Getting Started with mBlock

by Wang Yu, Product Manager at Makeblock

What is mBlock

You write programs to control your computer. To do that, you need to know the languages of the computer - Java, C, or Python are among those. If you want to control a robot, probably you need to know Arduino C++ or a similar language.

mBlock comes to help. You can write programs by dragging and dropping building blocks. Furthermore, with mBlock, you can not only design games and visual effects in your computer, you may also write programs to Arduino based robots.

Controls pictures ("Sprites") on the screen
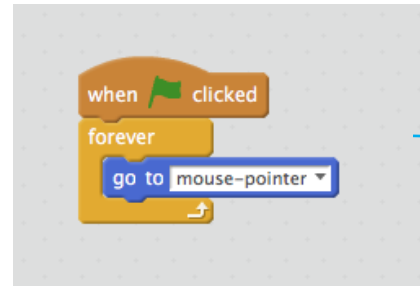
Controls robots and Arduino boards

Tips

mBlock and Scratch

mBlock is an open source branch of **Scratch**, a graphic programming language developed by MIT Media Lab Lifelong Kindergarten. That means you can make almost all Scratch projects and open almost every Scratch files in mBlock; besides, you earn the possibility of working with Arduino based robots.
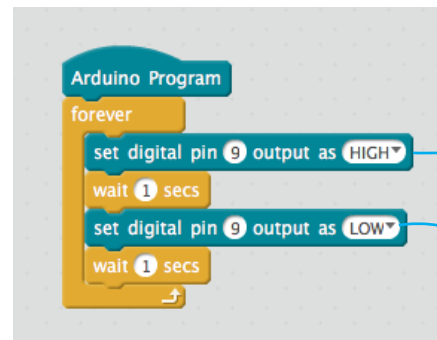
Tips

mBlock and Makeblock

Makeblock, the company making the famous mBot and construction kits for makers, is the one who translated Scratch into mBlock. Currently mBlock is actively maintained by Makeblock. But as an open source project, mBlock embraces a larger maker and educator community by providing features like extension center, supporting not only Makeblock's products by also arduino boards, Seeed Studio kits, Littlebits and more.

Getting mBlock

mBlock can be downloaded for free at
http://www.mblock.cc

It supports windows and mac. Linux users can use an
online beta version at:
http://edu.makeblock.com

For Windows Users

1 Goto www.mblock.cc. Click the big
"Windows Download" button.

2 After downloaded, click on the downloaded file or
double-click it in the windows explorer.
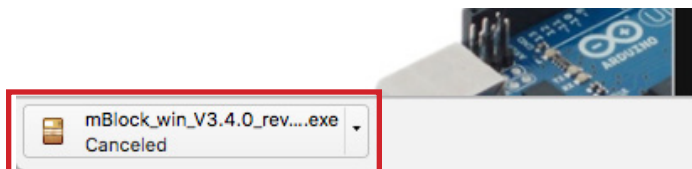
Virus?

Some old anti-virus software may claim mBlock as a virus. In this
case you may need to close that software before installing. Every
mBlock version is thoroughly tested, but since mBlock operates
with the hardware (Robots), some anti-virus software are just
vigilant about this kind of software.

For Mac Users

1 Goto www.mblock.cc. Click "mBlock for mac" link.
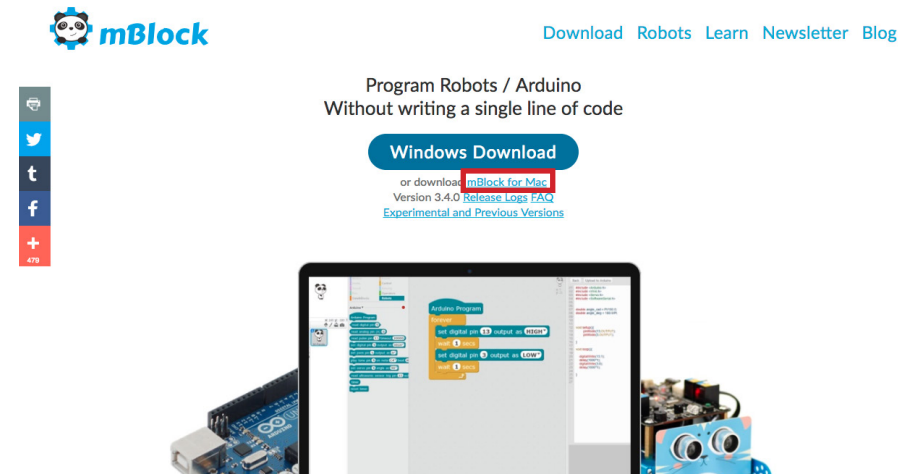
2 After that, open the .zip file, and drag the mBlock.app to your
Applications folder.
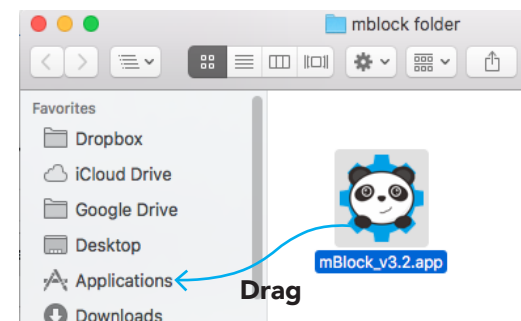
Tips

Mac OS Sierra

For the latest Mac OS Sierra
Users: When opening mBlock
the first time, you need to go
to the "Application" folder,
right click the mBlock icon, and
choose "Open" to avoid the
"unknown source" error.

Drag

A tour around mBlock

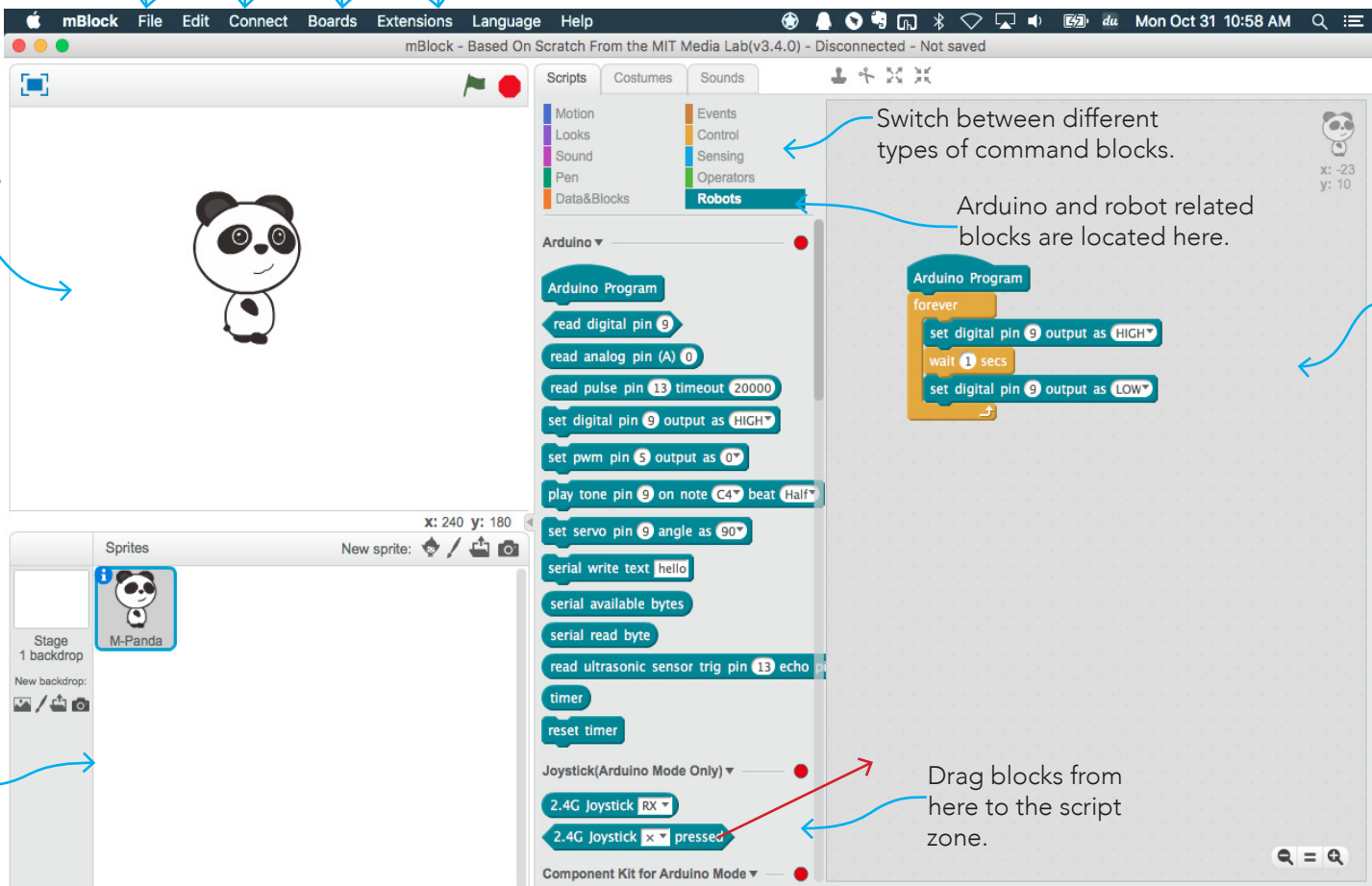Open mBlock and you'll see the following interface. Feel free to experiment around.

Connect to your robots or upload firmware.

Introduce new blocks by downloading extensions.

Save or load project files.

Select which type of hardware you're using

The "Stage" to hold drawings and moving pictures (we call those pictures "Sprites")

Switch between different types of command blocks.

Arduino and robot related blocks are located here.

the "script zone", where you place your command blocks.

The Sprite panel. You can create new sprites here.

Drag blocks from here to the script zone.

Playing with Scratch

As a branch of Scratch, everything you learnt from Scratch works with mBlock.

A good way of getting started with Scratch is through Scratch's website: http://scratch.mit.edu. You may also search"Scratch" in Amazon.com to find a book on this topic.

As a brief introduction, this guide will provide an example on the Scratch part of mBlock.

Example 1: The First Step

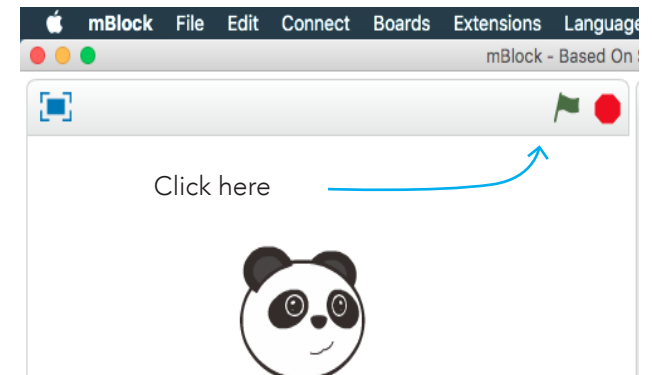**1** Open mBlock, and place the blocks as shown in the picture

Drag from the "Events" group

Drag from the "Looks" group

This changes the picture of the Panda, creating a "walking" effect

2 Click the green flag on the top of the screen, to let mBlock run your program. You should see the Panda "walks a small step".

Click here

Example 2: Draw a star

Scratch also has the drawing function. Complete the following program, click the green flag, and let the Panda draw a star!

From the "Control" group

From the "Pen" group

Change this to 144

Tips

Don't forget to visit Scratch's website: http://scratch.mit.edu. There are tons of animations, games, greeting cards and more to learn from!

Connect Your Robot / Boards

The primary reason of using mBlock is its power to control and program robots. Here is a short guide of how to connect it in several methods.

Connect through the USB cable

1 Open mBlock, click on the "Board" menu, and select the type of robots or boards you are using.

For Arduino Boards (for example)

For mBots
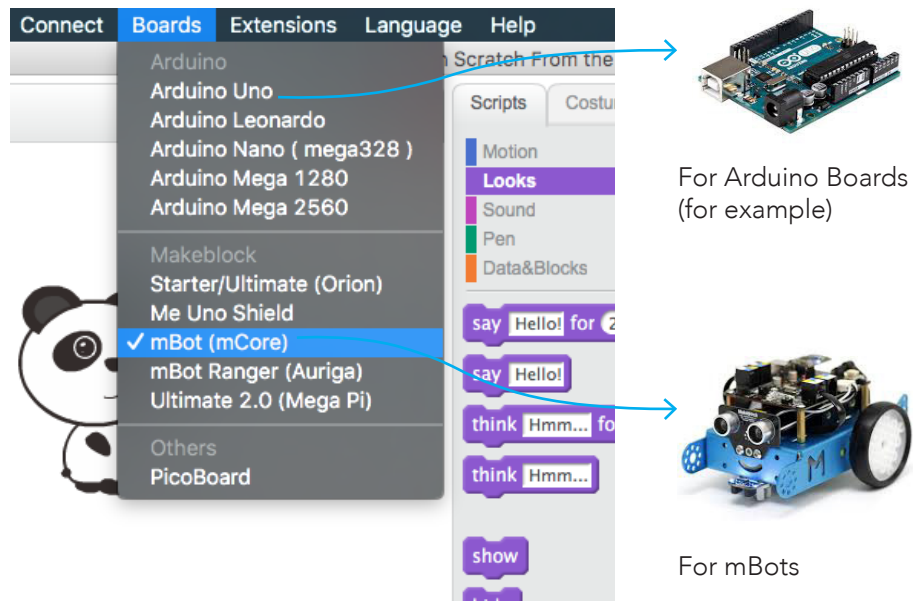
2 If you are using mBlock the first time, select "Install Arduino Driver" from the connect menu. This will install the programs necessary for communicating between the computer and the robot.

**Note for Mac OS Sierra users: Please skip this step and follow the instructions in this article:**
http://www.mblock.cc/posts/run-makeblock-ch340-ch341-on-mac-os-sierra

This is because Apple changed the way drivers work in their new operating system.
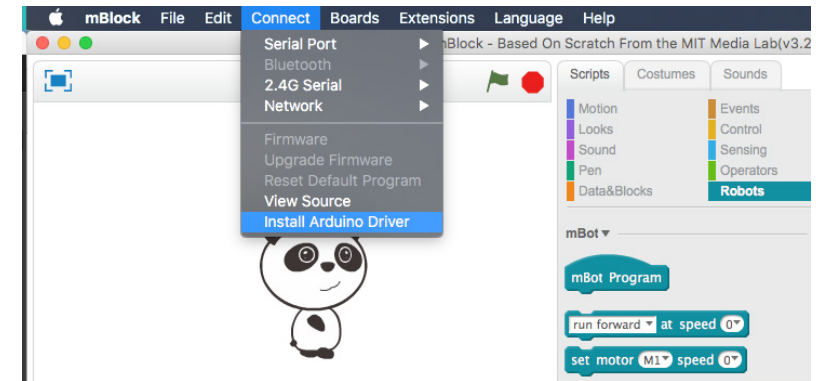
▲ **Note: Not for the latest Mac OS Users!**

3 **For Windows Users**: From the menu bar, select Connect, Serial Port, and the item like COM1 listed there. You may need to try multiple times if you have more than one devices connected.
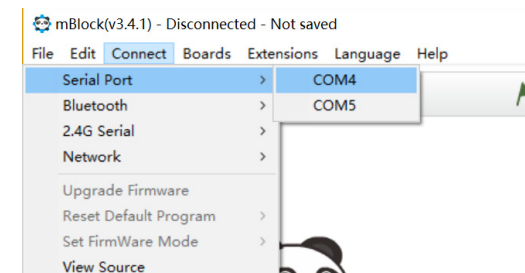
For Mac Users: From the menu bar, select Connect, Serial Port, and the item like /tty.usbserial... listed there. You may need to try multiple times if you have more than one devices connected.
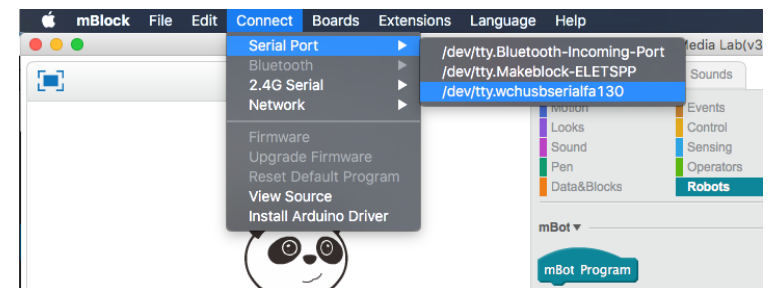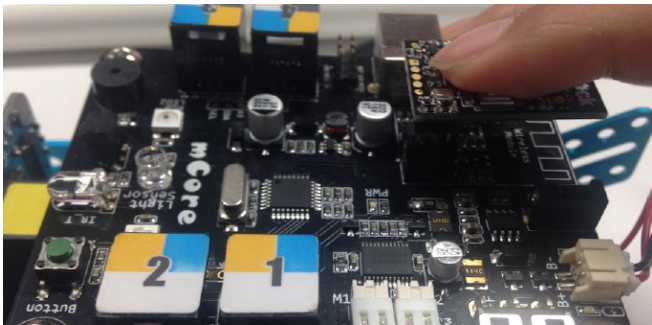
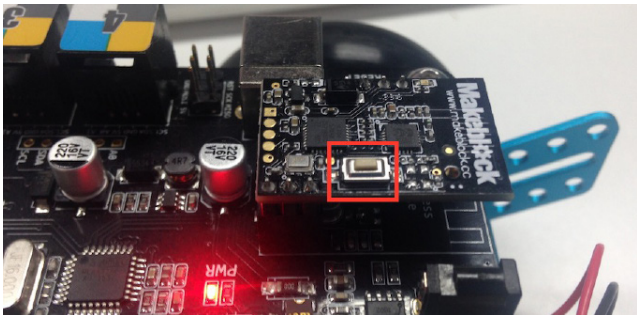## Connect through the 2.4G dongle

The 2.4G dongle is a nice way to control your Makeblock robots wirelessly. It comes in a dongle for your computer, and a 2.4G module for your robots.

**1** Plug the 2.4G Module to your robot, and turn on the power switch.

2 Press the button on the top of the 2.4G module, the LED light should turn from blinking to blinking very quickly.

3 While the LED light on top of the 2.4G module is blinking quickly, plug the 2.4G Dongle into the computer.

4 After that, the light on the 2.4G Module should be lighten on Steadily. Select "Connect, 2.4G Serial, the Connect" from the top menu.
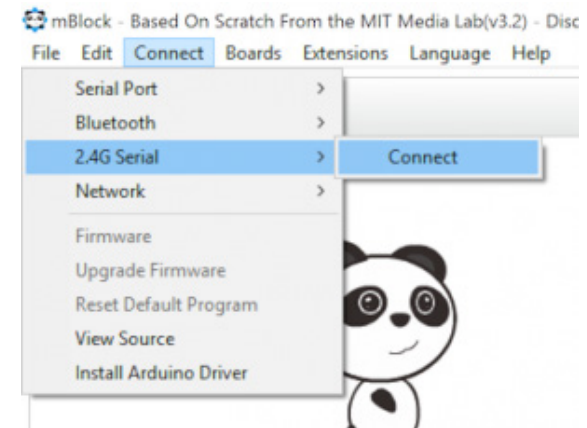

Now you can use your robot freely with the 2.4G dongle!

Connect through the Bluetooth (Beta)

You may try to connect to your boards/robots through Bluetooth, but **this function is still unstable and is not guaranteed to work in every computer**. This is because Bluetooth chips differ between computers, and operating systems (eg. Windows 7, Windows 10) treat them in different ways.

If you wish to try, here is a short guide about connecting boards/robots via Bluetooth. To finish this guide, you need a computer supporting Bluetooth, and the Bluetooth function needs to be enabled from the system settings menu.
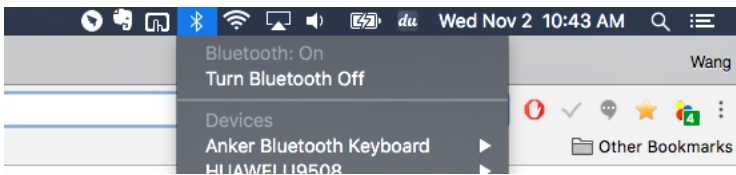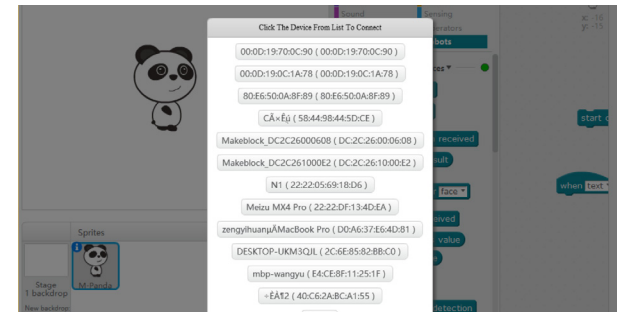

▲ **Make sure the Bluetooth is "On" in your computer**

For Windows Users

1 Click "Connect, Bluetooth, Discover". It will then pop up a list of discovered Bluetooth Devices. Note that this process may take around 60 seconds.
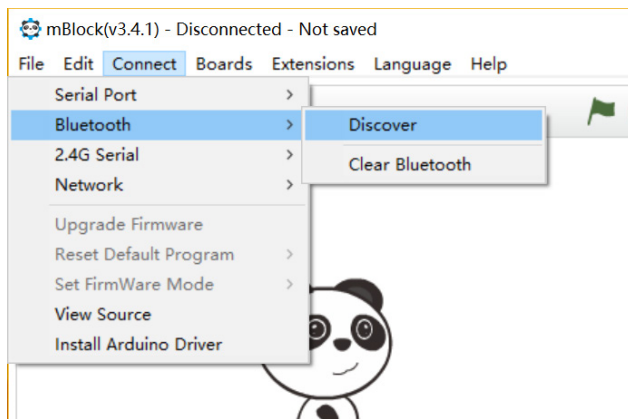
2 Select one from the list according to its name. For example, if you are using Makeblock products, it will have "Makeblock" in its name.
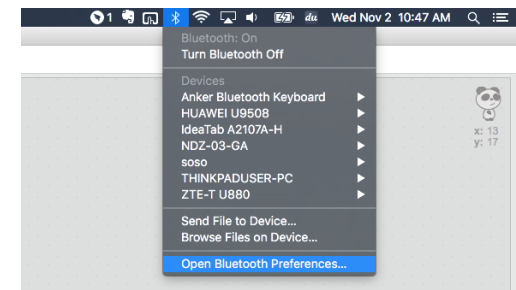

3 If it asks about "Pairing", click "Yes" to allow the computer talks to the board/robot.
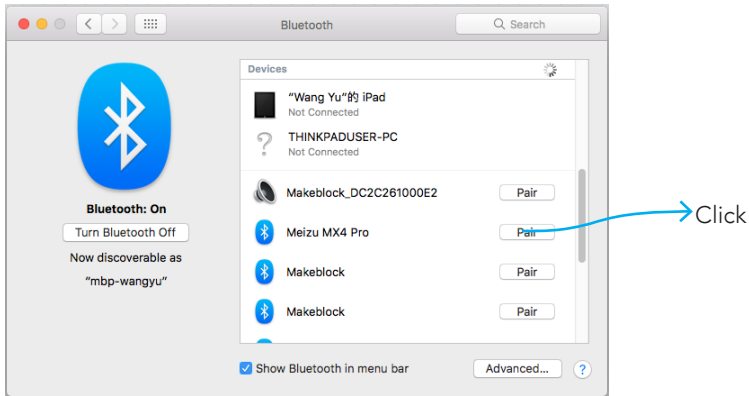

Click on the prompt to start pairing
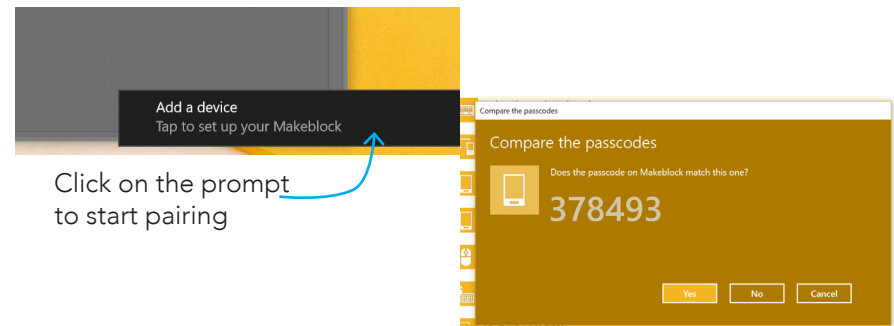
For Mac Users

1 If it is the first time you connect this device through Bluetooth, open the Bluetooth Preference through "Bluetooth Icon, Bluetooth Preference".

2 Click on the Pair Button on the right of the device you wish to connect. For example, for Makeblock products, it usually have "Makeblock" in its name.

Click

3 .After that, in the mBlock window, select, "Connect, Serial Port", and the new item corresponding to your Bluetooth device - in my case, it is /tty.Makeblock-ELETSPP.
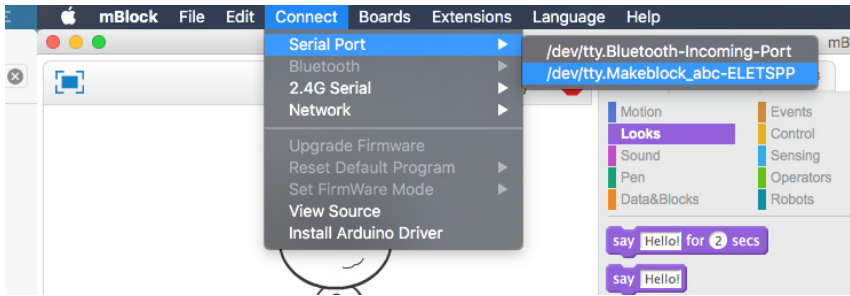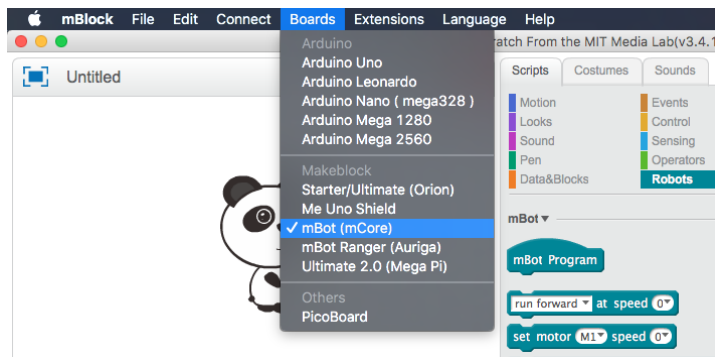

Tips

Why Serial Ports?

MacOS does not provide the API (Application Programming Interface, the tool for programmers to work on something) for Bluetooth Devices. Instead, through using drivers, we can map a Bluetooth device to another type - in this case, serial ports.

Hello, mBot

This tutorial will guide you through writing the first program for mBot, Makeblock's educational robot. If you are more interested in Arduino, you may jump to the next chapter.

1 Connect the mBot with one of the three methods described above (USB Cable recommended). When connected, it will say "connected" in the title bar.

2 Select mBot from the "Boards" menu. This will bring up mBot related commands in the "Robots" group.

3 (Optional) From the "Connect" menu, select "Upgrade Firmware". Wait until the upgrade is complete. This will allow the mBot to talk with the computer.
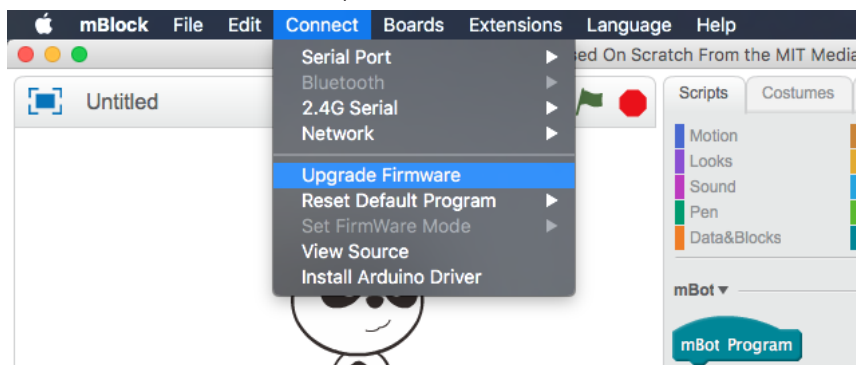
"Upgrade Firmware" and "Reset Default Program"
"Upgrade Firmware" will allow you control the mBot from mBlock, but it will disable the IR remote controller and switching mode with the on-top button; "Reset Default Program" will enable these functions like the mBot has just come from the factory, while it only support a part of the sensors available in mBlock. If you buy extra sensors from Makeblock, you may need to "Upgrade Firmware".

4 Drag "when (Flag) clicked" from the "Events" shelf; "forever" from the "Control" shelf; inside the "forever" block, place "say" from "Look" shelf, then "light sensor" from "Robots" shelf.
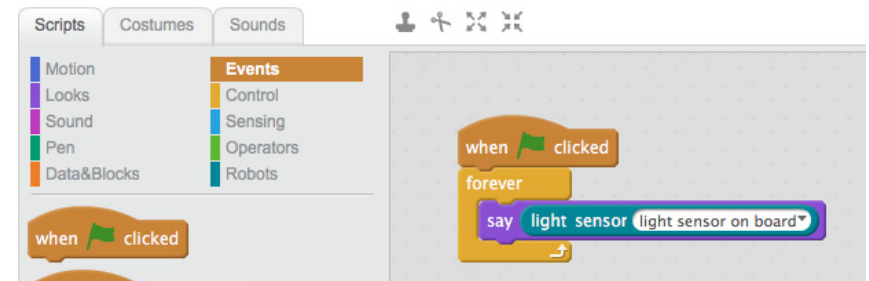
5 With mBot connected, click the green flag, and you will say the panda "saying" readings from the light sensor. Try cover the mBot with your hand, and you will see the number decrease.
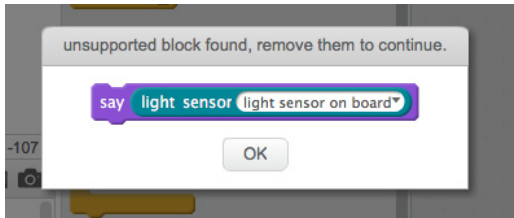
Click

See the number change
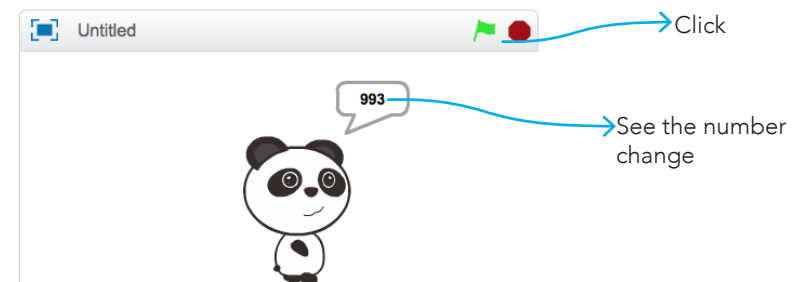
6 Now let's try upload a program into the mBot. Drag "mBot Program" from the "Robot" group, and attach "forever" to "mBot Program". You may delete the "When (flag) clicked" block
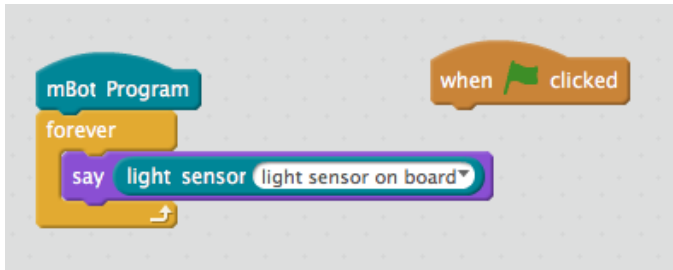
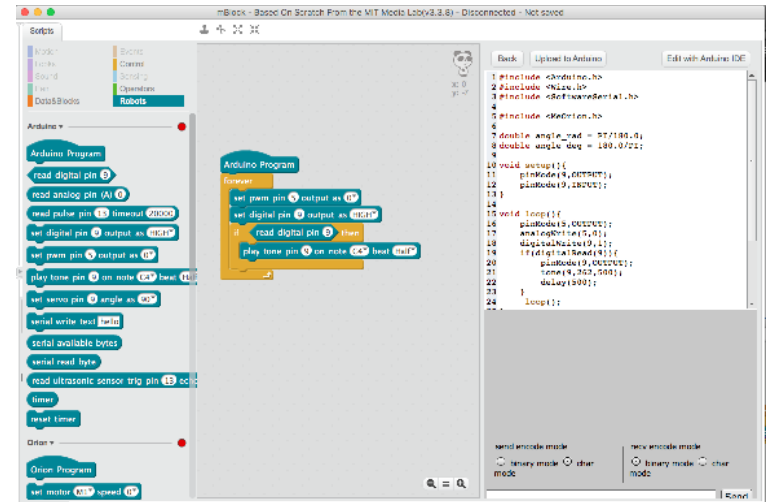**7** Select "Edit, Arduino Mode" from the menu. See what happens
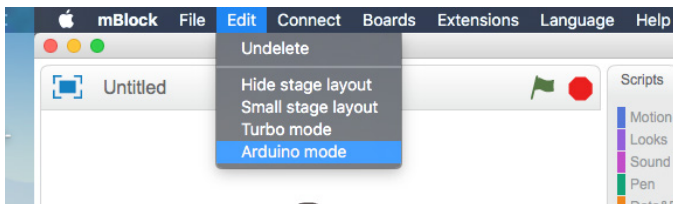
Oops, mBlock says "unsupported block found". This means not every block can be run in the Arduino Mode.
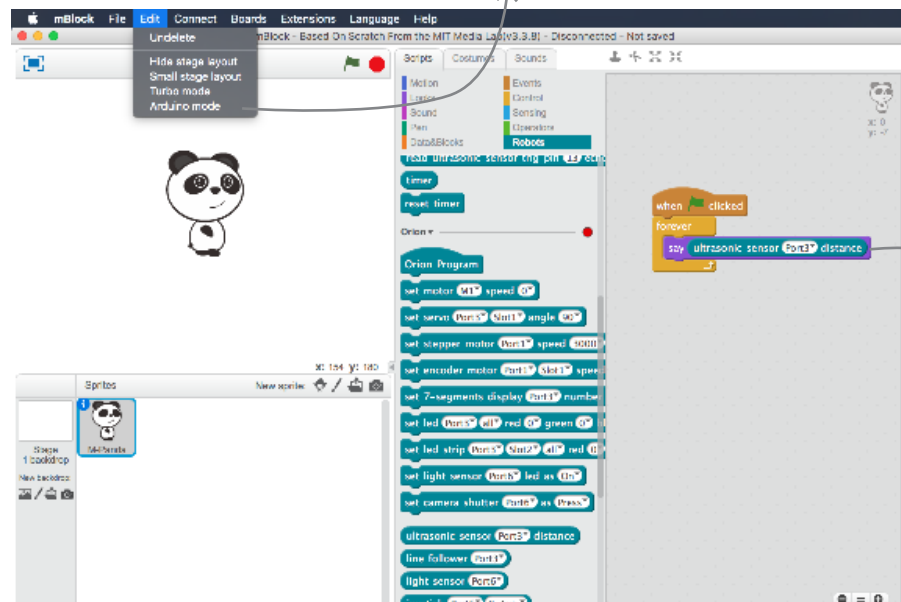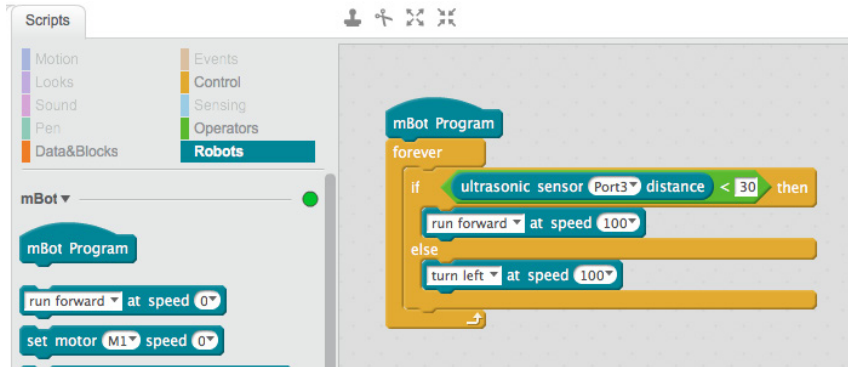

▲ **Arduino Mode**

In Arduino Mode, the program is **uploaded into the robot** and the robot is **run on its own**. However, you **cannot** use graphics from Scratch since the computer is no longer there.

use Edit/Arduino Mode menu item to toggle between Scratch and Arduino modes

▶ **Scratch Mode**

In Scratch Mode, the robot or Arduino board **must be connect to the computer** in order to run the program. You **can** use Scratch blocks to create graphics or make games.

This **"Say"** block can only be used in the Scratch mode; while the "**(Repeat) Forever**" block can be accessed in both modes.

8 Now let's try another program. Place blocks as shown below: The green block is from the "Operators" shelf.

9 Make sure "Arduino Mode" is selected in the "Edit" menu. Find "Upload to Arduino" button and click it.
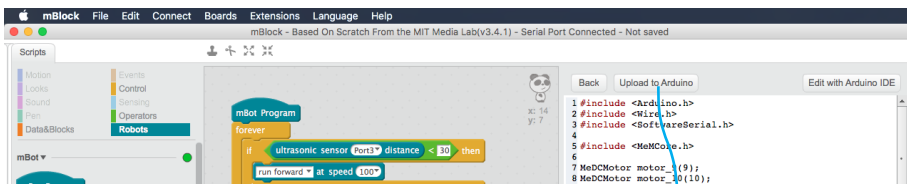
Click

10 Now unplug the USB cable, put the mBot on the ground, you'll find it keeps running forward and turns left when there is obstacles ahead!
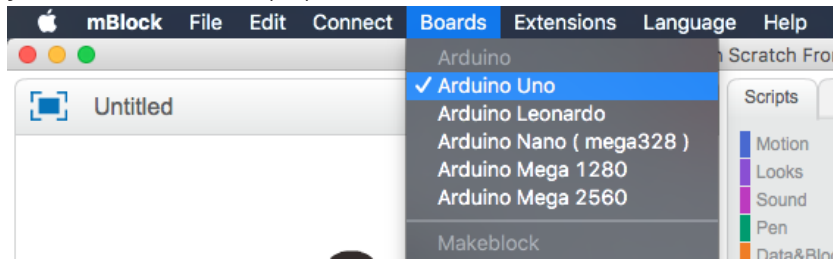
Tips

Reset Default Program?

You will find that mBot now does not respond to your command from the Makeblock App or the Scratch Mode in the mBlock. This is because the default program used to talk with these apps is overwriten by the obstacle-avoiding program you uploaded. You'll need to update firmware or "reset default program" to let it work again with the Scratch Mode or other Apps.

Hello, Arduino

This guide will give a short introduction on how to program Arduino boards with mBlock.

1 Connect the Arduino board through the USB cable, and follow the steps list on the "Connect through the USB cable" section.

2 From the "Boards" menu, select the board that match the one you have. The most popular choice is Arduino Uno.

3 From the "Connect" menu, select "Upgrade Firmware". Wait until the upgrade is complete. This will allow the mBot to talk with the computer.
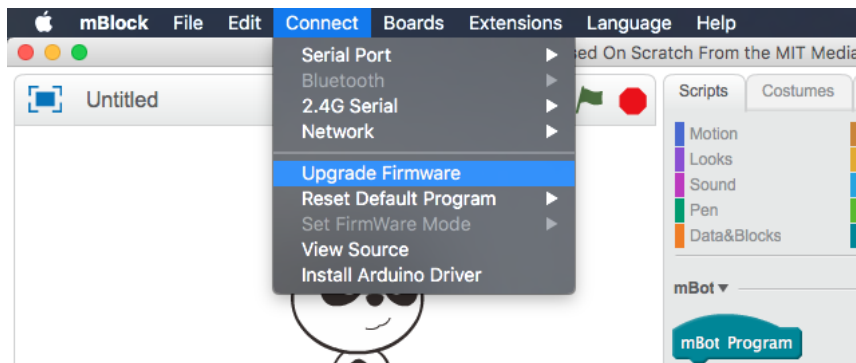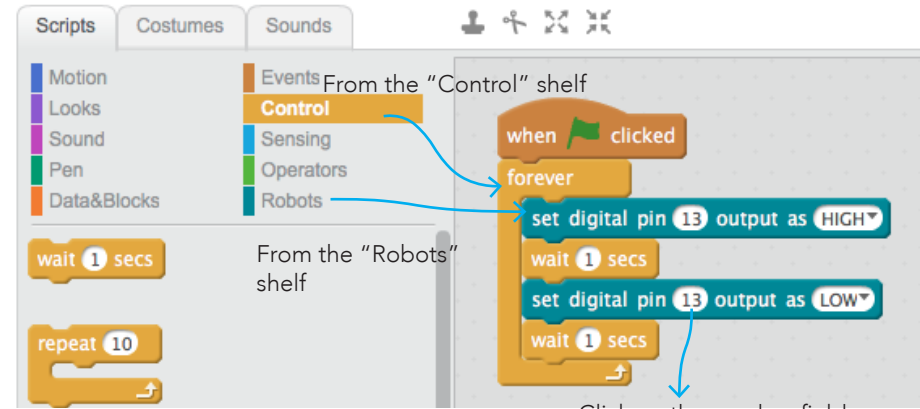
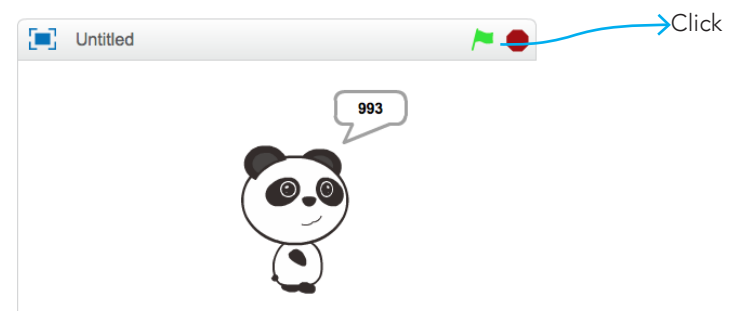**Tips**

"Upgrade Firmware"

"Upgrade Firmware" will allow you control the Arduino board from mBlock in the Scratch Mode. In the Scratch Mode, your Arduino board can interact with actors in the screen. Later I will introduce the "Arduino Mode", which will upload programs to the Arduino. Because the firmware will be overwritten every time you write a new program to Arduino, you need to "Upgrade Firmware" every time you come back from using the "Arduino Mode".

4 Place the following program in the script region

From the "Control" shelf

From the "Robots" shelf

Click on the number field and input 13

5 With Arduino Board connected, click the green flag, and you will see the LED light on the board is blinking.

Click

Why the LED blinks?

This is because in Arduino Boards, PIN13 is connected to an on-board LED; this is usually used as a test device. The program we wrote tells PIN13 to output high(on) and low(off) every 2 seconds, resulting in a blinking LED.

7 In Scratch Mode, it is required that your Arduino Board is connected to the computer. You may also choose uploading your program into the Arduino Board to do this, select "Edit, Arduino Mode".
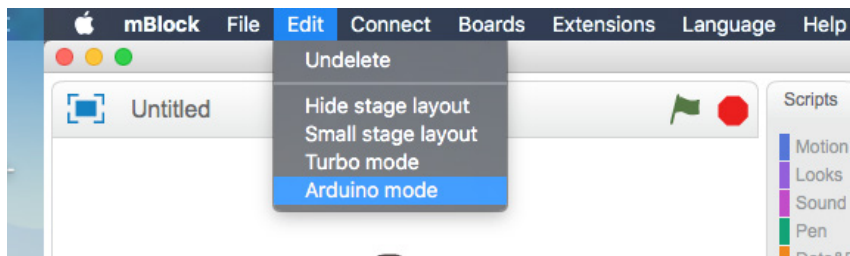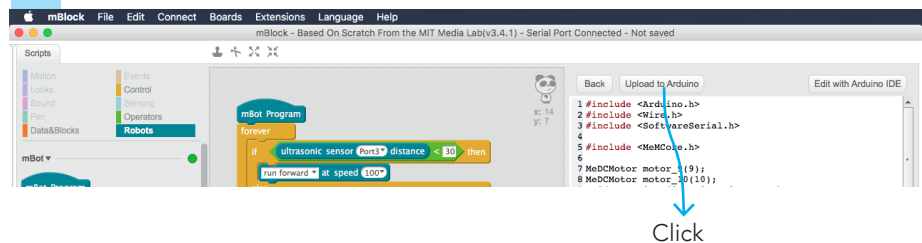
Scratch Mode and Arduino Mode

In Scratch Mode, the robot or Arduino board **must be connect to the computer** in order to run the program. You **can** use Scratch blocks to create graphics or make games.

In Arduino Mode, the program is **uploaded into the robot** and the robot is **run on its own**. However, you **cannot** use graphics from Scratch since the computer is no longer there.

8 Place the following program in the script region

From the "Control" shelf

From the "Robots" shelf

Click on the number field and input 13
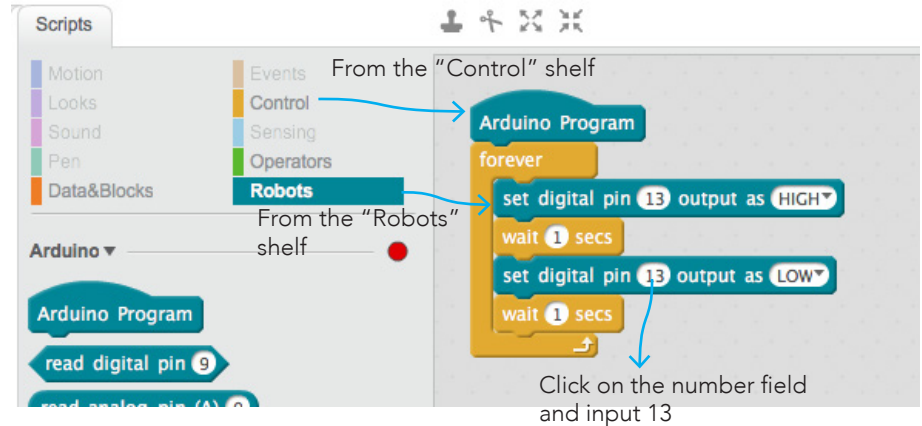
9 Click the "Upload to Arduino" button on the right panel

Click

10 You will find a LED on the Arduino board starts blinking.