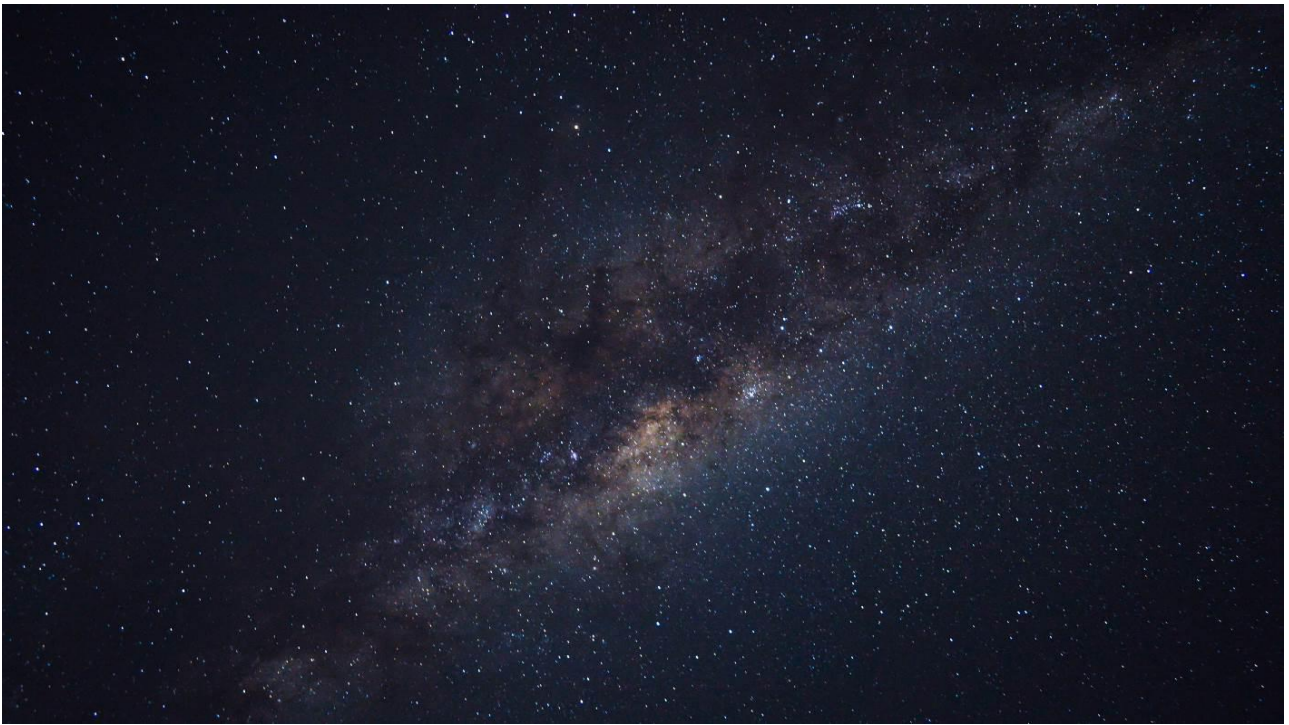


Argot?



The RGB LED rings on Me Auriga emits a dazzling white light, and then the light turns red, orange, yellow, green, blue, indigo and purple, isn't this just like the visible light spectrum of the sun? Then, the light runs through the first LED, the second, then the third, and stops at the fourth LED blinking red. What does this mean?

Mark, Dr.Zhang of IDA and members of his research team is discussing the message received from the outer space by Auriga. What is the meaning of this message?



Learning Objectives

This chapter includes introduction of mBlock interface and examples showing you how to write programs with mBlock. You will learn how to use the mBlock to control the RGB LEDs by connecting the mainboard Me Auriga with the computer via USB cable.

Scientific knowledge



Light-emitting diode (LED) is a semiconductor device that can emit visible lights. It can only emit dim red light in the early stage, but later, other colors became available under the manufacturer's continuous research and development. Now LEDs are available across the visible, ultraviolet, and infrared wavelengths, with very high brightness. Early LEDs are often used as indicators or used in display panel, but now they have extended to daily lighting, replacing traditional light bulbs and fluorescent lamps. LEDs are even playing an essential role in various high-precision device.

Getting Prepared



Me Auriga (mainboard)

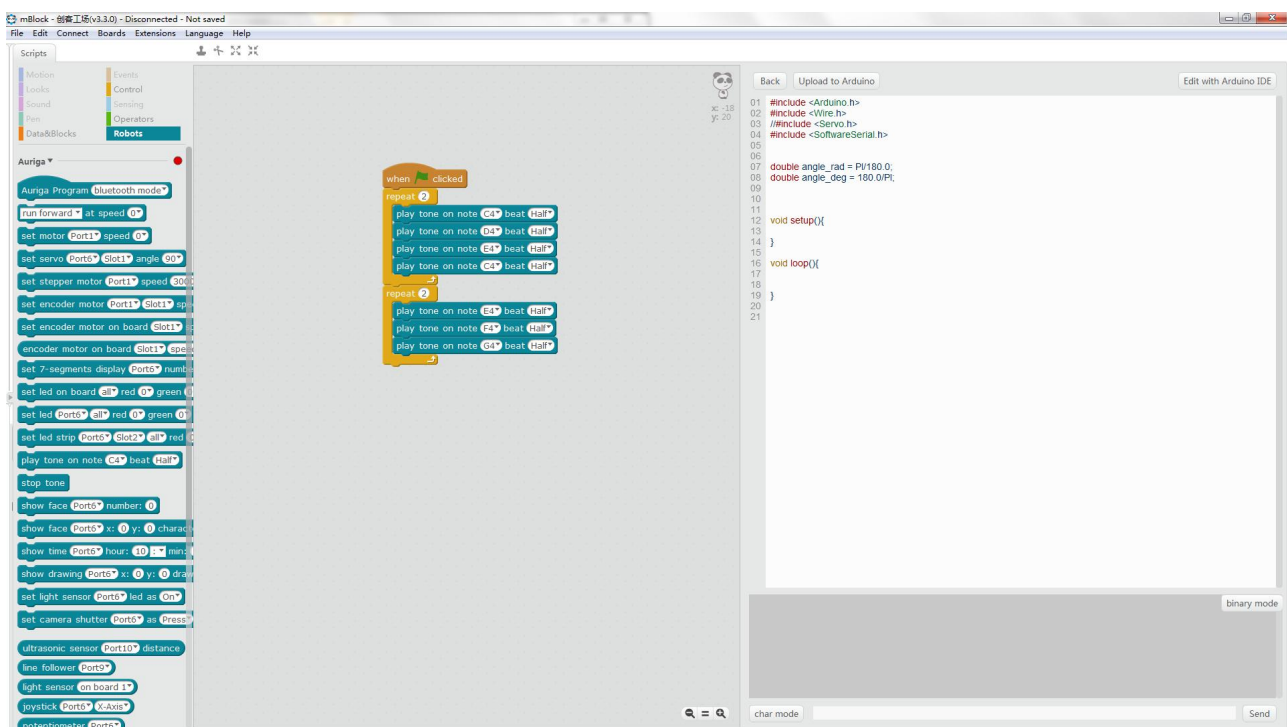


USB cable

Learning Tasks

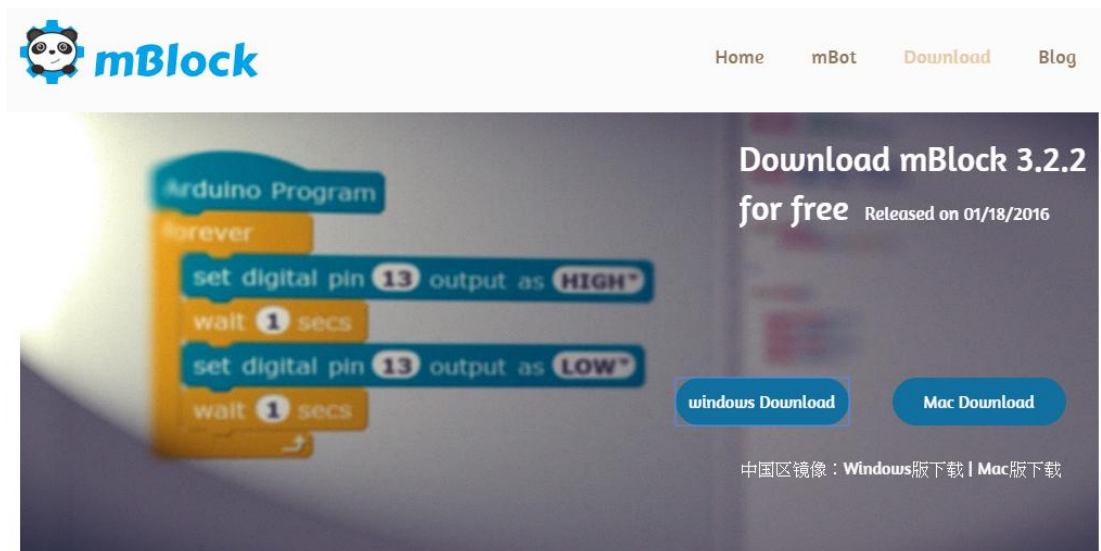
Learning Task 1 - Establishing a Teaching Environment for mBlock

What is mBlock?



mBlock is an easy-to-use graphical programming software developed by Makeblock with high interactivity and high efficiency. Based on Scratch 2.0, mBlock also combines robot control commands closely to help improve student's interest in learning programming as well as electronic knowledge. mBlock not only brings the works of the students from virtual world to physical world, but also helps the students to apply their programming skill in various fields.

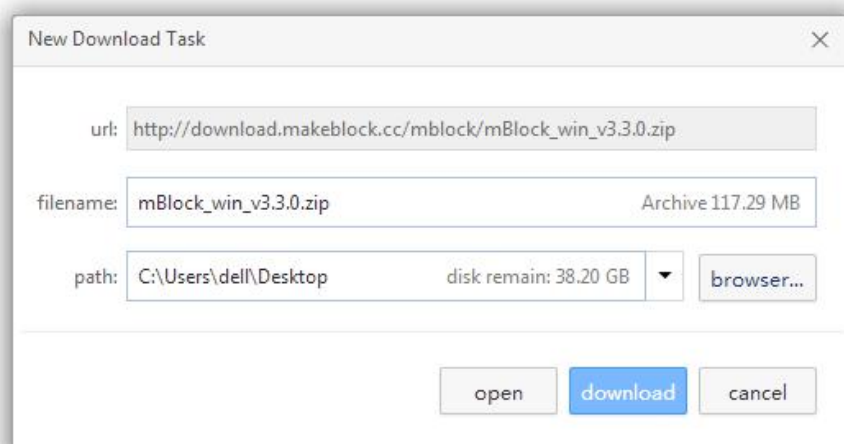
Download & Install mBlock



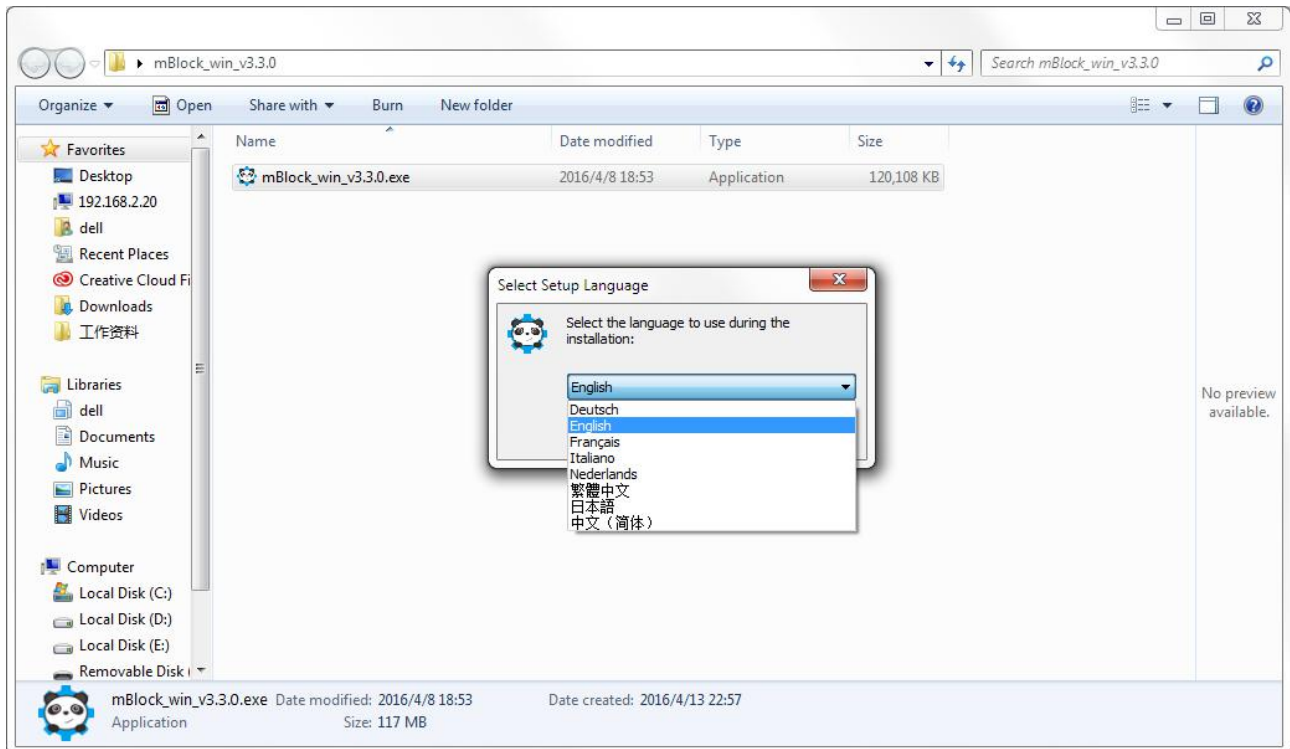
Open your browser and visit <http://www.mblock.cc/download> for downloading mBlock. If you are using a Windows operating system, please click “Windows Download” to start downloading; if you are using the Mac operating system of Apple, please choose “Mac Download”.

Note: The following example is based on Windows operating system.

1. Click “Windows Download” and begin to download...



2. After downloading, open zip file “mBlock_win_Vx.x.x” and select language for mBlock.



3. After installation, tick “Launch mBlock” and click “Finish” to open mBlock.

Introduction to mBlock Interface



The mBlock interface is mainly divided into 7 sections, as shown in the above figure.

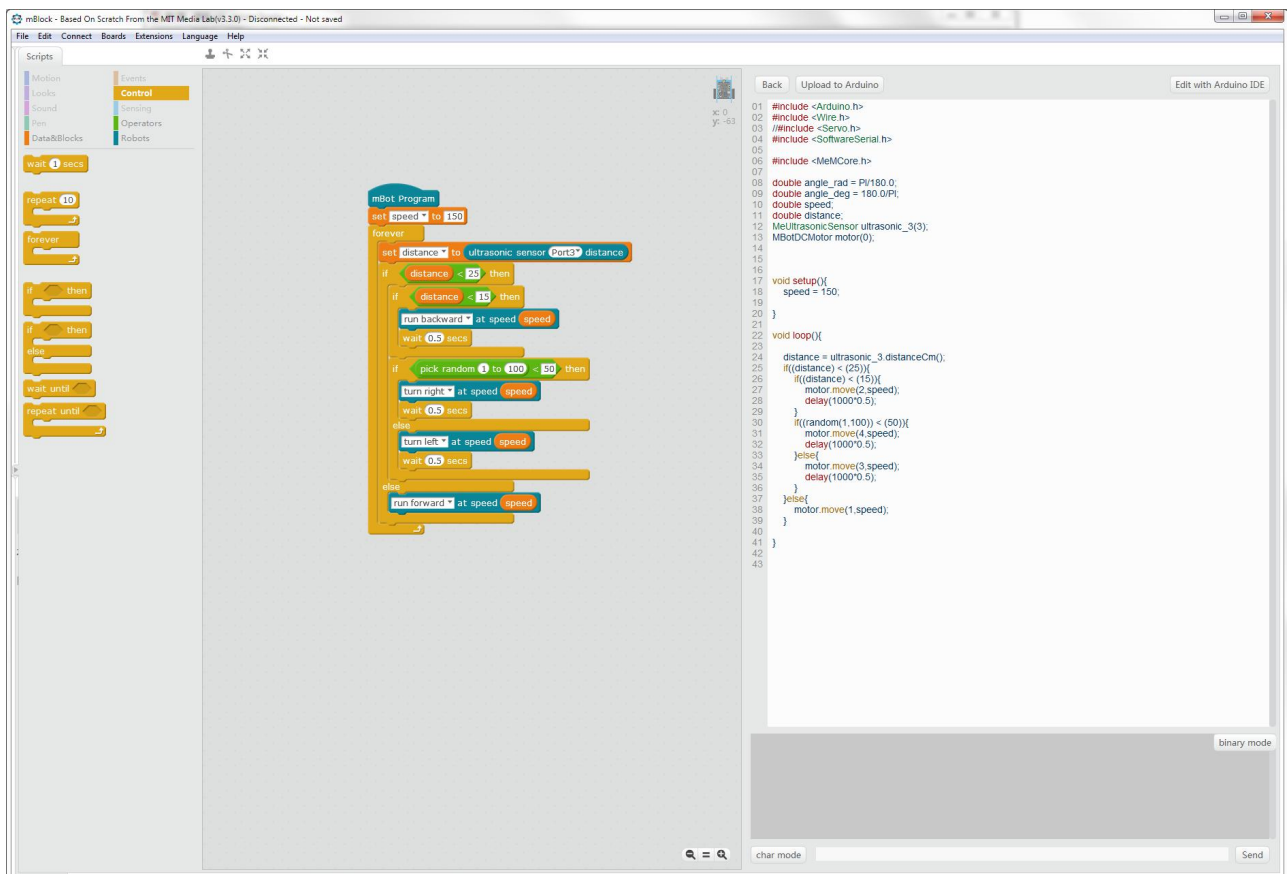
- | | | |
|----------------|----------------|-------------------|
| 1. Menu Bar | 2. Stage Area | 3. Sprite List |
| 4. Tabs | 5. Block Types | 6. Blocks Palette |
| 7. Script Area | | |

The menu bar in mBlock looks really different from the menu in Scratch. Now let's take a look at these tabs one by one.

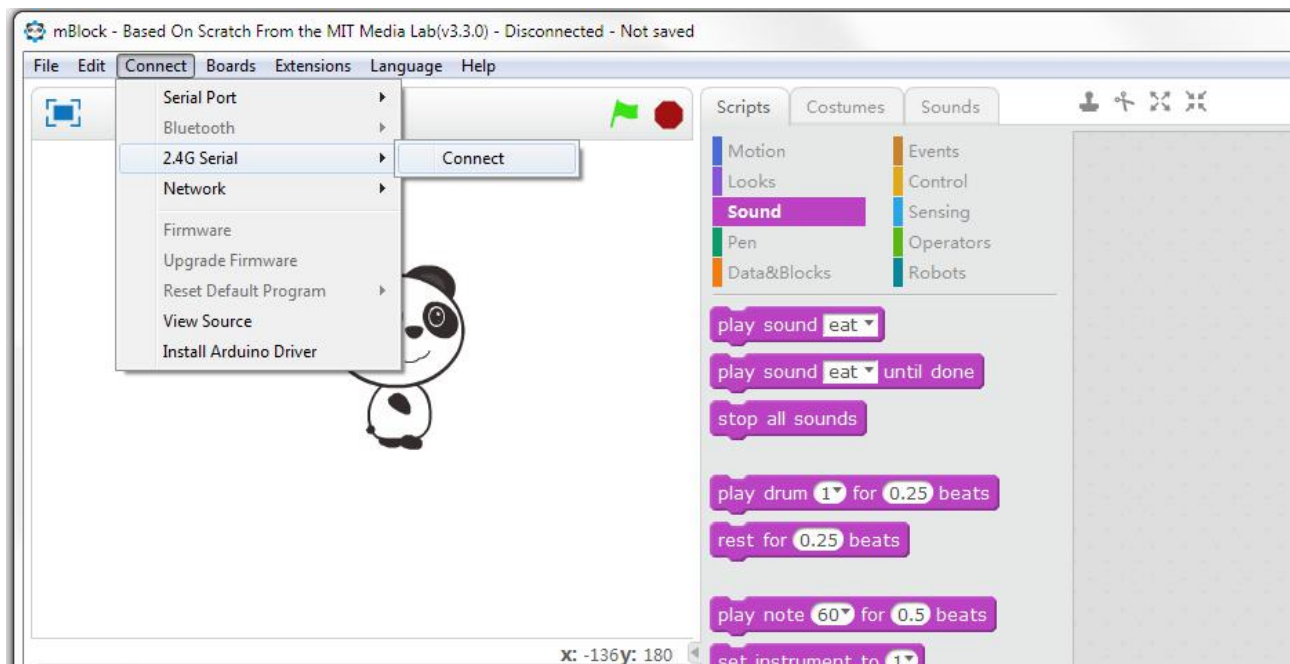
1. Menu Bar: this menu bar contains 7 tabs, including File, Edit, Connect, Boards, Extensions, Language, and Help. We will introduce these tabs one by one.

[File]: Add new files or manage files. mBlock comes with additional taps Import Image and Export Image, allowing you to create your own library for teaching.

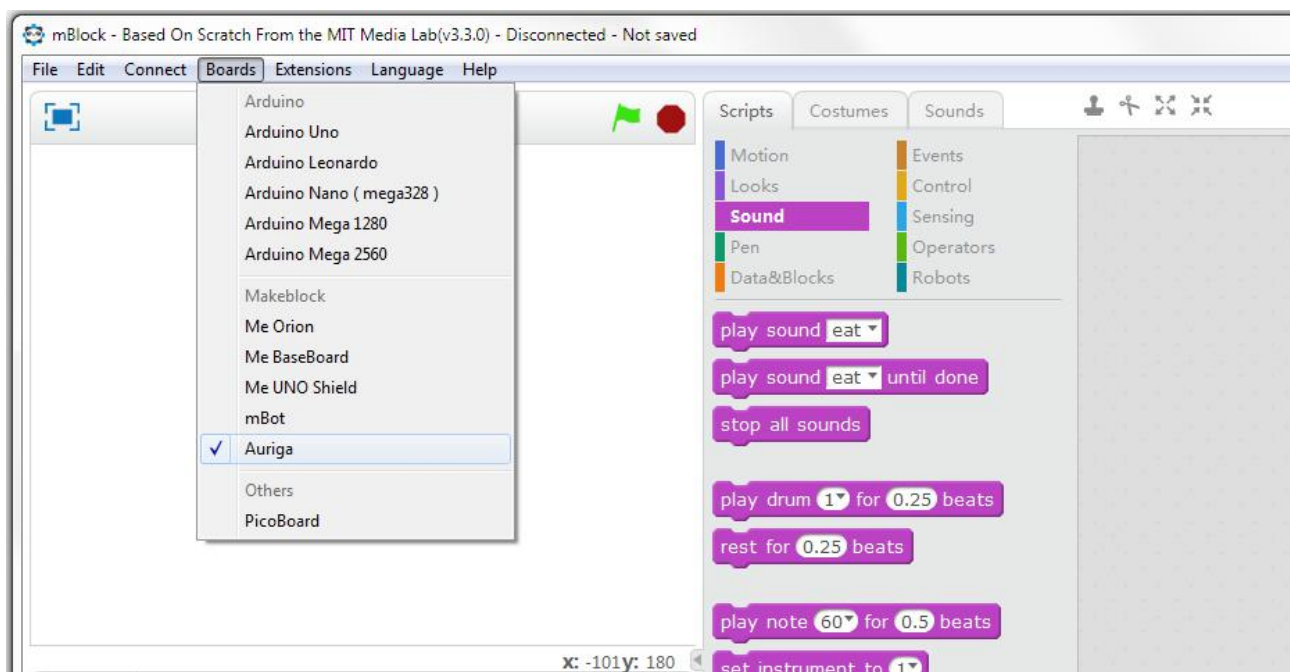
[Edit]: Select mode for Stage or choose edit mode. mBlock also includes Arduino mode, allowing you to transfer your program into Arduino C language or edit with Arduino IDE.



[Connect]: Connect is a special function of mBlock enables you to connect hardware with mBlock, or download firmware or Arduino driver.



[Boards] mBlock enables connection with up to 10 open source boards.



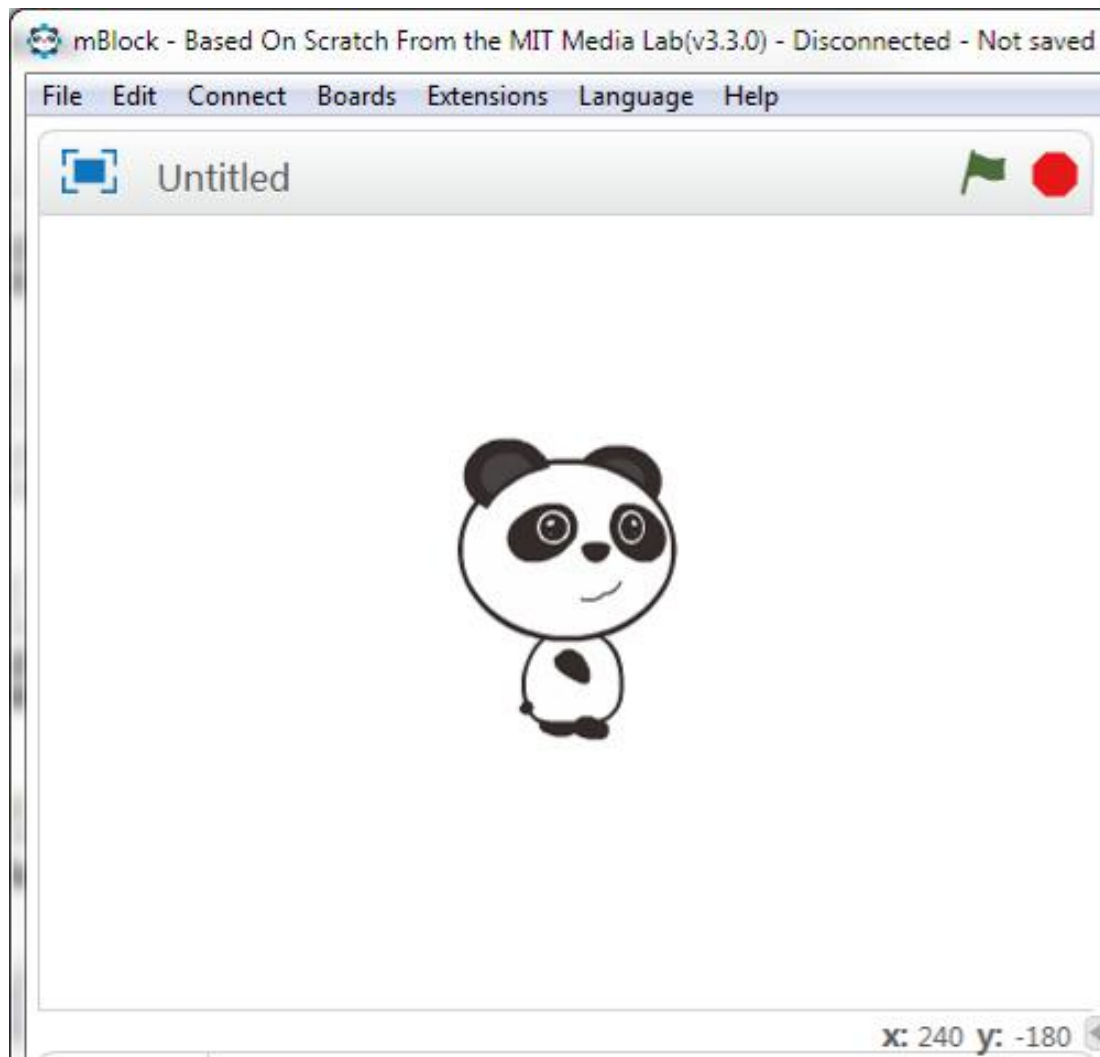
[Extensions] An easy-to-use tap for you to manage extensions. In addition, mBlock also support seamless connection with LEAP Motino sensor.



[Language]: More than 10 languages are available in mBlock. You can also set font sizes according to your needs.

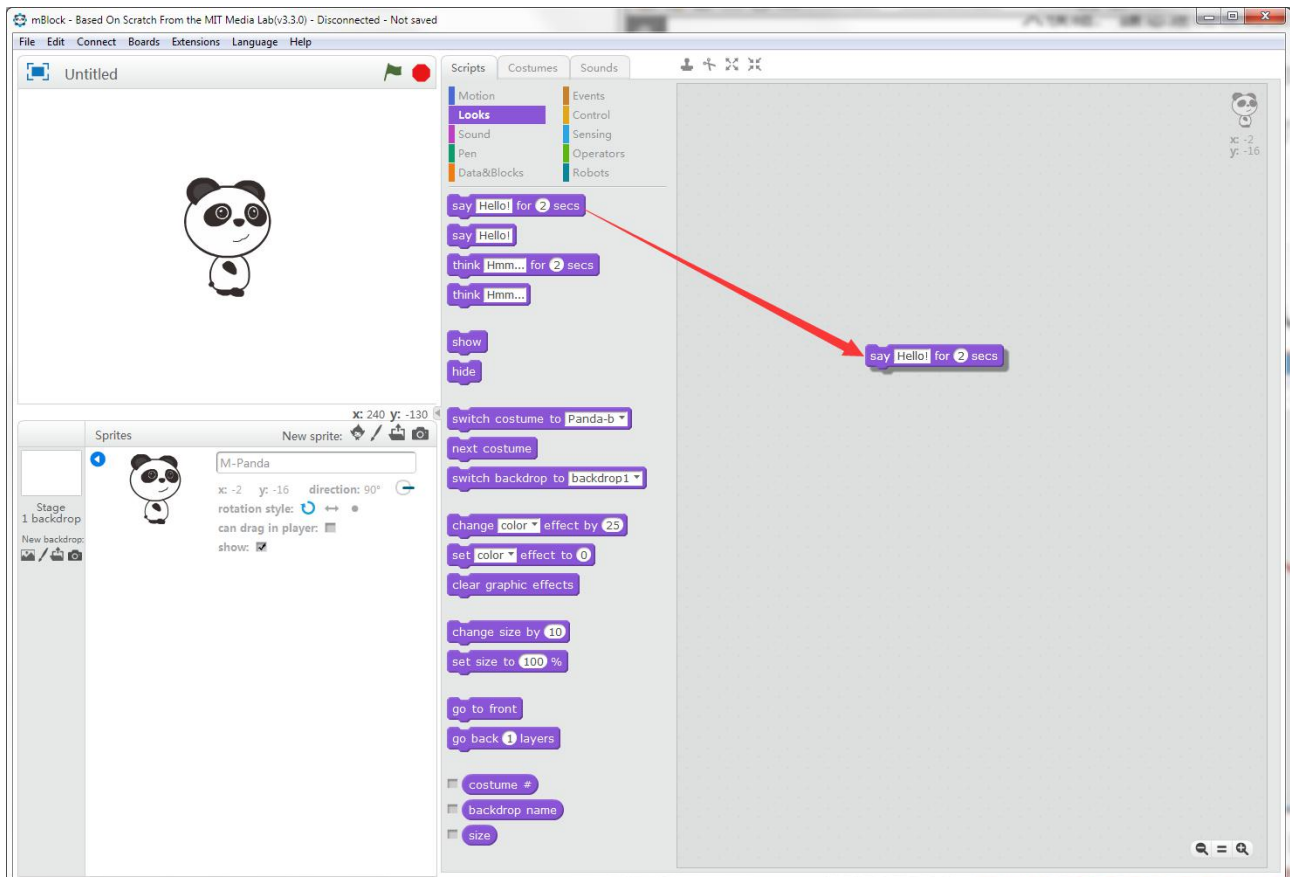
[Help]: Is there anything wrong with mBlock? You can report bugs to mBlock Team, get access to mBlock forum or check software updates in here.

2. Stage Area: animation of your program appears here. You can also use mouse to interact with your sprite.



3. Sprite List: display the Sprite controlled by mBlock.
4. Tabs: tabs for editing scripts, costumes, or sounds.
5. Block Types: various type of block here. mBlock also includes built-in Robot block, allowing you to connect hardware without plug-in.
6. Blocks Palette: the block of code you'll use to program your sprites.
7. Script Area: An area where you drag the blocks in, snap them together into scripts.

Learning Task 2 - Quick Guide for Editing Blocks in mBlock

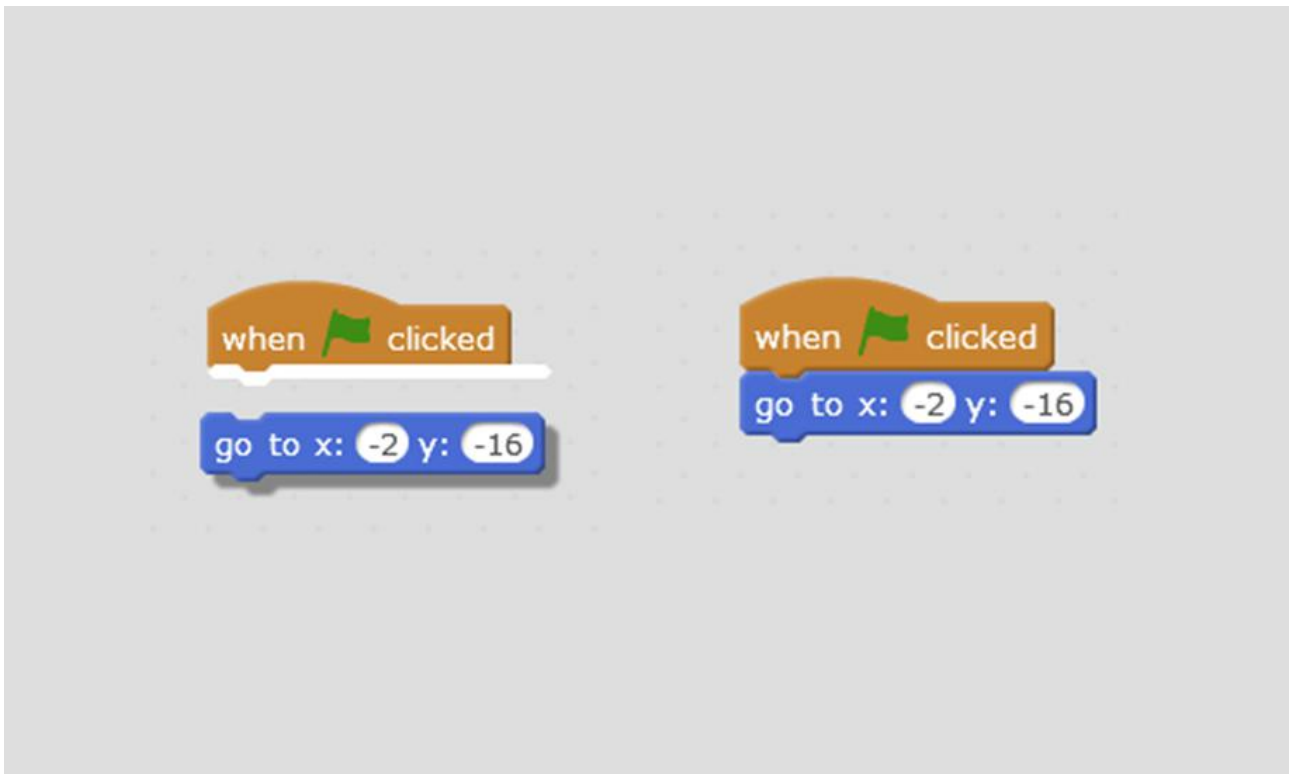


Editing blocks in mBlock is quite simple. All you need to do is drag the blocks to Script Area with your mouse. When several blocks are combined in a specific order, then it will be able to realize your ideas. The whole process is called programming.

How to Combine, Delete, or Copy Blocks

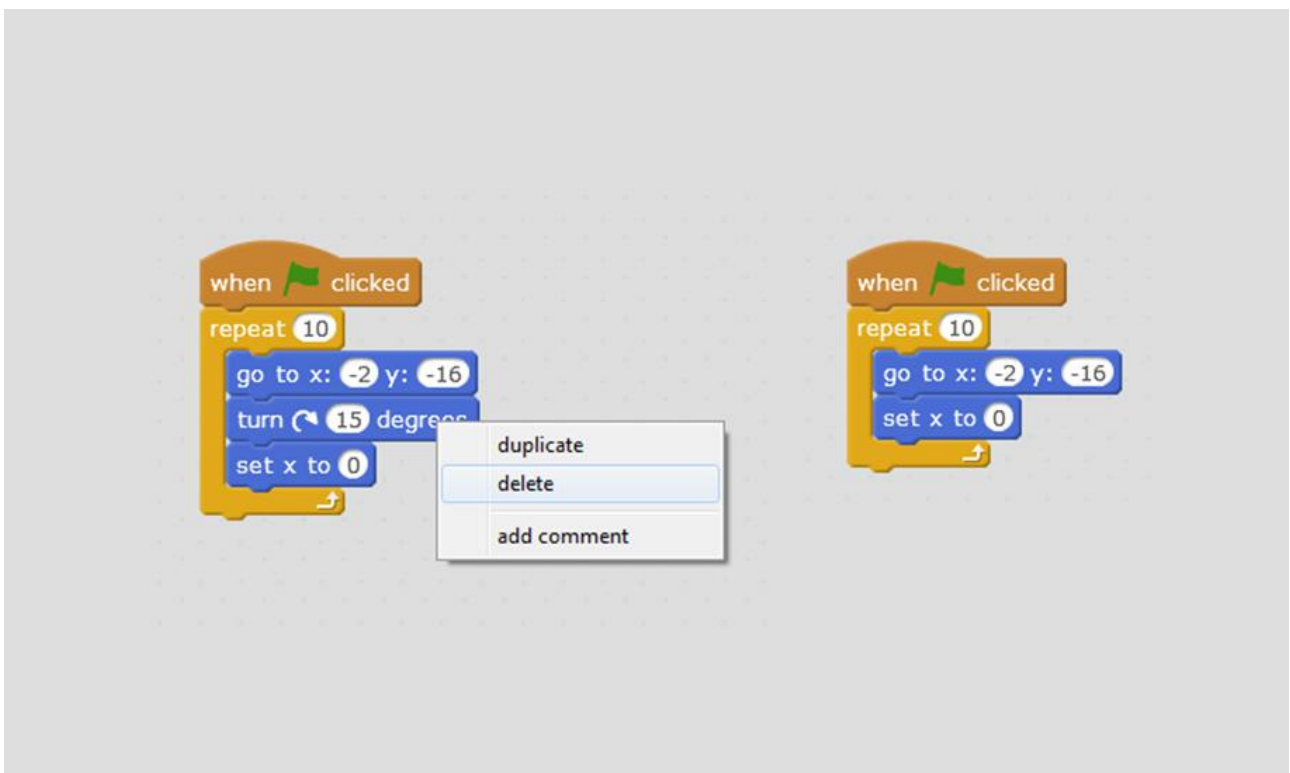
Combine blocks together: blocks in mBlock have different shapes. Some blocks are shaped with a rounded top and a bump at the bottom, but some are shaped with a notch at the top and a bump on the bottom. This unique design of blocks indicates whether they can be combined together or not.

Drag a block and bring it close to the block you want to combine with, you will see a white line between two blocks. The white line indicates the place where the two blocks stick together.



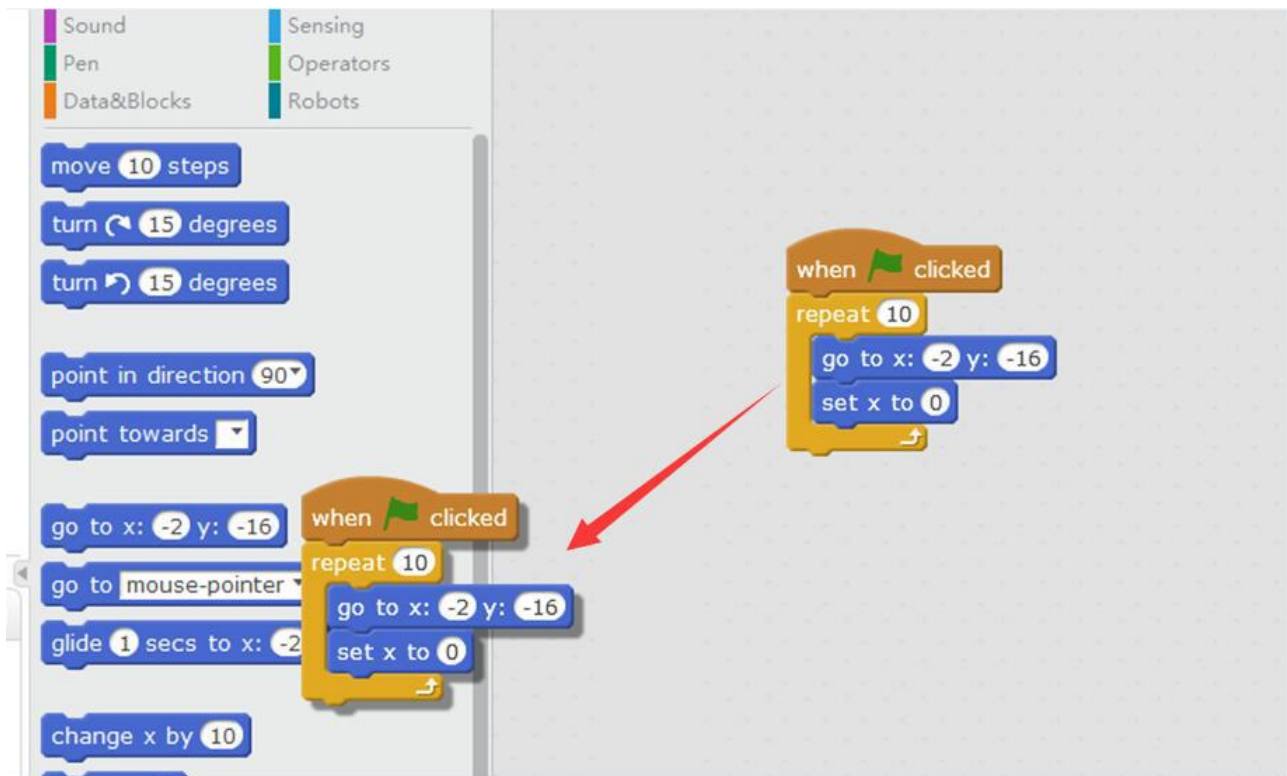
Delete a block: unlike Scratch, you can delete a block by using mouse

Move the mouse to the block you want to delete, right-click and select [Delete] in the drop-down list.



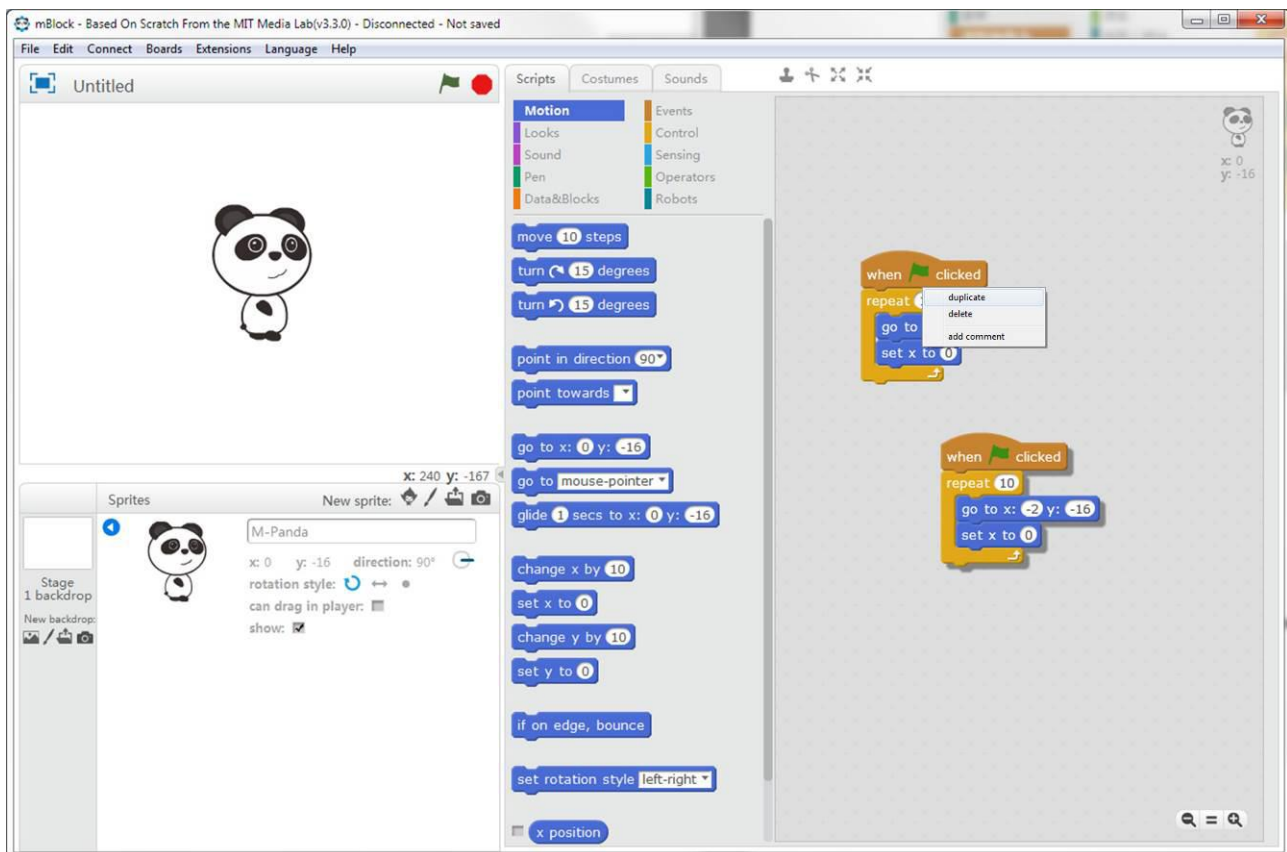
Delete a series of blocks:

Drag this series of blocks from Script Area to Script Palette, then this series of block will be deleted successfully.

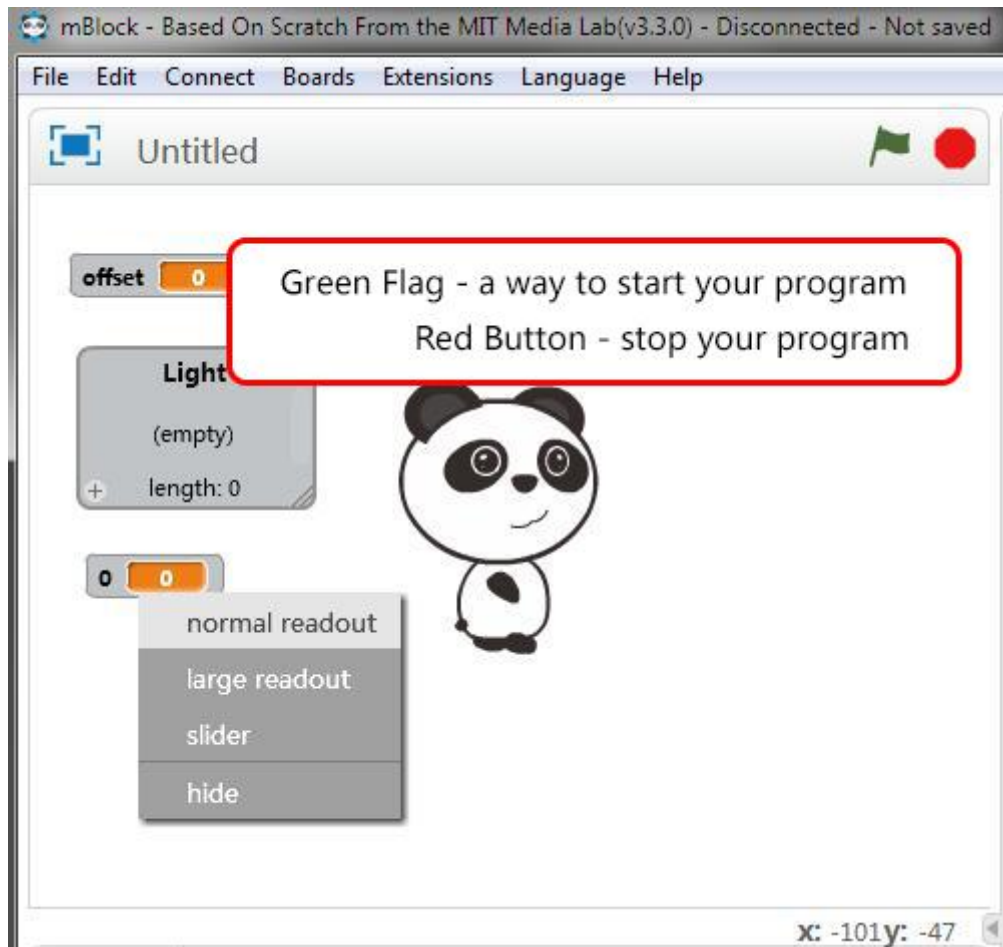


Copy a block or a series of blocks: mBlock enables you to copy a block or a series of block, which saves a lot of time switching between different block types.

Move your mouse to the series of block, right-click and select [duplicate], then there will be another series of blocks in the Script Area.

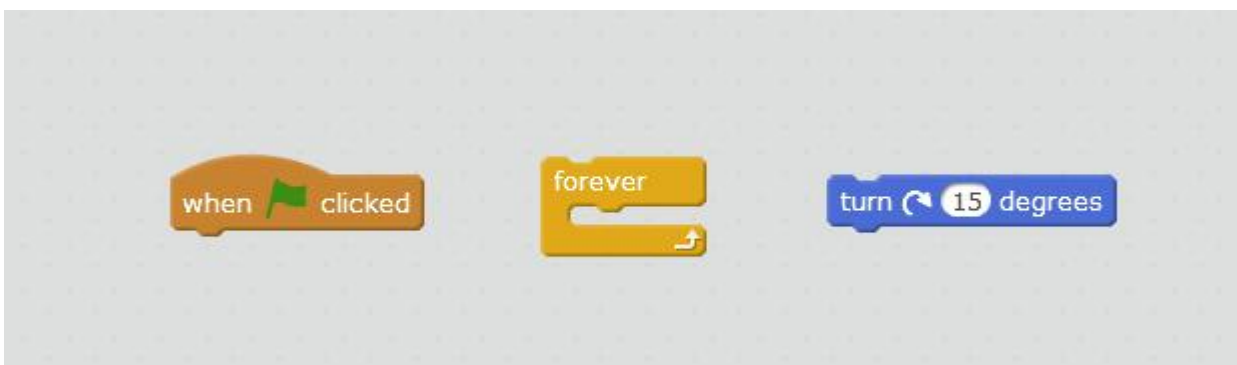


How to Start or Stop a Program

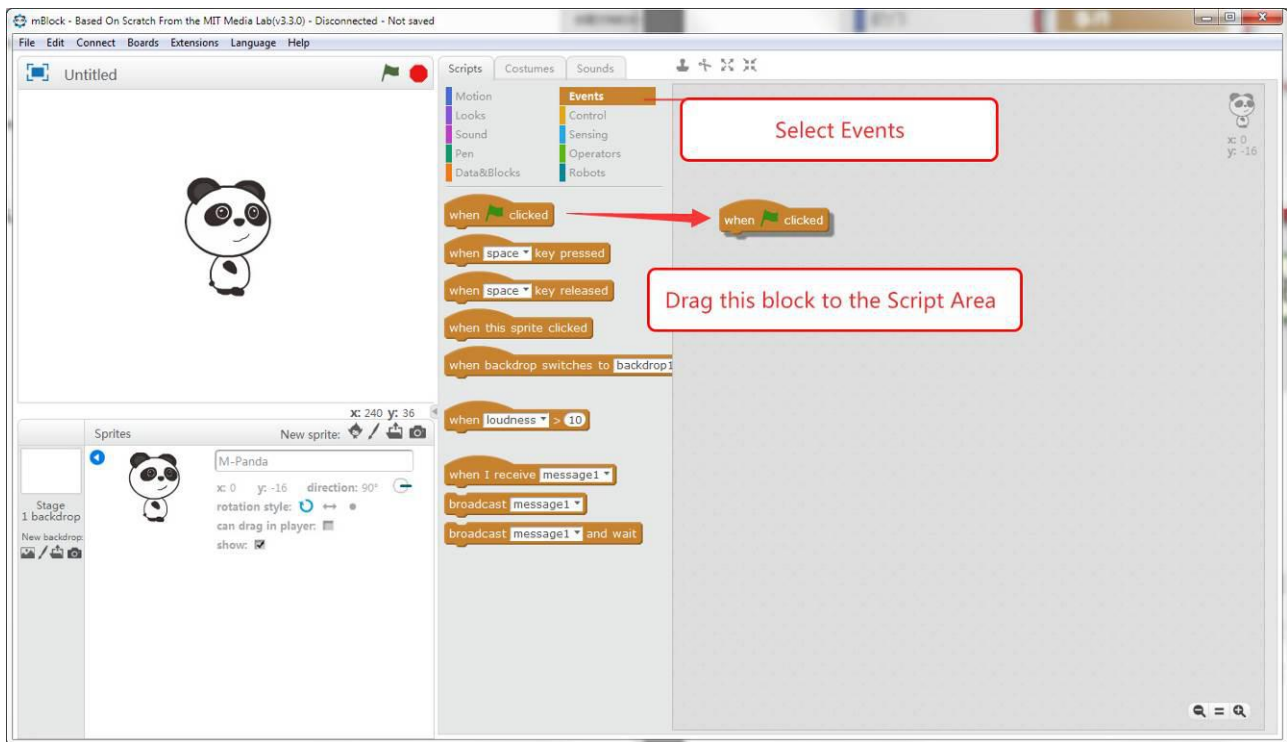


Start a Program

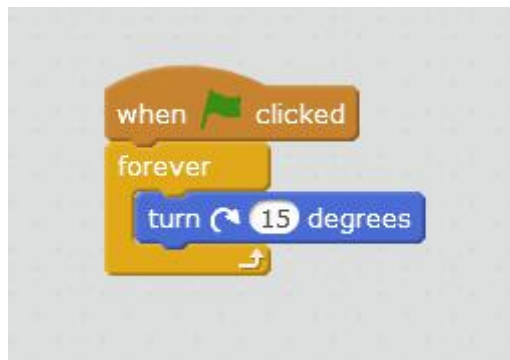
Example: How to Rotate a Panda



Now let's find above three blocks from the [Events], [Control], and [Motion] respectively and drag them to the Script Area.

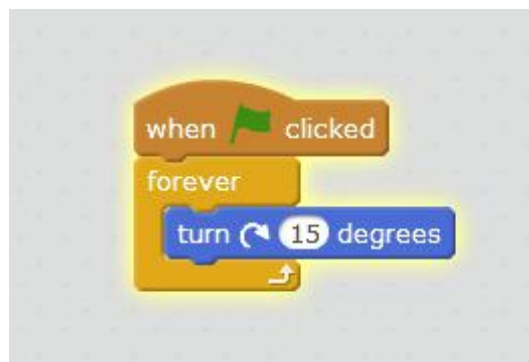


Then we combine these three blocks together as shown in the right picture.



When we click the green flag (the one on the upper right corner of the Stage or the one in the block), the panda will do exactly as required in the program and there will be a light yellow halo around the blocks. The yellow halo will disappear after implementing the whole program.

Since there is a [forever] block in this program, the panda will keep turning.



Did you success in turning your own panda?



How to stop the operation of a program:

If you want to stop a program, just click the red button on the upper right corner of the Stage or click the blocks (the program) in the Script Area.

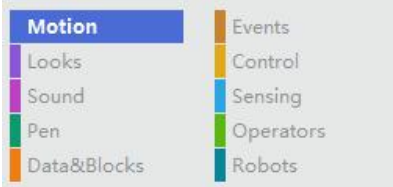

After understanding how to start or stop a program, we will introduce the blocks used in this example.

		When the green flag is clicked
When click the green flag on the stage, the panda will follow the commands under this hat block one by one		

		Forever
Keep repeating all commands contained in this C block.		

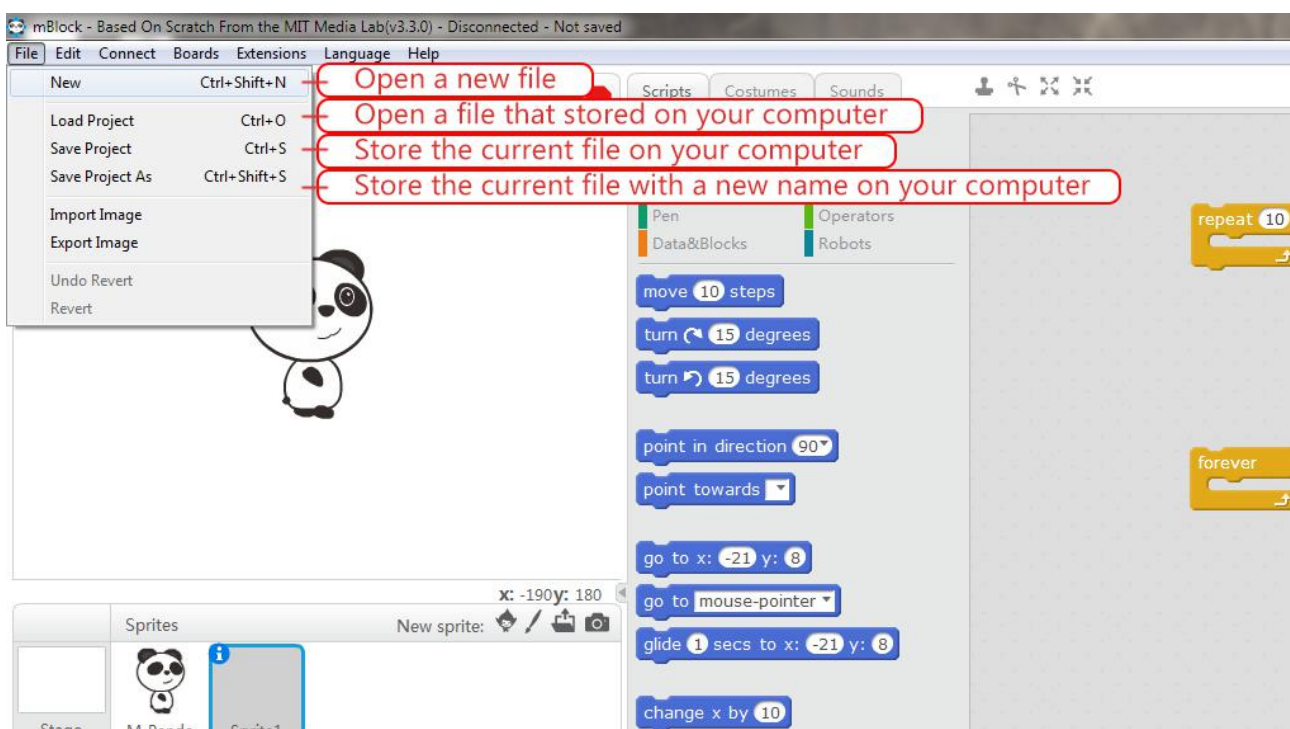
In addition to [forever] command, there is another command called [repeat...times] that you can define the repeating times on your own.

		Repeat...times
Set the number of times and the panda will implement all commands contained in this C block for ... times. The number of times can be set by inputting a number through keyboard or can be designated by making a variable.		

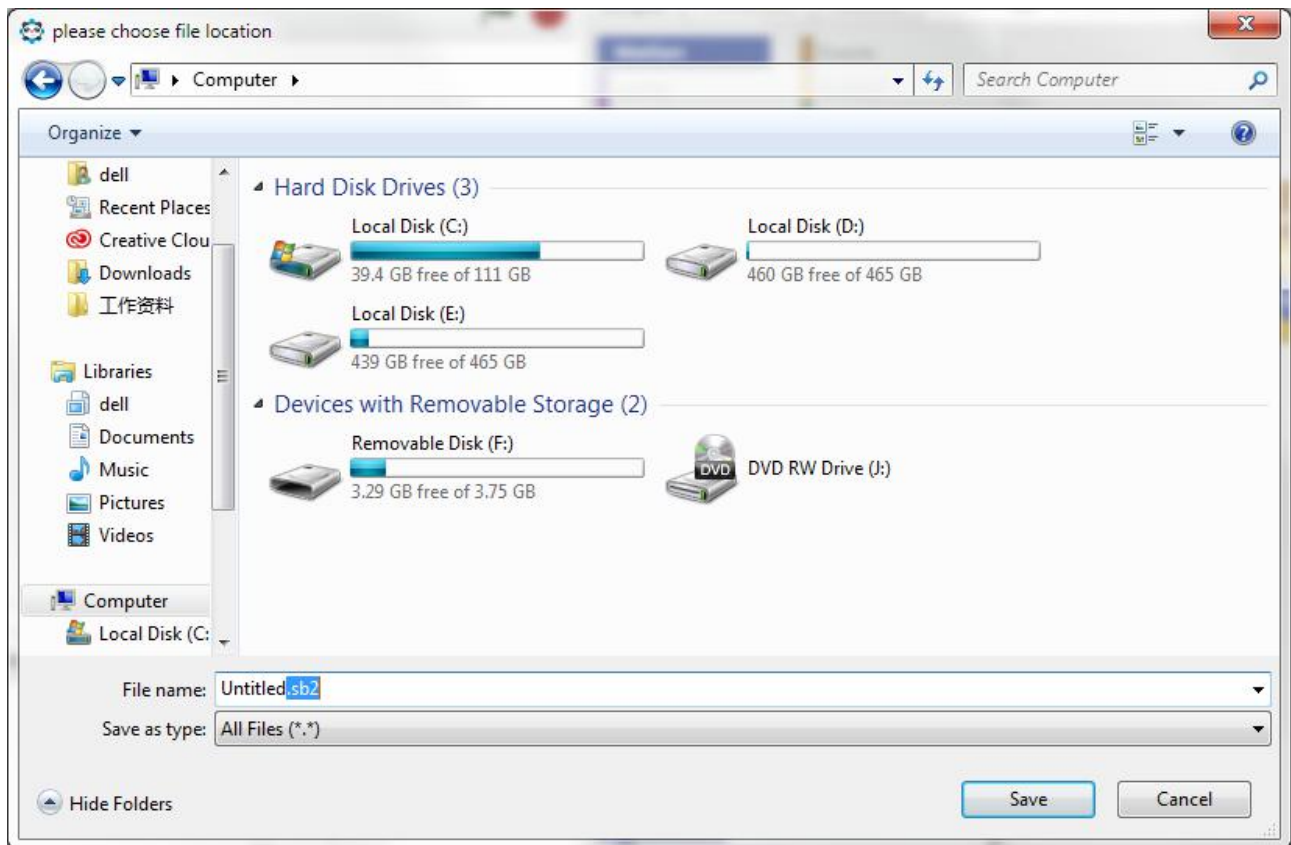
		<p>Turn the panda for ... degrees clockwise</p>
<p>Rotate the panda for 15 degrees clockwise. The degree of rotation can be set by inputting a number or can be designated by making a variable.</p>		

Manage Files

File management includes 4 functions, as shown in the following picture:



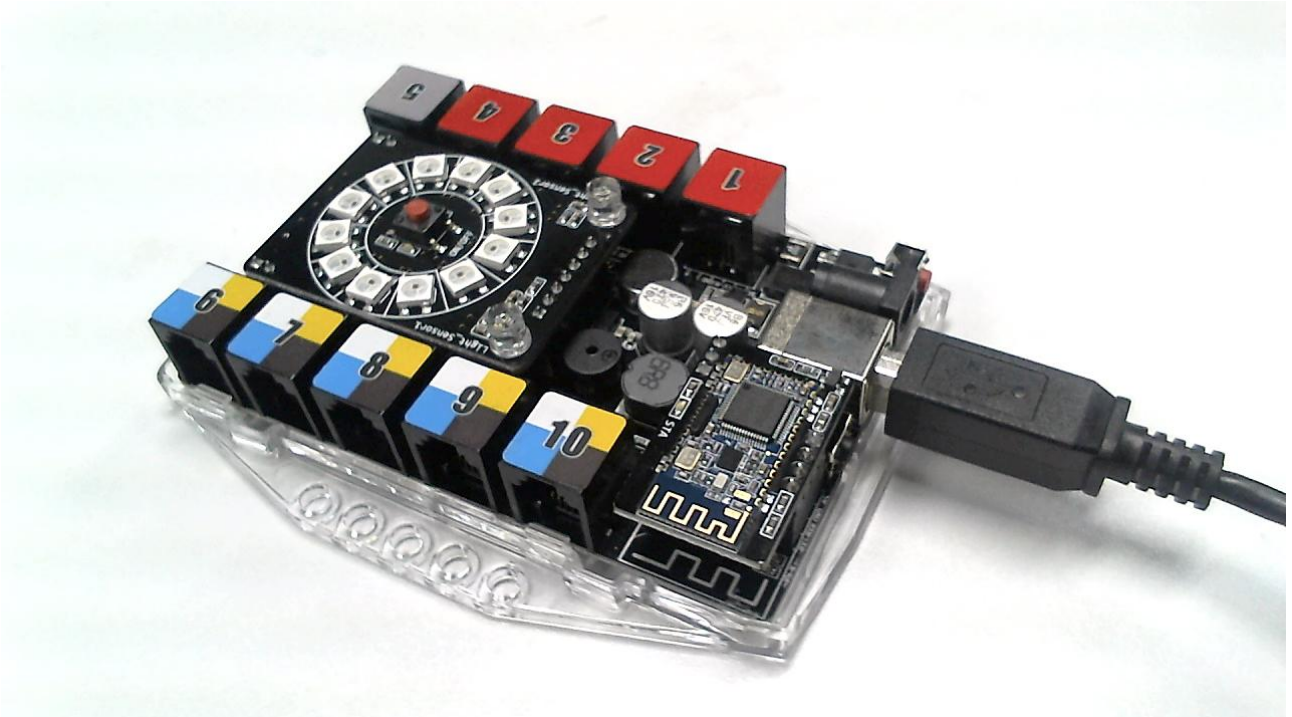
If the file has a .sb2 extension, make sure you keep the extension when saving the files with a new name.



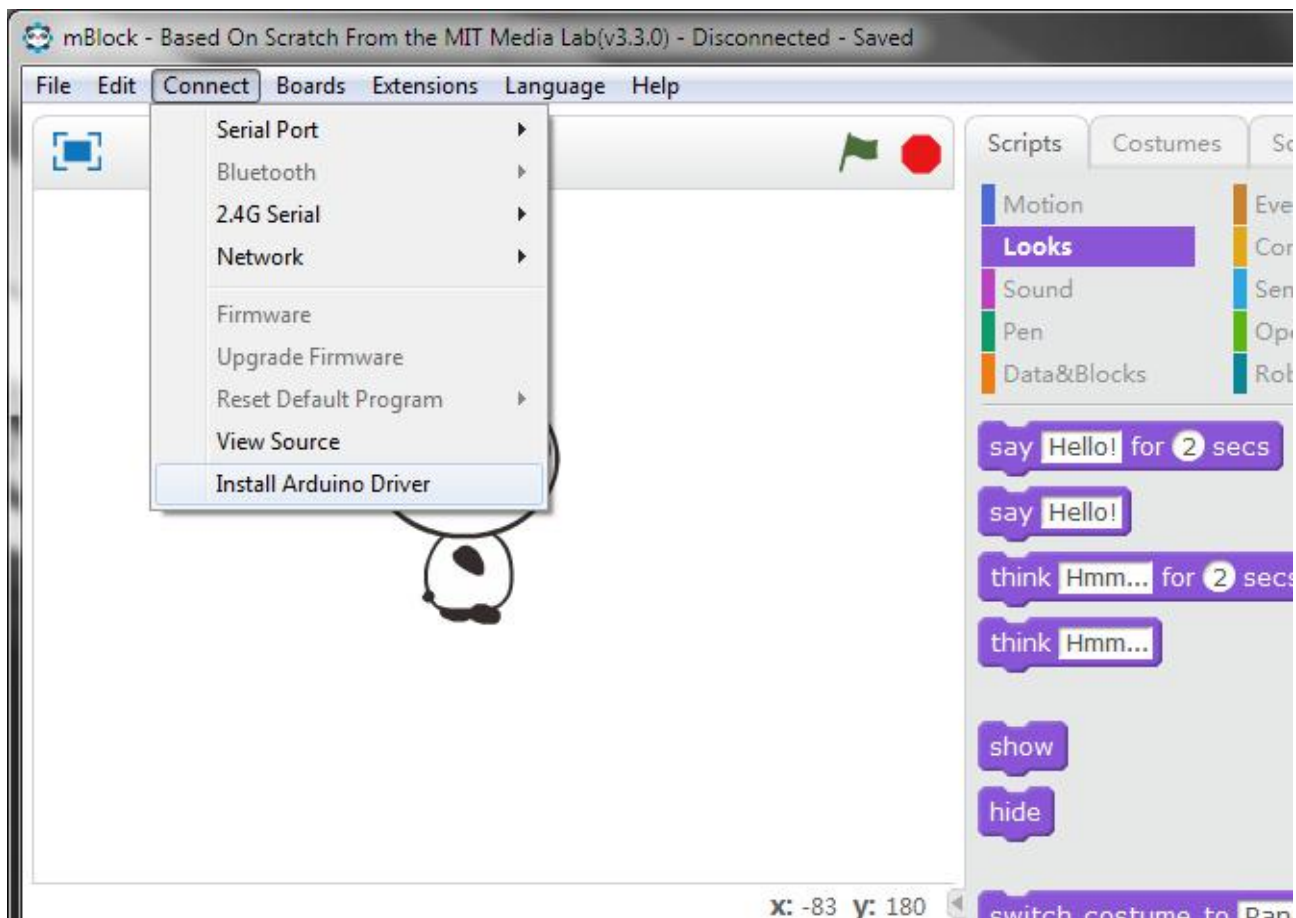
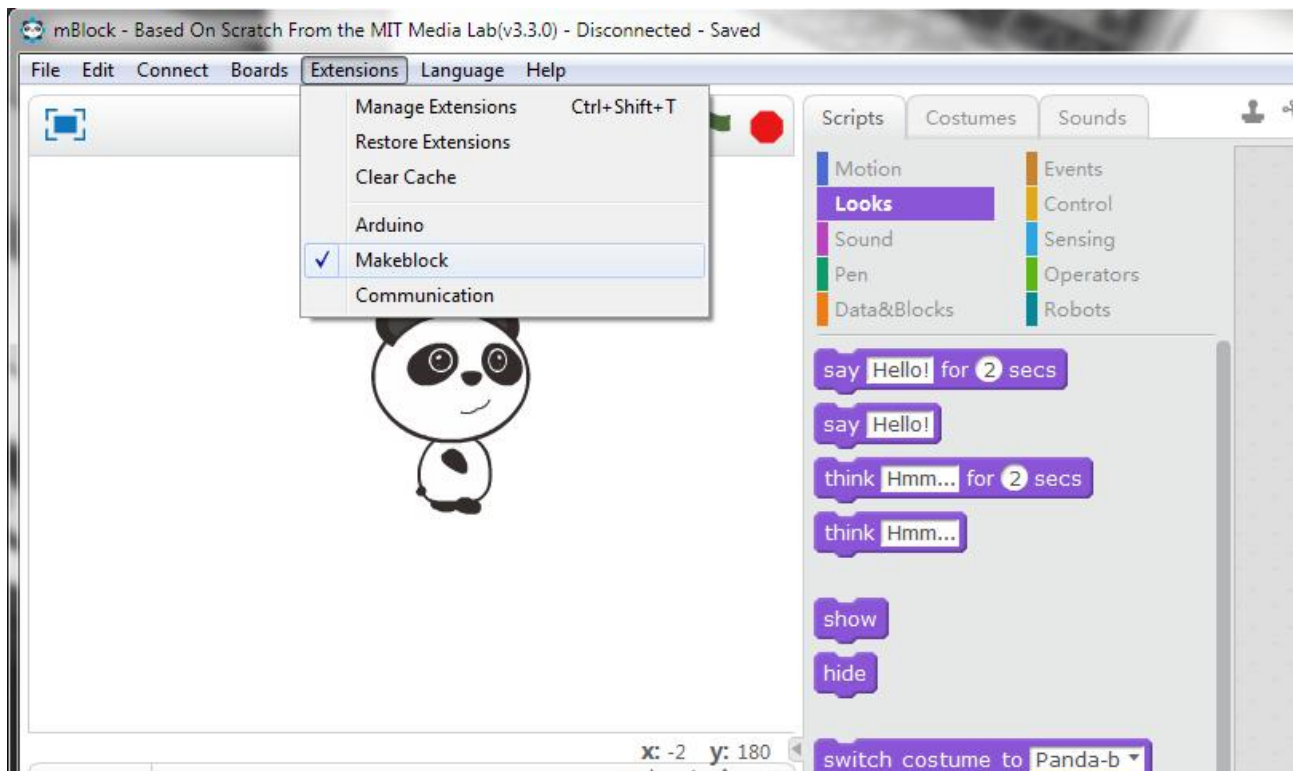
Task

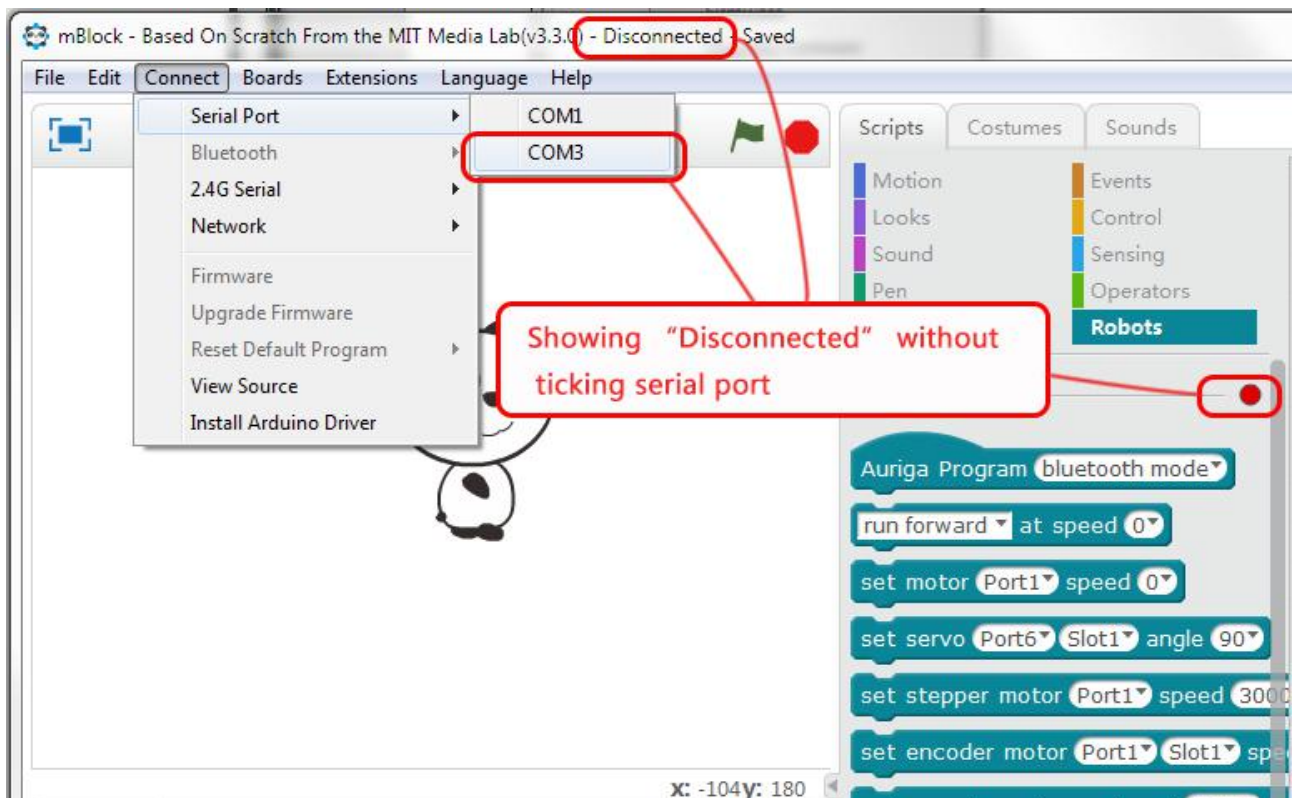
Task 1 - Control Me Auriga with Computer via USB (Online Control Mode)

We need to make sure mBlock is well installed on computer before connecting Me Auriga with computer. Then we connect one end of the USB cable to Me Auriga and insert the other end of the USB cable into the USB interface of the computer. When first connect Me Auriga with computer, there will be a message showing “Installing device driver software” at the bottom-right corner of the desktop. When the driver is installed in the computer, corresponding serial number “COM XX” will show up. “COM XX” is the serial port we should select when using mBlock.

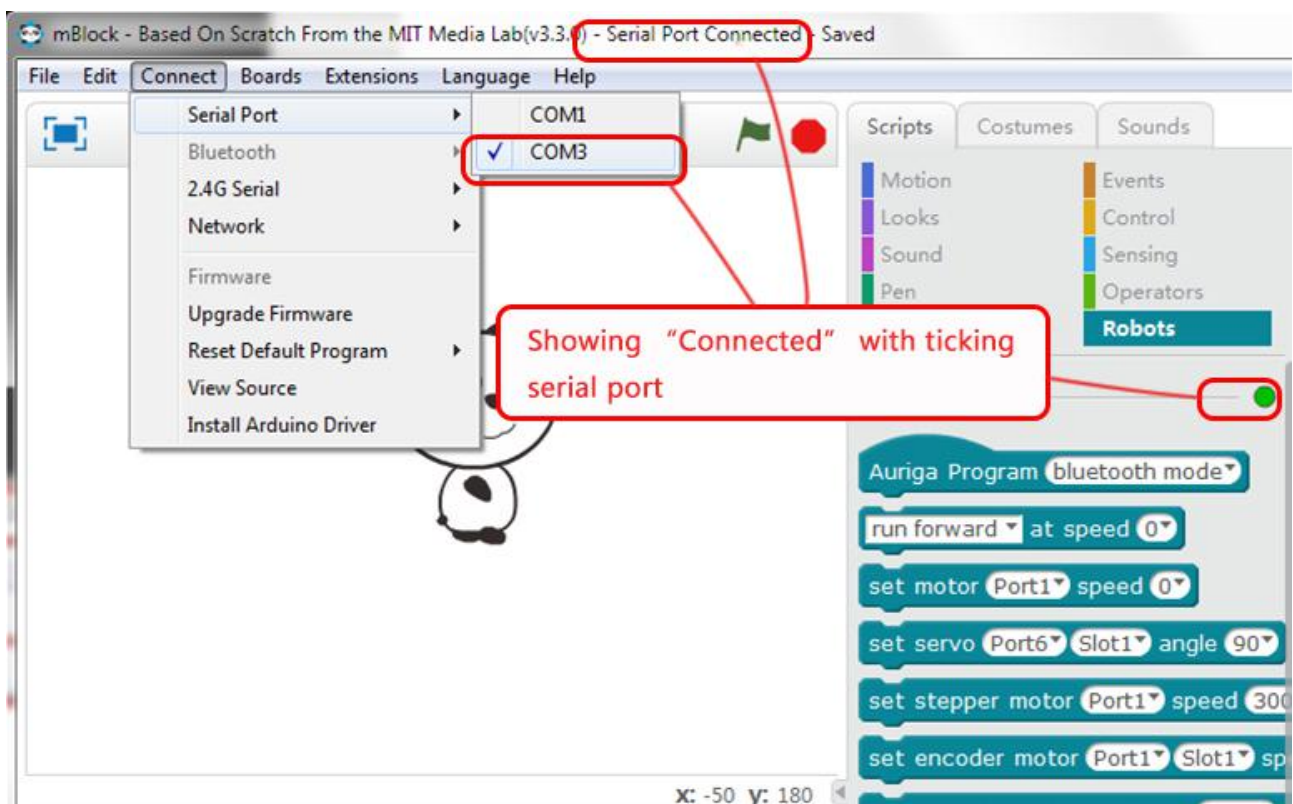


Select [Boards] in mBlock and install Arduino driver

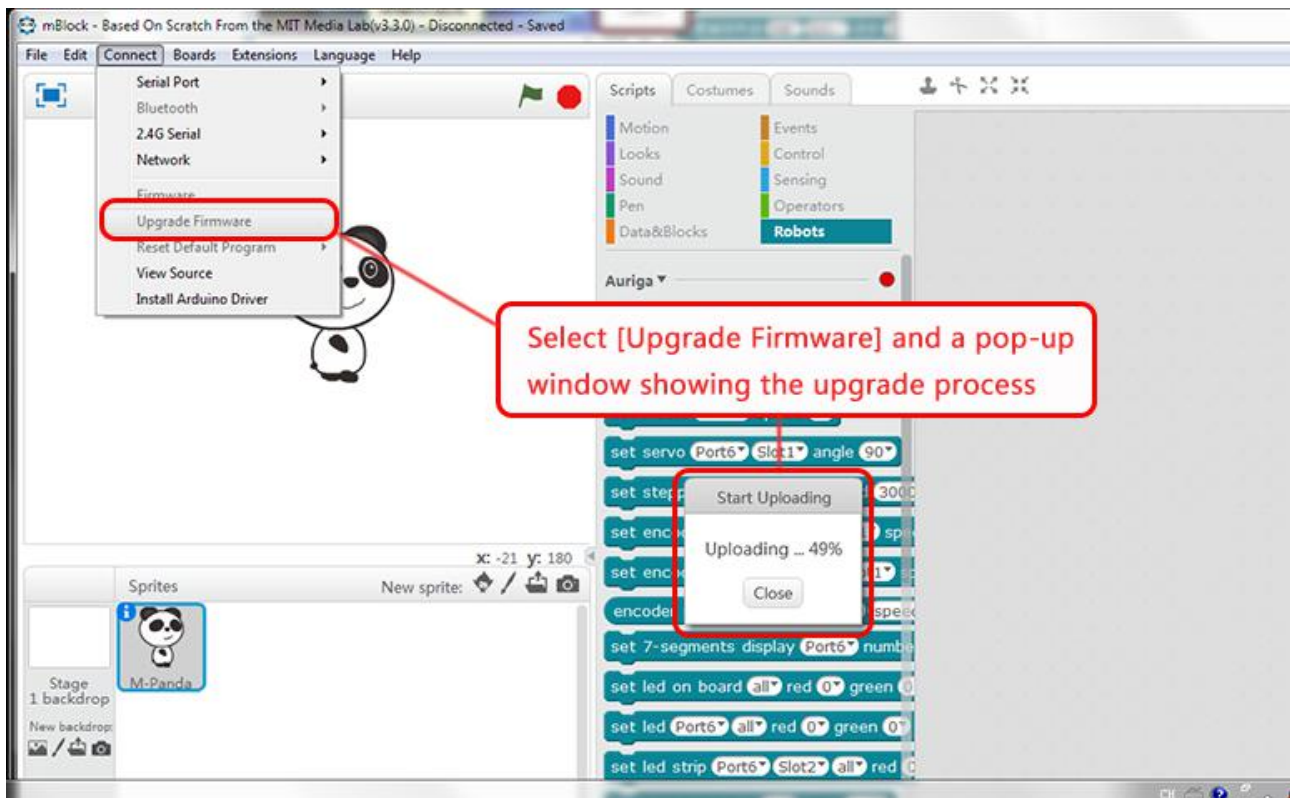




Click [Connect] and [Serial Port], then you'll see the serial number of the device connected to this computer. Then select the latest serial port number.



After selecting serial port, the status indicator will turn green, which means that we have connected Me Auriga with computer successfully.

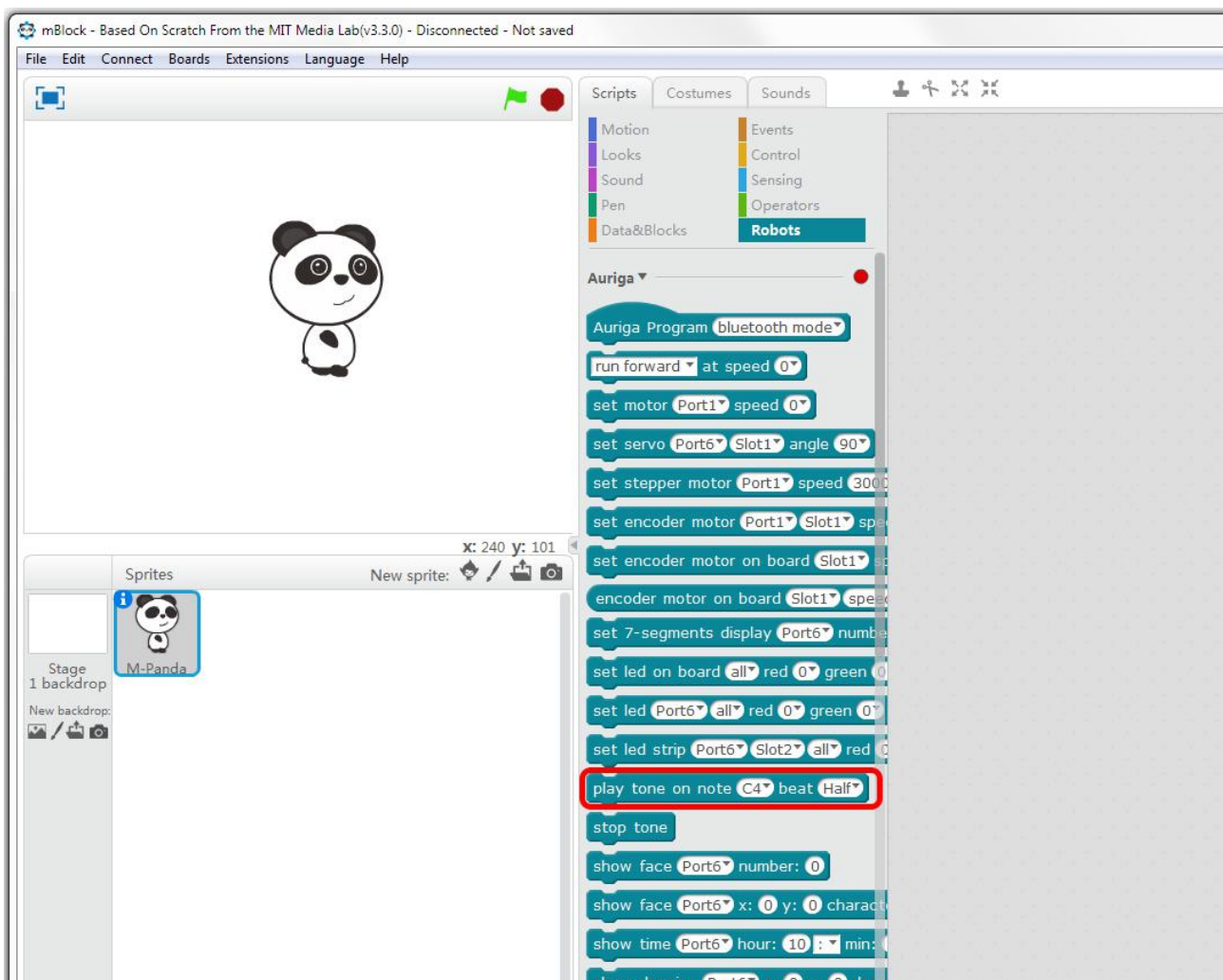
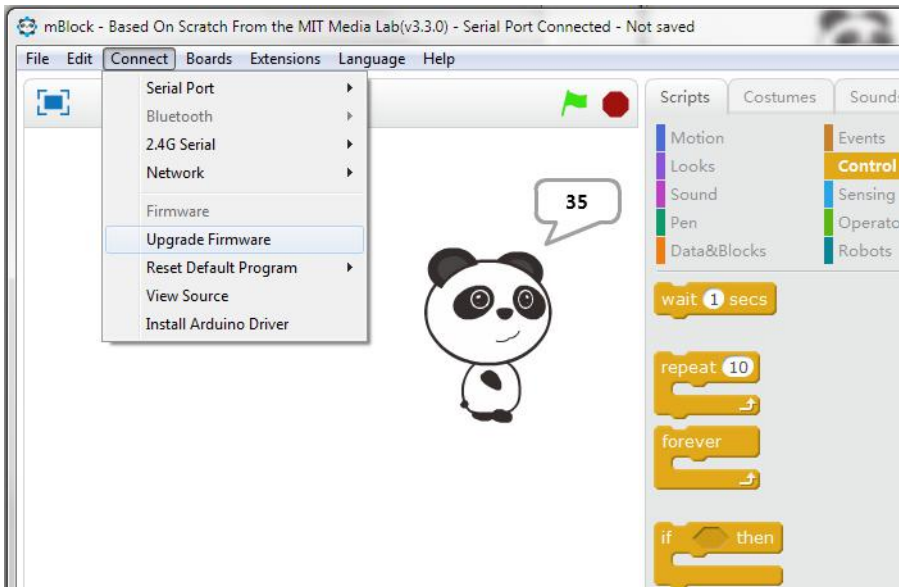


This chapter is mainly introducing how to use the blocks to control Me Auriga, hence we need to write a communication program which enables communication between Me Auriga and computer. Click **[Connect]** and select **[Upgrade Firmware]**, then mBlock will download communication program to Me Auriga automatically.

Check whether we have upgraded firmware for Me Auriga successfully:

Tips

When you already uploaded Arduino program to Me Auriga, make sure to install firmware again if you want to re-connect Me Auriga with mBlock.



Click the block **[play tone on note XX beat XX]** in the Block Types section. If Me Auriga can make a sound, it means that we have built a connection between Me Auriga with computer. Congratulations!

Now, let's move to the next step – write a program for Me Auriga.



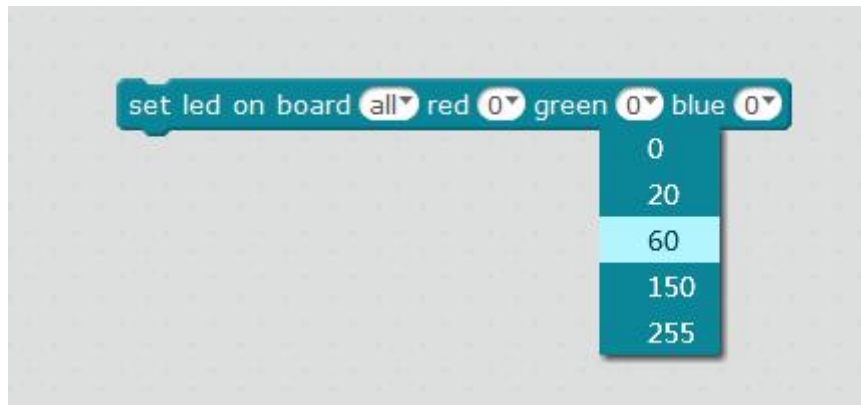
Introduction to RGB LEDs

The 12 RGB LEDs on Me Auriga of mBot Ranger look very beautiful and they are placed in a circle. Each RGB LED can be programmed to control the brightness of three colors (red, green and blue) and combine these three colors to produce various colors of light.

Now, let's learn how to control RGB LED with blocks:

	RGB LED block
<p>[All]: the number of RGB LEDs. The default value of this tab is “all”. When we select “onboard” and “all”, it means that we can control all 12 RGB LEDs on Me Auriga. When we select “onboard” and “2”, it means that we can control the 2nd RGB LED on Me Auriga.</p> <p>[0]: control the brightness of red, green and blue with a range from 0 to 255. “0” means no output, and LED is turned off; “255” means the maximum output, and LED is turned fully on.</p>	

The white oval box in the blocks is the place where we can change functions of each block. If we click the inverted triangle in the white oval box, there will be a drop-down list which allows you select a value for this block. We can also input a value through keyboard directly.



1. Drop-down List: select the values set by the system
2. Input a value through keyboard: click the white oval box and input a value (range: 0~255) through keyboard



Please set values for these three colors to create various colors of light.

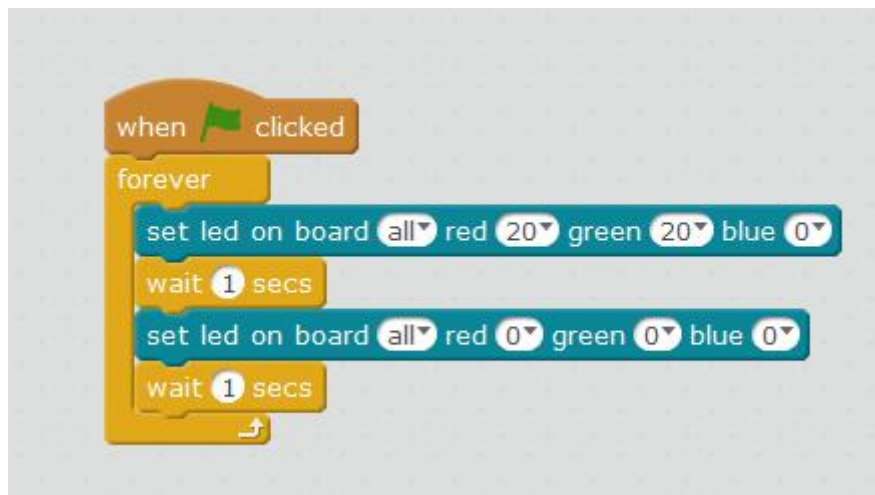
Can you figure out the color of the RGB LED if we set the block like this?



All we need to do is drag this block to Script Area and set values for “red”, “green” and “blue” respectively. Click this block, and the RGB LED on Me Auriga will show the color you just set. How amazing it is!

If we keep implementing this command, the color of RGB LEDs on Me Auriga will change very fast and we won't be able to see the change of each RGB LEDs very clearly. At this point, we can add a **[wait...seconds]** block in this series of block.

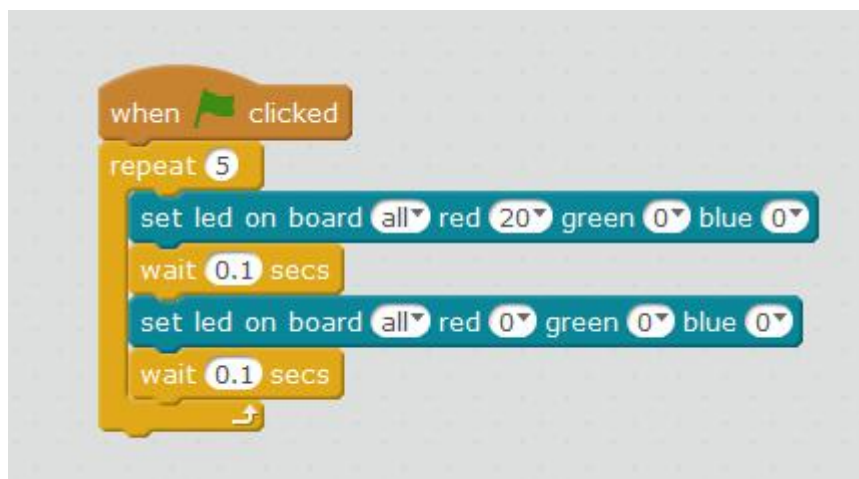
	Wait...seconds
A block that lets your RGB LEDs “wait”... seconds.	
The RGB LEDs on Me Auriga will not show any color during this time. The RGB LED will not implement next command.	



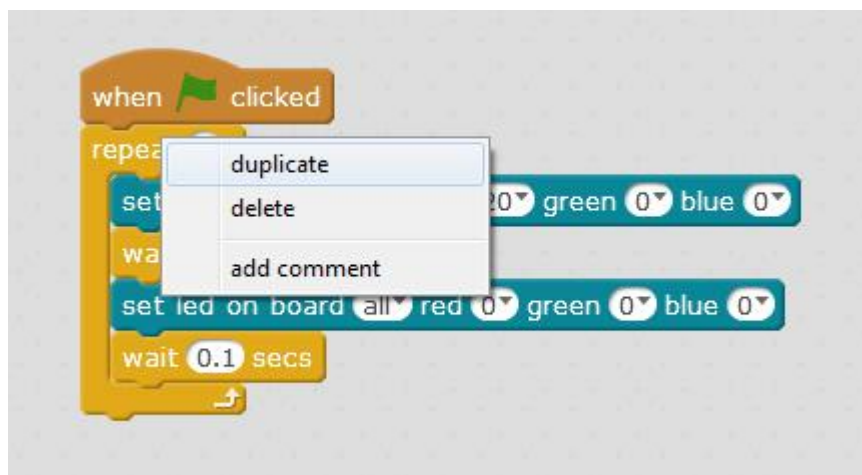
Set the program as above and then we will be able control the RGB LED successfully.

Task 2 - Here is an additional task.

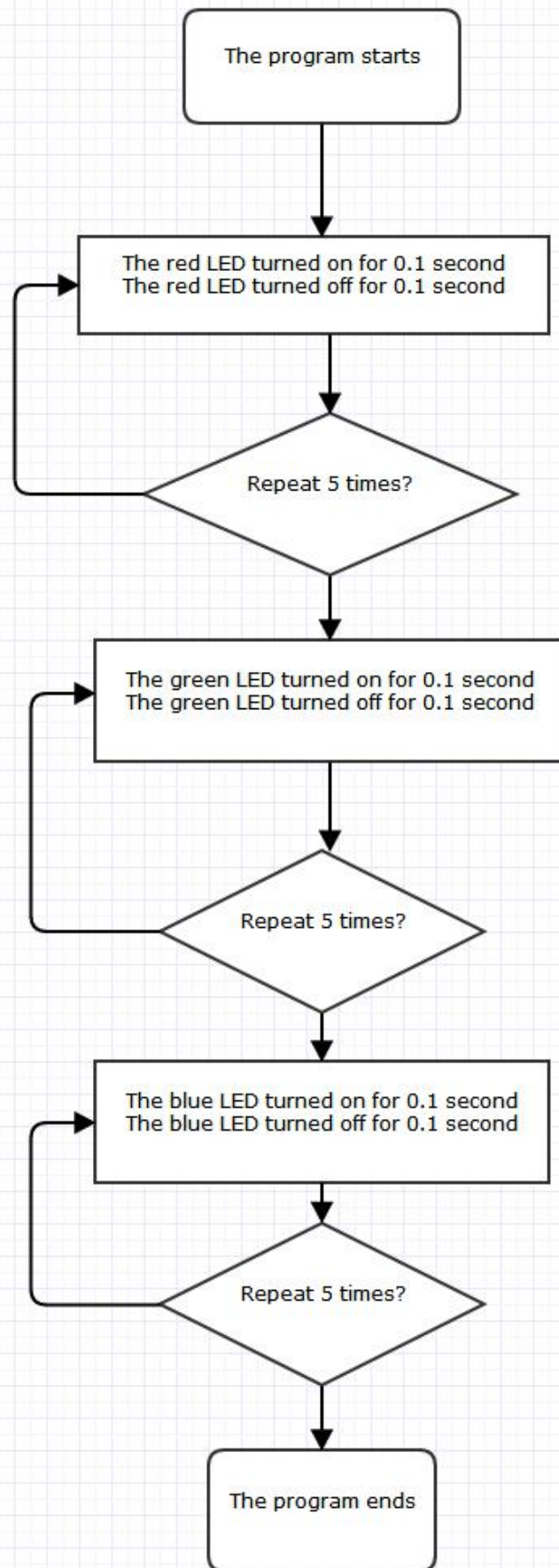
Use [Repeat...Times] command to control the RGB LEDs and let them flash 5 times.



Right-click and select “duplicate” to copy this series of blocks.




Revise the program to make the red LED flash 5 times, green LED flash 5 times, and blue LED lights flash 5 times.



Then the program should be set as follows:

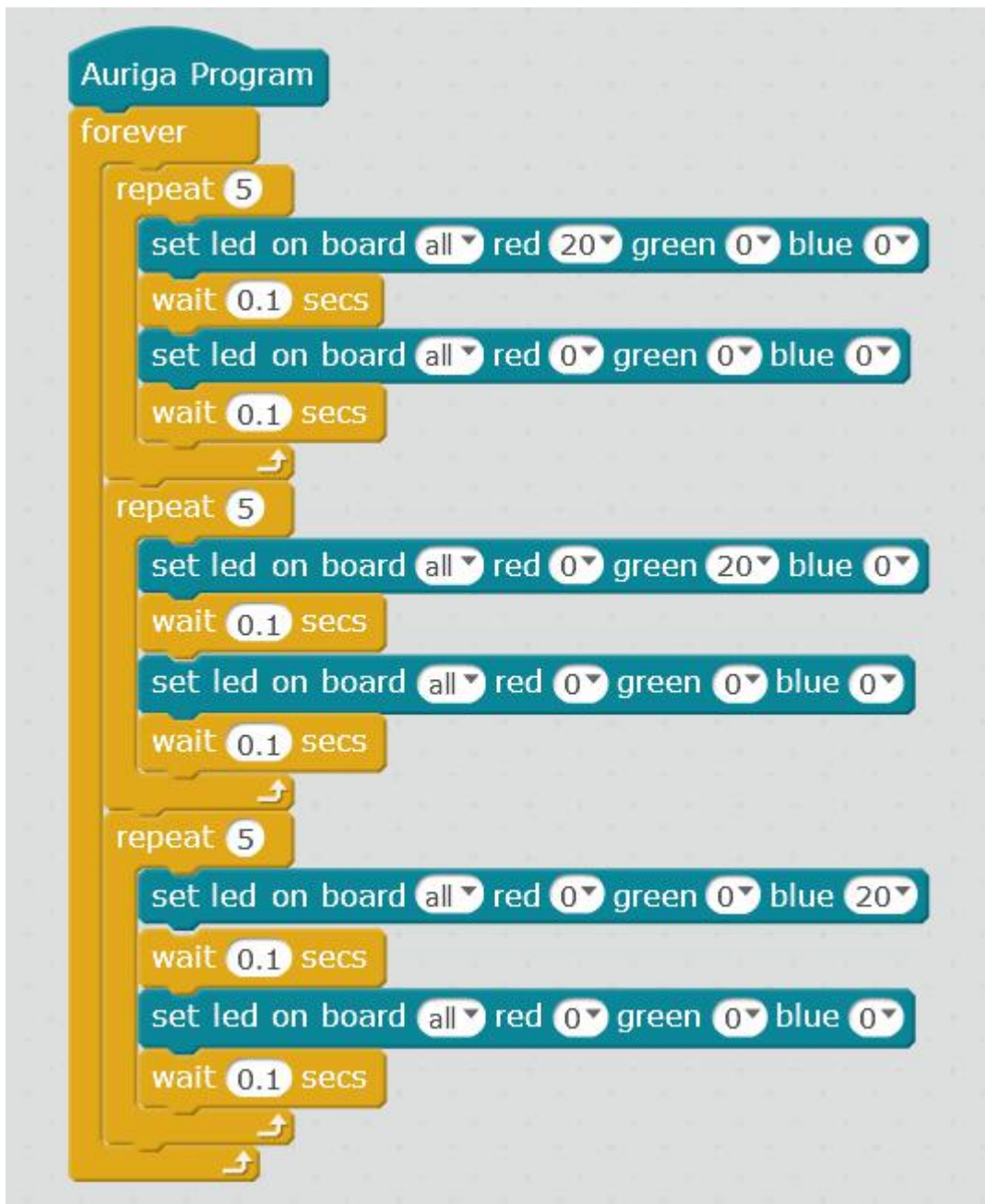


Task 3 - Control Me Auriga Without Computer (Offline Control Mode)

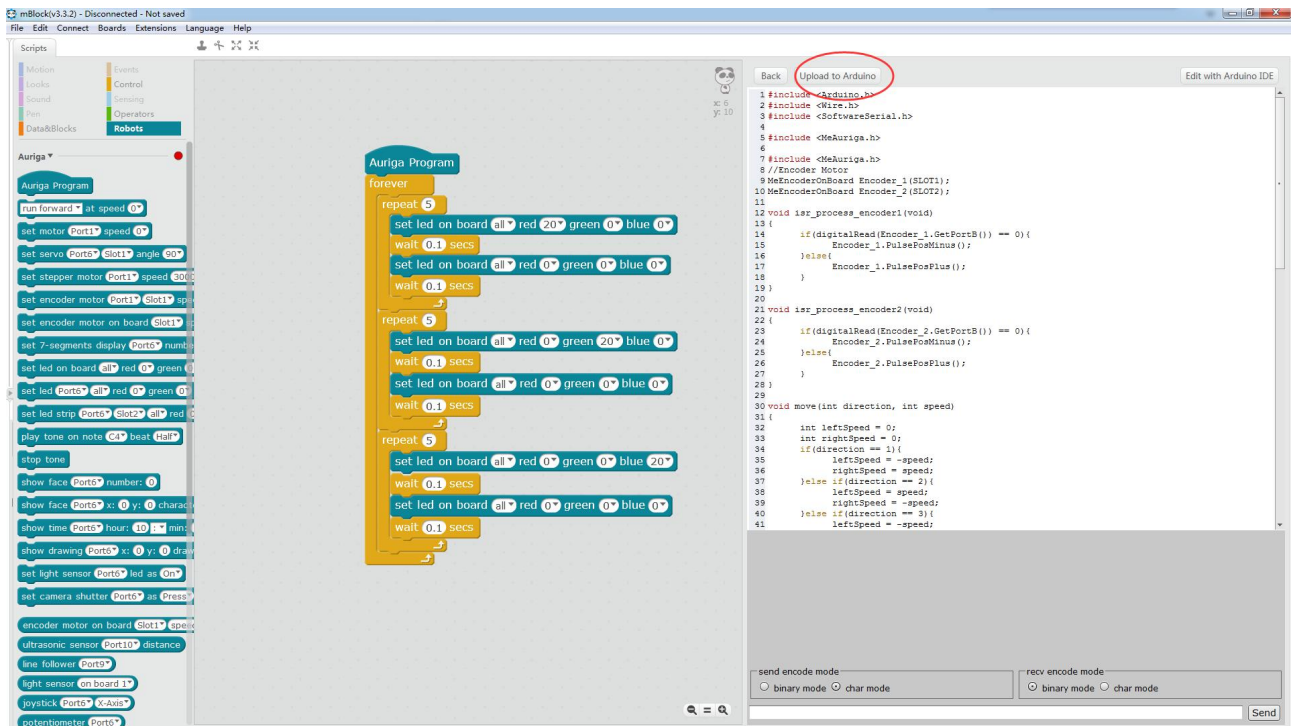
	Ranger Main Program
<p>Download program to Ranger. This program will be saved on Me Auriga. When we start Me Auriga, Ranger will implement this program.</p>	



Replace the hat block with [Ranger Main Program] block, as shown below:



When we click the block , mBlock will show as below:



We need to confirm:

1. Ranger is connected to computer via USB
2. Ranger is powered on.
3. Make sure to select correct serial port [COM XX] in the drop-down list
4. Check if the title bar shows “Connected” and the status indicator turns green.

mBlock will transfer the whole program into Arduino C language automatically, as show in the picture above. At this time, click “Upload to Arduino” button (marked in the red circle), then mBlock will compile the program and upload it onto Ranger.

Please check whether your Ranger can implement this program automatically. Even if we power off and restarts Ranger, it will still implement your program. This is the whole process of offline control. Ranger can implement program independently without connection with computer or tablets.

Control Mode	Device	Method	Ranger
Online control	PC, tablet, or mobile phone	USB Bluetooth (wireless) 2.4G (wireless)	Use specific firmware to receive commands (program) from computer, tablet or mobile phone
Offline control	/	/	Compile and download the program directly

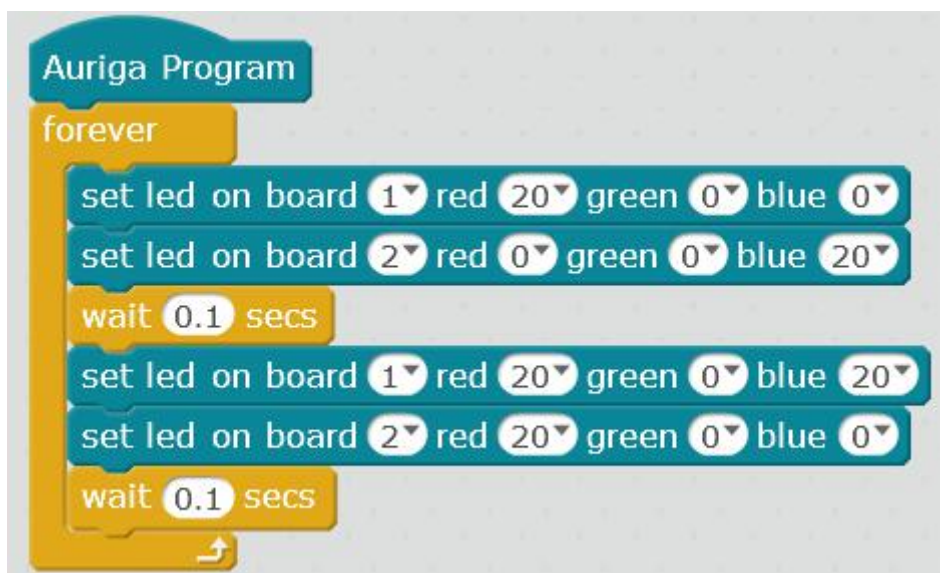
Challenging Task

Challenging Task 1 - Control RGB LEDs at Different Locations

1. Can you turn on or off the RGB LEDs at different location? You can control them by selecting corresponding number as shown below:



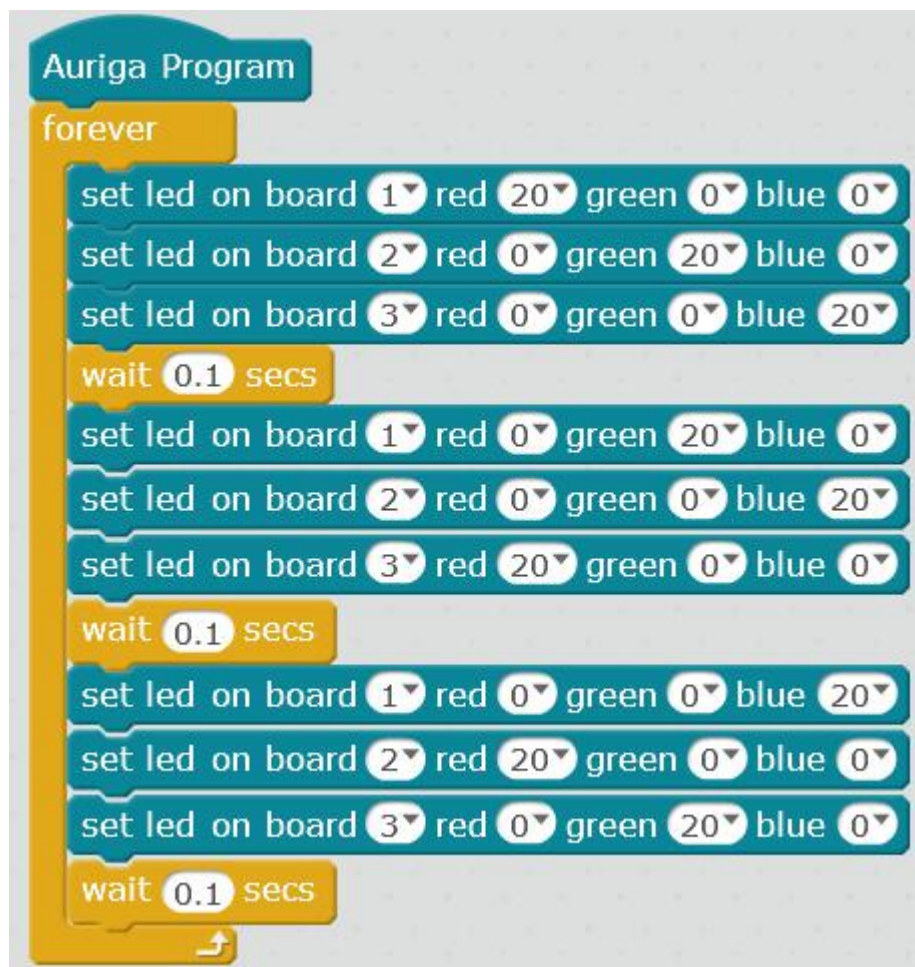
Reference:



Challenging Task 2 - Design Your Own Light Show

Think how to perform your light show by controlling RGB LEDs

Reference:



Conclusion of this chapter

This chapter mainly introduce how to control Me Auriga through blocks. Do you feel more powerful in controlling the robot?

Robots will help human do dull and boring jobs sooner or later. Can you name a job that can be done by a robot?



Rex, an assistant robot of Mark, rushed into the hall, stopped in front of Mark and said, “The message (code: AD20250627) has been analyzed successfully. The result of the analysis is that there are 30 groups of Auriga distributed in Eurasia area receiving the electromagnetic wave signals sent from Mars, which is sixty-two million kilometers away from the earth. The analysis sample is the different arrival time of the signals.” in a synthetic voice.