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, Pharmaceutics, Energy, Automobile, Construction, Ensurance and Internet.

Further information:
www.juanantonio.info
www.esmeta.es

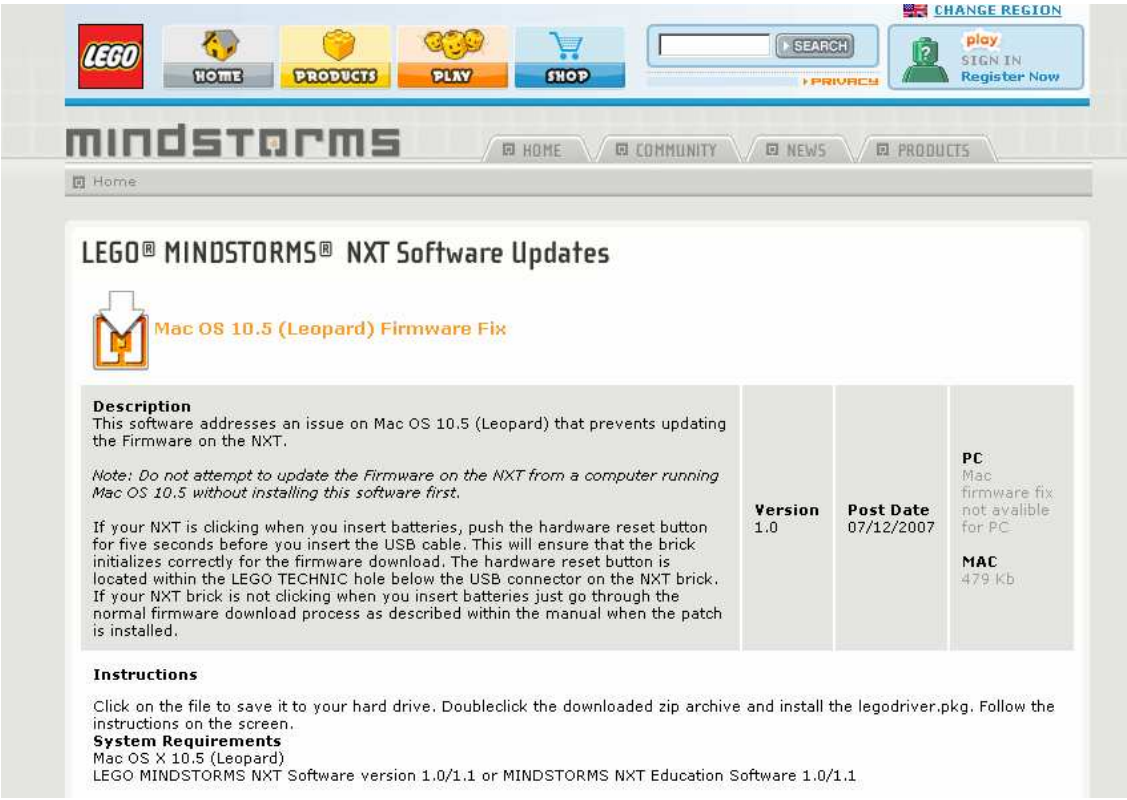
2.- How to install lego firmware

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.

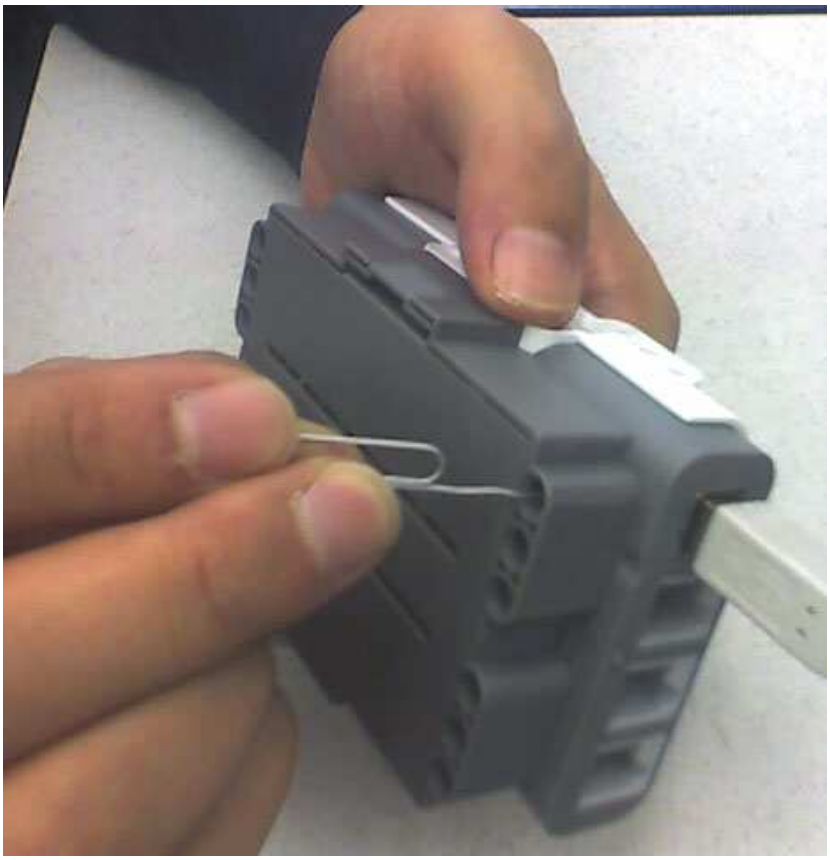
2.2.- Download latest Lego firmware

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

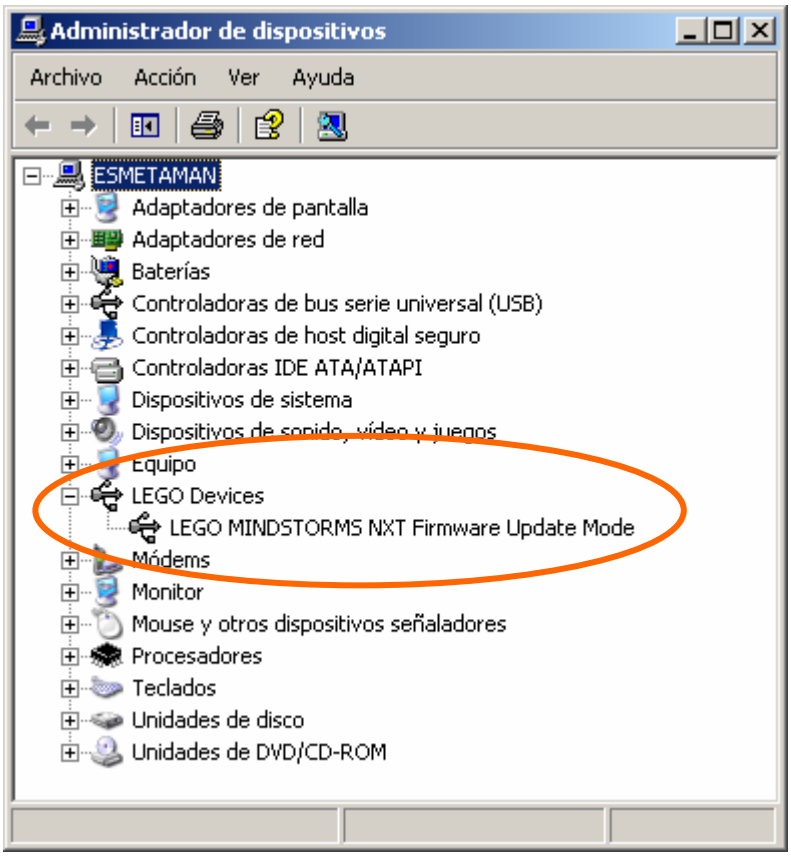


2.3.- Set your NXT brick in update mode

Once you have stored latest firmware, it is neccesary 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.



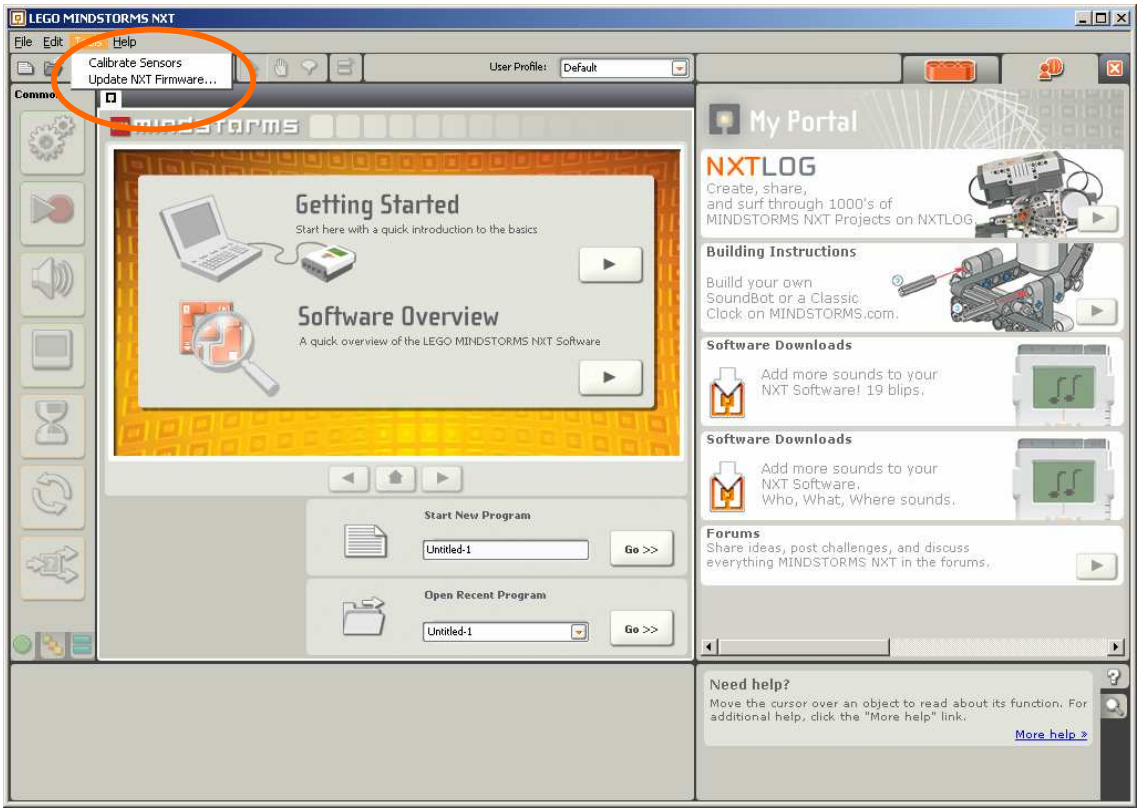
If you want to be sure, check your Lego Devices connected with your computer then you will see:



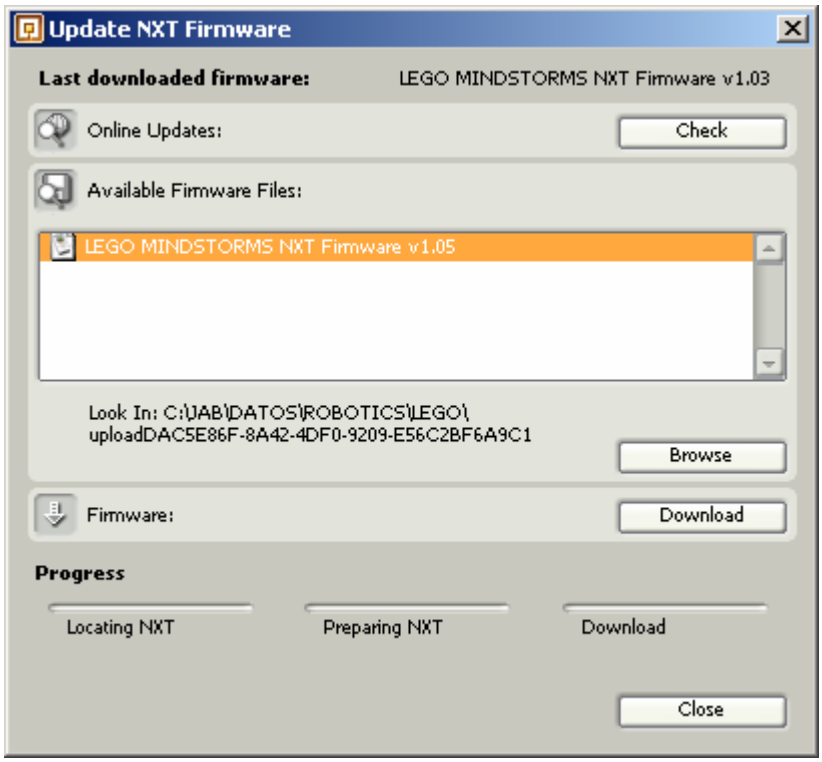
2.4.- Reinstall Lego firmware

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.