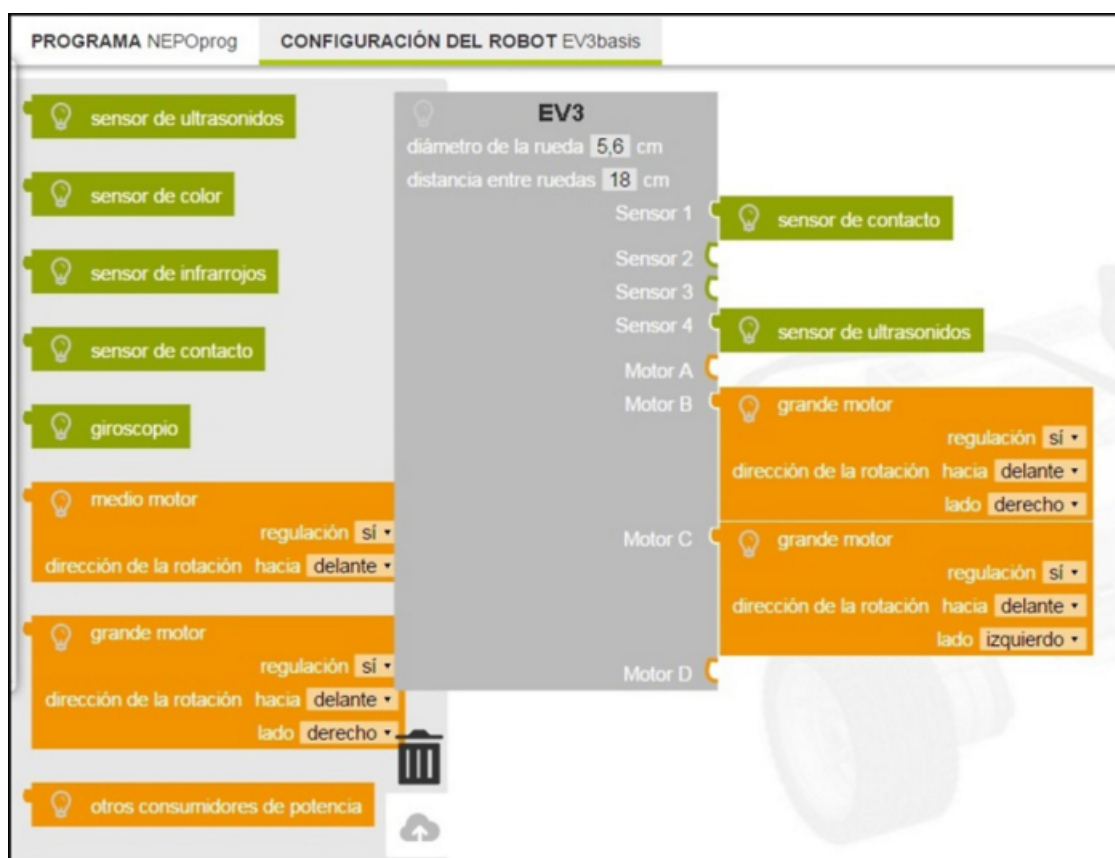

Once configured, the moment has come to program. NEPO offers two different levels: beginner and expert.

The beginner level offers a palate of fewer programing blocks, this is so not to overwhelm the first time user. In contrast, the expert level offers the complete palate of blocks.

Creating a program with NEPO is similar in the way in which it is done using Scratch. It is done by placing the necessary blocks to get the robot to perform in the desired way.

It is possible to give structure to a program creating new blocks (and collapse them so they take up less visual space) as you can see in the following image, although you cannot yet execute parallel tasks.
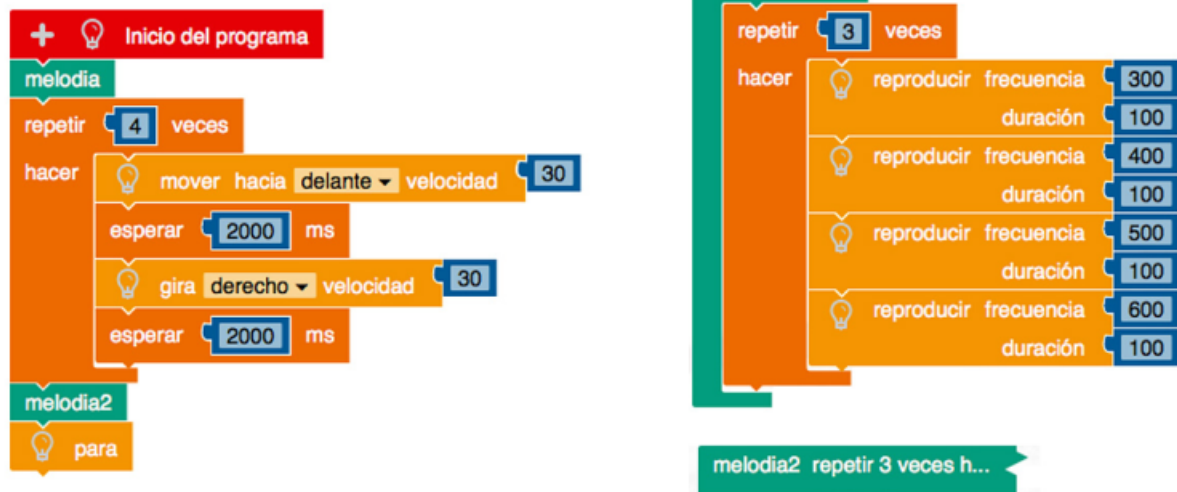
If desired, you can see the corresponding code in Java using the view source option in the Edit menu or by clicking on the icon.

Connecting the EV3

Open Roberta Lab allows the possibility of connecting and downloading the programs to the EV3 via a WIFI connection. This allows you to program from devices that up till now weren't able to be used, such as smartphones, tablets, and Chromebooks. The EV3 must have a wireless skewer so that it can be connected to the appropriate wireless network.

Both the device used to program and the robot will need to be connected to the same Wi-Fi router. From that moment you can link a computer to a robot using the code provided by the EV3.

It is also possible to connect the Ev3 via USB from computers with different operating systems. On a computer with Windows, Linux, or MAC OS X it will be necessary to pre-install an application on your computer. On Chromebooks, it will be enough to install an extension for Chrome.

Sharing Programs

Another valuable feature of Open Roberta Lab is the ability to share programs with other users. You can share with the option of read or write only, this aids in developing a group project, something very useful in education.

Google drives is a way in which files are shared to facilitate collaboration in workgroups or to allow access to 3rd parties. In Open Roberta Lab there are certain differences that are worth mentioning. The programs are not stored as edited and there is no sign indicating that more than one person is simultaneously editing. In a situation like this, whoever first saves, modifies the cloud copy, while the other editor upon trying to save will receive a message informing them that the program has recently been saved and you can modify the changes via Save As.

The Simulator

Open Roberta Lab can be use with or without a robot. It offers a simulator with five different scenarios in which to run programs. The editors for simulation and real life programming are separated so for now you cannot test run a program in the simulator before downloading it to your EV3. For now it is also not possible to change the default configuration of the robot in the simulator.
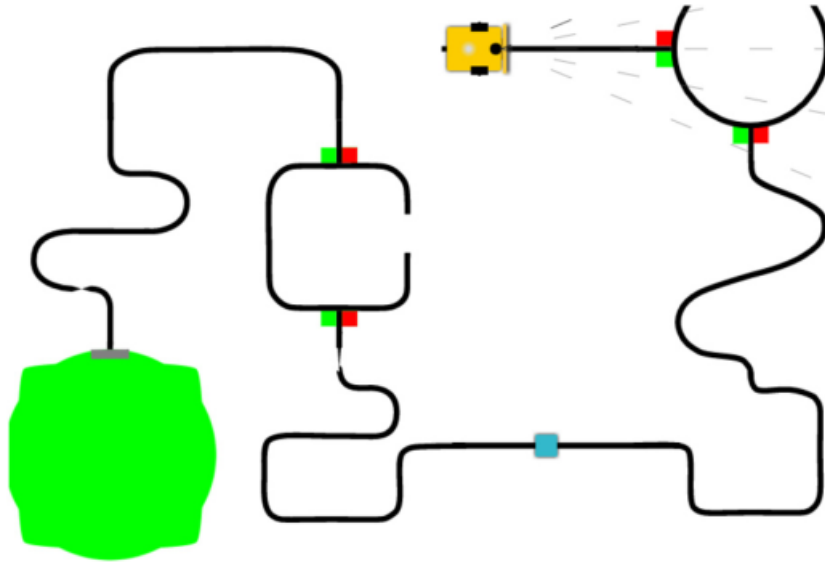
The future of Open Roberta

The Open Roberta Lab as a programming platform for robotics doesn't stop at the EV3. Rather it aspires to extend to other robotics platforms used in education. The next step will be the NXT and after that possibilities includes Thymio, Edison, NIBObee, Raspberry Pi and Arduino among others.

The development wiki shows some other ideas, like configuring a Raspberry Pi 2 as a server in order to use Open Roberta Lab in an environment where internet Access could be a problem.

Final note

Open Roberta Lab is still in the beta phase, with that said, some of the features may present a problem, certain features may also be changed, but without a doubt, for the better. So take a look at the Open Roberta website to see how it is growing.

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Open Roberta: http://www.open-roberta.org/en/welcome/