

## 1.- Introduction

### 1.1.- Goals

Many developers around the world choose LeJOS, Java for Lego Mindstorm as the platform to develop programs with NXT Lego Mindstorm. I consider that this eBook will help LeJOS community to develop better programs with LeJOS.

### 1.2.- LeJOS Project

LeJOS is Sourceforge project created to develop a technological infrastructure to develop software into Lego Mindstorm Products using Java technology.

Currently leJOS has opened the following research lines:

1. NXT Technology
  - a. NXJ
  - b. iCommand
2. RCX Technology
  - a. leJOS for RCX

This eBook will focus in NXT technology with NXJ using a Windows Environment.

### 1.3.- NXT Brick

The NXT is the brain of a MINDSTORMS® robot. It's an intelligent, computer-controlled LEGO® brick that lets a MINDSTORMS robot come alive and perform different operations.



#### Motor ports

The NXT has three output ports for attaching motors - Ports A, B and C

### **Sensor ports**

The NXT has four input ports for attaching sensors - Ports 1, 2, 3 and 4.

### **USB port**

Connect a USB cable to the USB port and download programs from your computer to the NXT (or upload data from the robot to your computer). You can also use the wireless Bluetooth connection for uploading and downloading.

### **Loudspeaker**

Make a program with real sounds and listen to them when you run the program

### **NXT Buttons**

Orange button: On/Enter /Run

Light grey arrows: Used for moving left and right in the NXT menu

Dark grey button: Clear/Go back

### **NXT Display**

Your NXT comes with many display features - see the MINDSTORMS NXT Users Guide that comes with your NXT kit for specific information on display icons and options

#### Technical specifications

- 32-bit ARM7 microcontroller
- 256 Kbytes FLASH, 64 Kbytes RAM
- 8-bit AVR microcontroller
- 4 Kbytes FLASH, 512 Byte RAM
- Bluetooth wireless communication (Bluetooth Class II V2.0 compliant)
- USB full speed port
- 4 input ports, 6-wire cable digital platform (One port includes a IEC 61158 Type 4/EN 50 170 compliant expansion port for future use)
- 3 output ports, 6-wire cable digital platform
- 100 x 64 pixel LCD graphical display
- Loudspeaker - 8 kHz sound quality. Sound channel with 8-bit resolution and 2-16 KHz sample rate.
- Power source: 6 AA batteries

### **1.3.1.- NXT Sensors used in the eBook**

NXT Sensors used in the document are the following:

- NXT Motor
- Ultrasonic Sensor
- Compass Sensor
- NXTCam
- Tilt Sensor
- NXTCam
- RFID Sensor

### **NXT Motor**



**Ultrasonic Sensor**



**Compass Sensor**



**Tilt Sensor**



**NXTCam**



**RFID Sensor**



## 1.4.- About the author



Juan Antonio Breña Moral collaborates in LeJOS Research team since 2006. He works in Europe developing Engineering and IT solutions for middle and large customers in several markets as Defence, Telecommunications, Pharmaceuticals, Energy, Automobile, Construction, Insurance and Internet.

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## 2.- How to install lego firmware

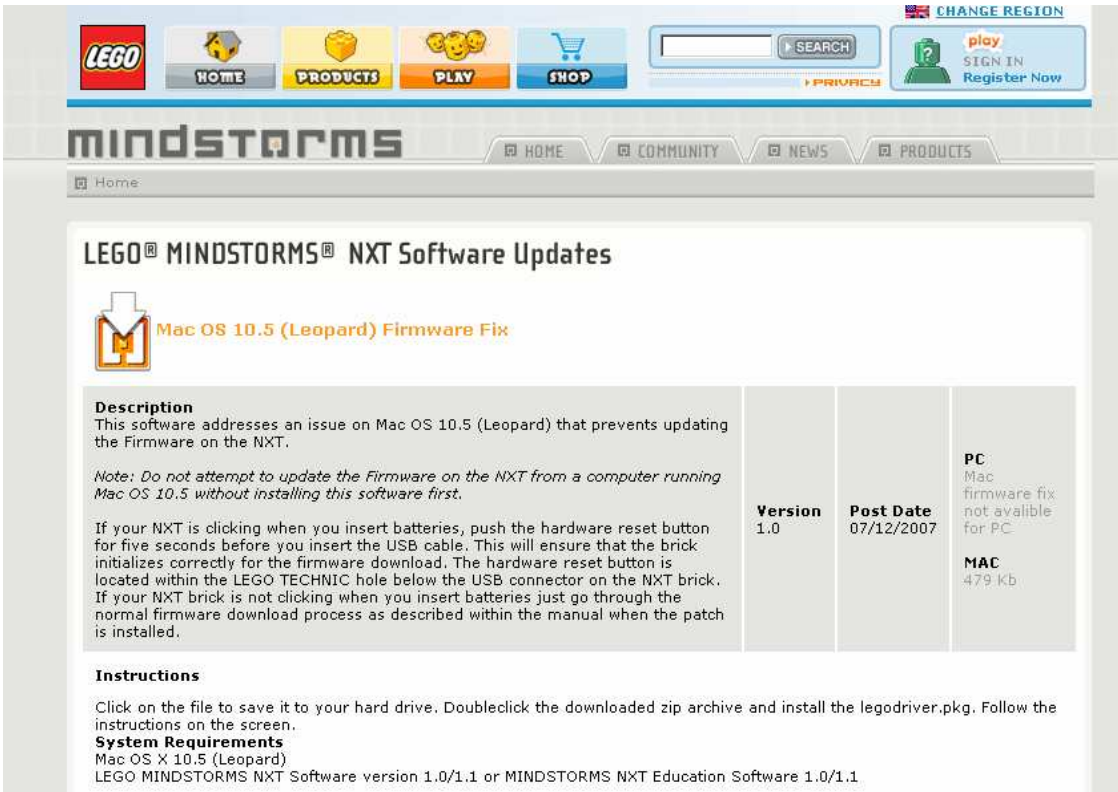
### 2.1.- Introduction

LeJOS is an excellent platform to develop software for NXT Lego Mindstorm but it is not the unique solutions.

If you read the section NXT Programming Software written by Steve Hassenplug in <http://www.teamhassenplug.org/NXT/NXTSoftware.html> then you will notice that exist several options to develop software in the NXT brick. If you have installed LeJOS firmware and you decided to reinstall Lego firmware, read this section to know how to do.

### 2.2.- Download latest Lego firmware

To reinstall Lego Firmware is necessary to have latest firmware in your computer. Visit <http://mindstorms.lego.com/support/updates/> to download the firmware.



**LEGO® MINDSTORMS® NXT Software Updates**

**Mac OS 10.5 (Leopard) Firmware Fix**

**Description**  
This software addresses an issue on Mac OS 10.5 (Leopard) that prevents updating the Firmware on the NXT.

*Note: Do not attempt to update the Firmware on the NXT from a computer running Mac OS 10.5 without installing this software first.*

If your NXT is clicking when you insert batteries, push the hardware reset button for five seconds before you insert the USB cable. This will ensure that the brick initializes correctly for the firmware download. The hardware reset button is located within the LEGO TECHNIC hole below the USB connector on the NXT brick. If your NXT brick is not clicking when you insert batteries just go through the normal firmware download process as described within the manual when the patch is installed.

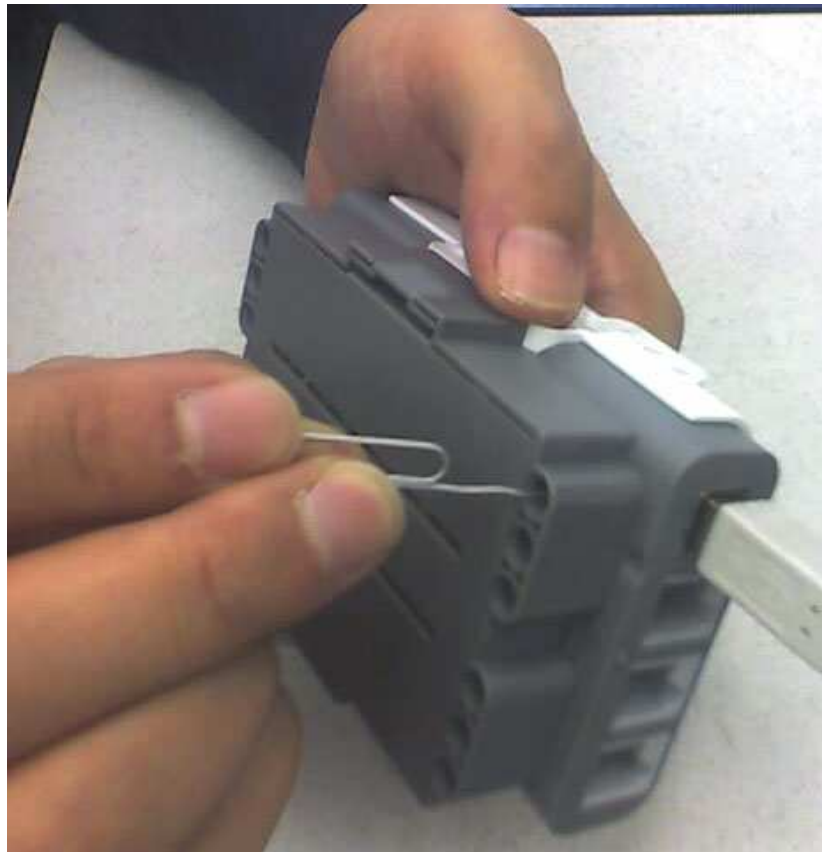
Version	Post Date	PC	MAC
1.0	07/12/2007	Mac firmware fix not available for PC	479 Kb

**Instructions**  
Click on the file to save it to your hard drive. Doubleclick the downloaded zip archive and install the legodriver.pkg. Follow the instructions on the screen.

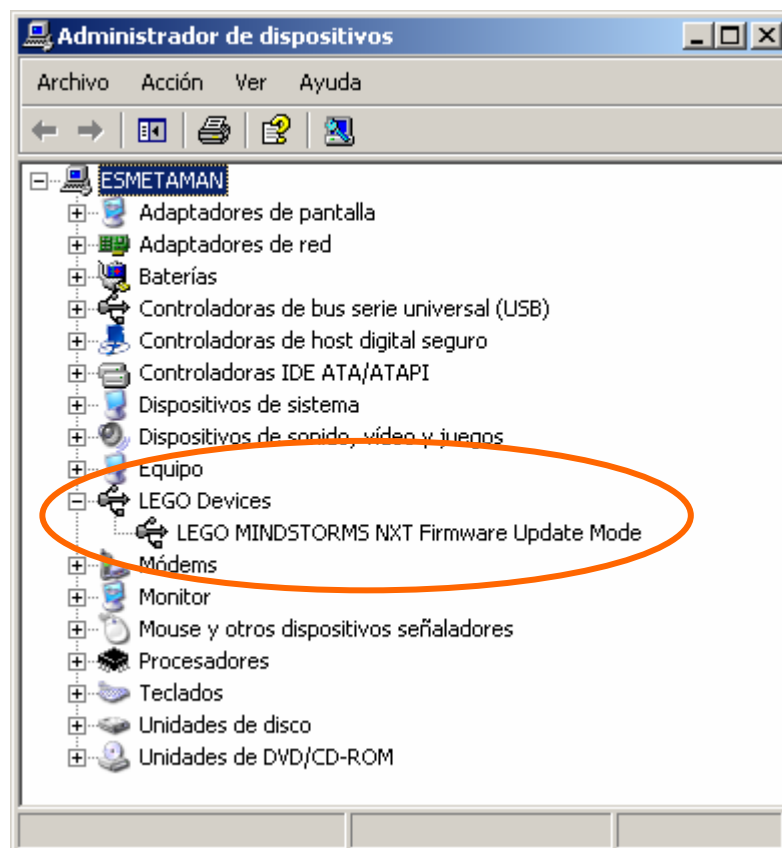
**System Requirements**  
Mac OS X 10.5 (Leopard)  
LEGO MINDSTORMS NXT Software version 1.0/1.1 or MINDSTORMS NXT Education Software 1.0/1.1

### 2.3.- Set your NXT brick in update mode

Once you have stored latest firmware, it is necessary to set your NXT brick in Update mode. To update the mode in your NXT brick then you have to push reset button. To find that button see at the back of the NXT, upper left corner and push it for more than 5 seconds then you will hear an audibly sound.



If you want to be sure, check your Lego Devices connected with your computer then you will see:

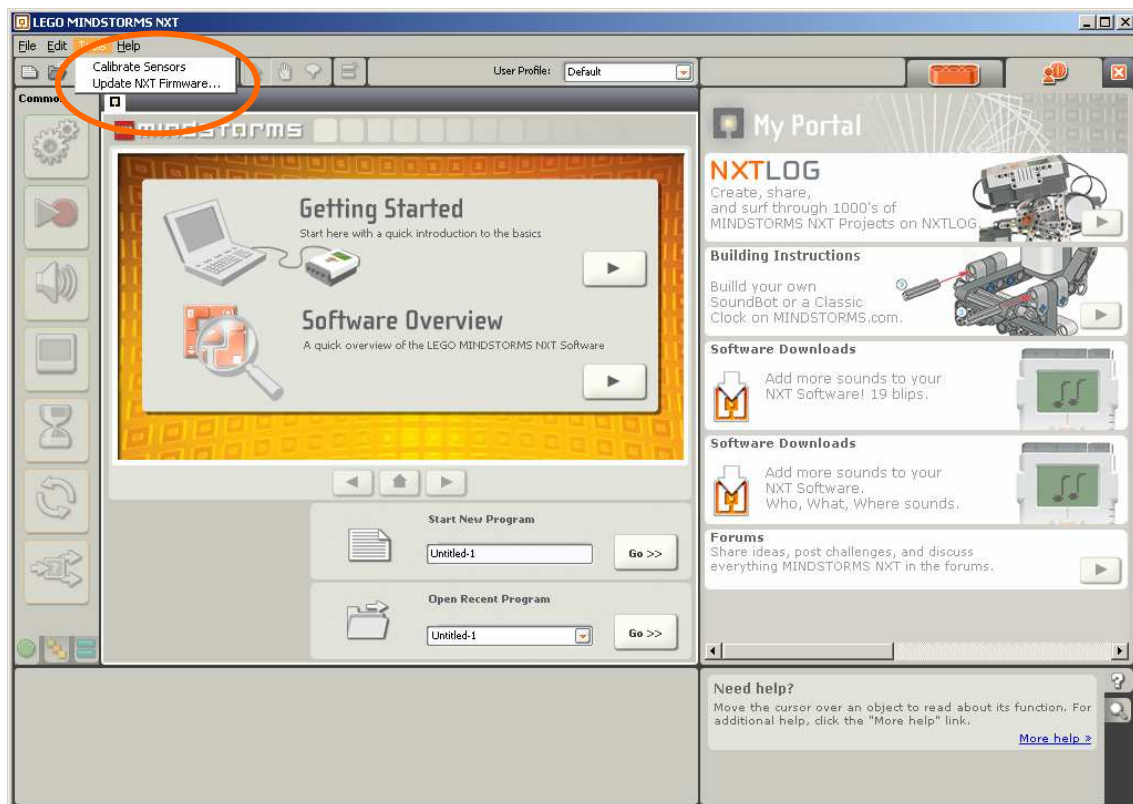


## 2.4.- Reinstall Lego firmware

Use Lego Software that you received with your NXT Kit to download Lego Firmware.

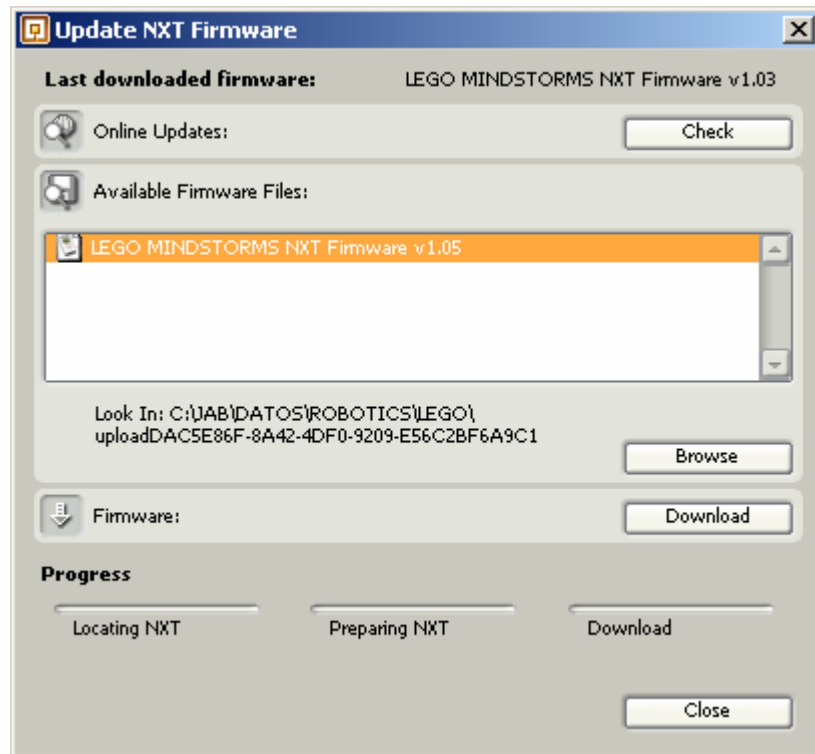


Execute the software and search the option Update NXT Firmware in Tools tab.



When you click in that option then you will see an assistant to download the firmware. Select the firmware that you downloaded and click in download button:





When the process finish then you will see all step with green color and your NXT brick will have Lego Firmware.

