xArm User Manual

Warming tips

1.When the robotic arm moves, please keep your fingers away from the range of motion, prevent from getting hurt. If it operates normally, disconnect the power firstly.

2. Please remember to tun off the switch if there is something wrong with servo and examine whether the servo wire loose or not.

3. Please don't forcibly twist the joint when the robotic arm is powered on so that it will not cause any joint damage.

4. Robotic arm's servo that we used is a high-precision device and also a consumable so that it needs to be replaced after a long time use.

5. The heat of servo will raise if the robotic arm keeps running for a long time. You should make the robotic arm take a rest until it totally cool down so that it can keep on running. Please remember to turn off the switch while you are not using it.

6. In the case of power-on, do not forcefully pull on each joint. If you need to adjust, please connect the USB and click on the motor in the software to power off.

7. When connecting to Bluetooth, connect directly in the APP. Do not connect in the phone settings.

8. If you do not use the robot arm for a long time, be sure to close the control board switch and disconnect the battery connector to prevent the battery from being damaged.

9. If the xArm emits a " DiDiDi" sound during use, that is the low-voltage alarm circuit in the circuit starts working, please check if the power adapter is properly powered.

10. If you find other control methods are normal during use, but the handle and mouse control does not respond, please re-plug. The signal interface or data head on the servo control board jack.

11. If you connect the MCU outside, please refer to the secondary development communication protocol and communication program included with our data, and strictly abide by the need to perform it (this function is only applicable to customers with sufficient programming basis and function)

12. If you still have any questions, please feel free to contact us at support@lewansoul.com.

Catalog

1 Introduction

1.1 Product introduction

xArm is a programmable mechanical arm with feedback, it contains six high-life serial servos. Each servo can display temperature, position, voltage. Servo with RGB indicator. Observe the working status of the servo. Unique link structure design and oxidation blasting surface treatment make its body more beautiful and cool.It supports computer programming control, mobile phone and joystick control, and can also be manually programmed offline. The tutorial and development materials are very detailed. I believe this xArm can bring you a lot of knowledge and fun.

We have prepared a second development kit, which contains more than a dozen electronic modules and structural components. For details, refer to Chapter 6.

The robot not only provides The opportunity for hands-on assembly is even more a robot for learning programming. This robot has many advantages from design to workmanship and development. Its unique design, excellent workmanship, and after several updates and optimization, it can complete multiple tasks and develop gameplay, and more gameplay are waiting for you to discover.

Hope that xArm can be a good partner in your study and life!

1.2 Features

A Powerful power: Using serial bus servo LX-15D as a power source for robotic arms. Full metal gear, high precision imported potentiometer. Torsional force, precise angle. Servo support angle read back, voltage feedback, temperature feedback, alarm indicator and servo protecting .

B Powerful master control system: Robotic controller uses ARM core CPU, built-in Bluetooth module and 16M Storage memory, single action group can hold 510 actions. Better experience programming fun.

C Simple wiring scheme: Direct connection 7.5V DC power adapter, no need for any voltage regulator module. The handle receiver uses terminal design, plug and play, so greatly reduces the difficulty of wiring and saves time.

D Suction cup design: Using the vacuum chuck, the robot arm can be stably fixed on the table to prevent the robot arm from slipping due to movement.

E Various programming methods and control methods:Support mobile programming, computer programming and offline manual programming and support mouse, mobile phone, handle, computer control.

F Extensive development: Support for secondary development of Scratch/Arduino, providing rich tutorials

2 Main assembly

2.1 Product list

Full metal structure bracket	1pc
USB cable	1pc
Power adapter	1pc
handle receiver	1pc
PS2 wireless handle	1pc
serial bus servo controller	1pc
LX-15D serial bus servo	5pcs

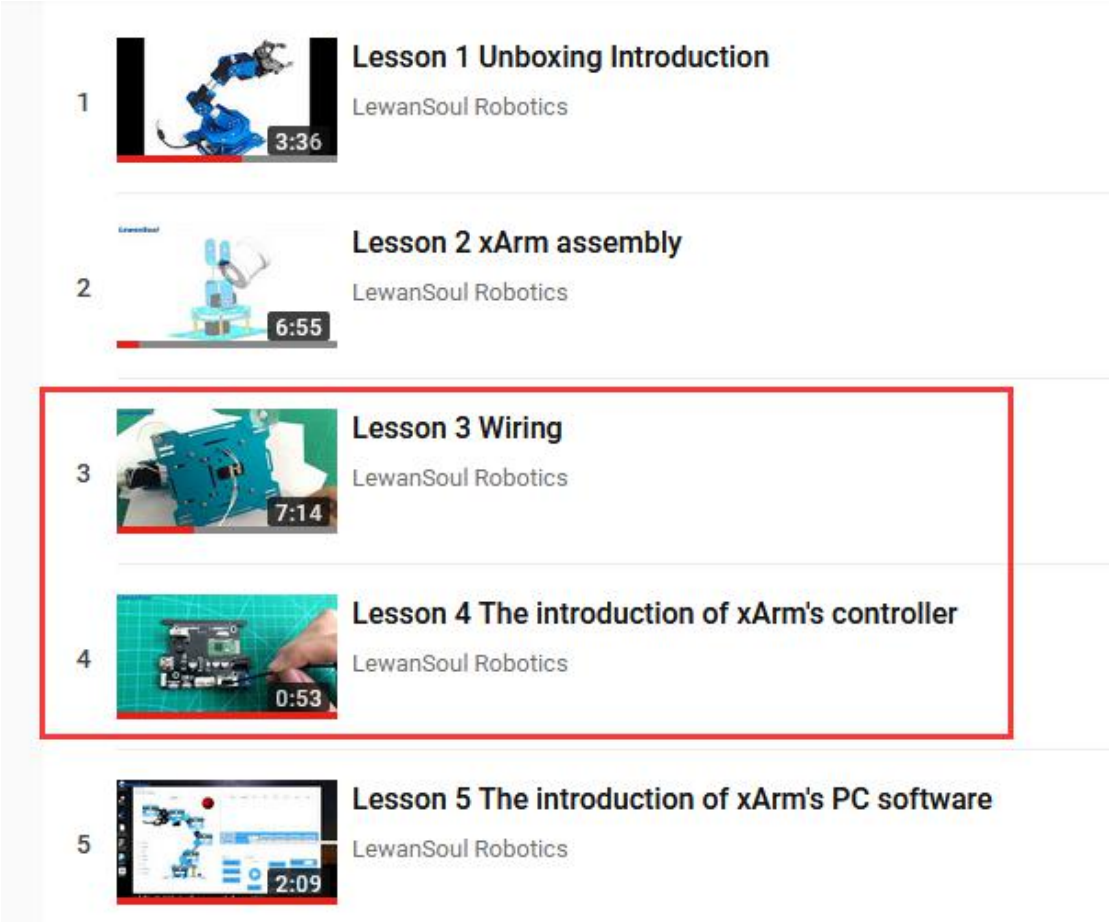
2.2 Product parameters (Scratch/Arduino)

Weight	About 1100g
Programming method	Scratch, Arduino
Bluetooth module	Support
Package Dimensions	185*170*430mm
Input	Ultrasonic sensor module, touch button module, infrared module,sound sensor, Line-tracking sensor, potentiometer module
Output	Digital tube module, LED lattice module, RGB LED module, Mechanical arm
Offline mode	Bluetooth module
Microprocessor	Arduino UNO
Power supply	Input:AC100-240V-50/60Hz Output:DC 7.5V

2.2 Assembly and wiring

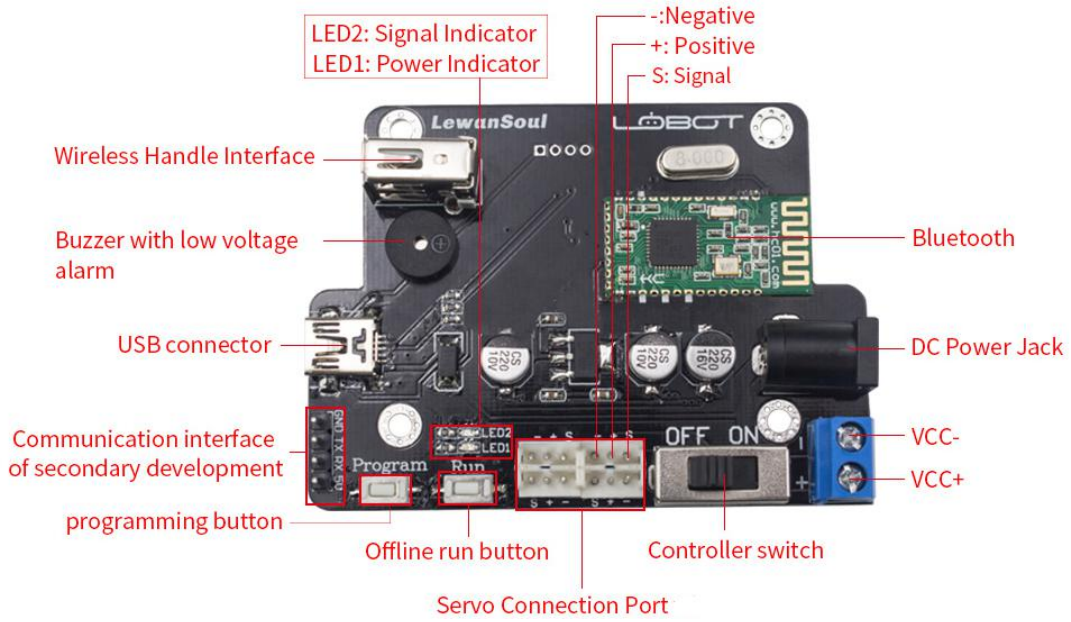
(1) We provide detailed 3D animation to show you how to assemble and wiring the robotic arm, please refer to the link and QR code.

Link	QR code
http://bit.ly/2L6ys8a Lesson 2 xArm assembly	
http://bit.ly/2slbzXx Lesson 3 Wiring	



3 Serial servo controller and servo

3.1 Serial servo controller



Wireless handle interface: Connect handle receiver.

Buzzer with low voltage alarm: Low voltage alarm has prompt function, if the power supply is below 5V, the servo controller will make sound of beep(DIDI), please replace the battery or charge the battery in time.

USB connector: Connect xArm with computer.

Communication interface of secondary development:Support secondary development (It can directly connect to some SCM like Arduino and Raspberry Pi.)

Offline run button: The robot runs action group automatically;

1. Download action files that need to be run offline to No.100 action group
2. Press the flexible button on the controller
3. Press once to offline run button once; press and hold for 3 seconds (until the blue light flashes) and it will run all the time.
4. Restart the controller to remove the cycle run.

Servo connection port: Connect bus servo;

Controller switch: Control the power on the controller;

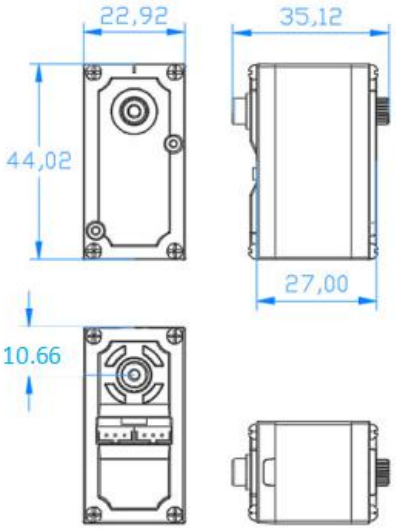
DC power jack: Connect power adapter;

Bluetooth: Matching on mobile phone's Bluetooth;

LED power indicator: Marked the work status of controller. The light keeps red, which means the controller power supply in a normal state.

LED signal indicator: Turn on switch and light showing green. But when a signal is sent, the light will start to flash until the action group is done.

3.2 Serial bus servo



Servo LX-15D(Essential parameter)

Product name: LX-15D Serial Bus Intelligent Servo
Product weight: 43.3g
Product size: 44.02mm*22.92mm*27.00mm
Rotation speed: 0.18sec/60degree(4.8v)
0.15sec/60degree(6v)
Servo accuracy: 0.24degree
Corner range: 0-240degree(deviation30 degree)
Stall torque: 15kg.cm(6v) 17kg.cm(7.4v)
Servo ID: 0-253(user settings)
Storage: Power down and save user settings
Work voltage:5-8.4V
Length of wire:10cm, other
Feedback features: Support
Control style: Serial
Communication baud rate: 115200
Motor type: Carbon (310:1)
Gear type: Metal
Parameter feedback: Temperature, Voltage, Position

4 Install

4.1 xArm PC software

Here is the link and QR code of xArm PC software:

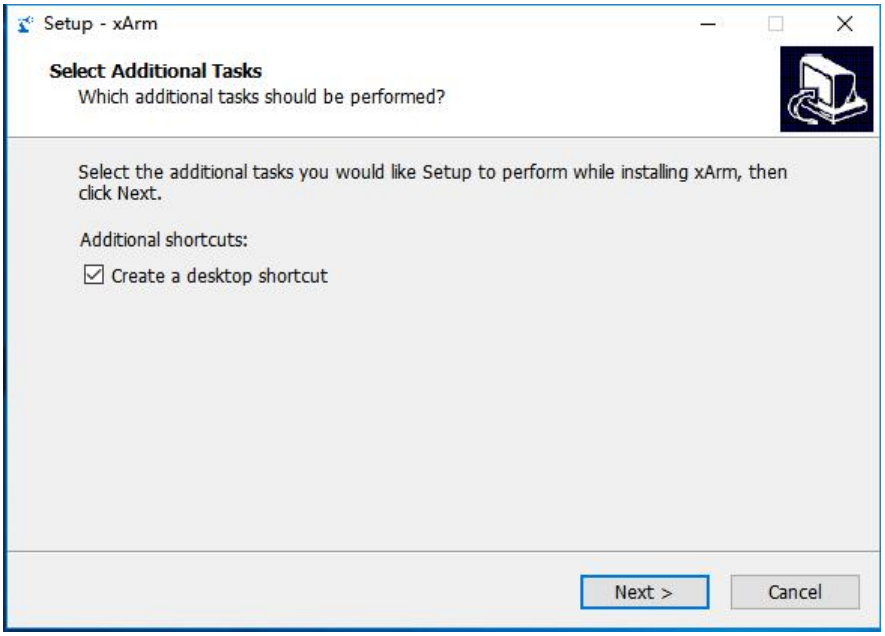
link	QR code
http://bit.ly/2BY4u6h	

Open the website link or scan the QR code. Select " xArm setup V2.2" to download.

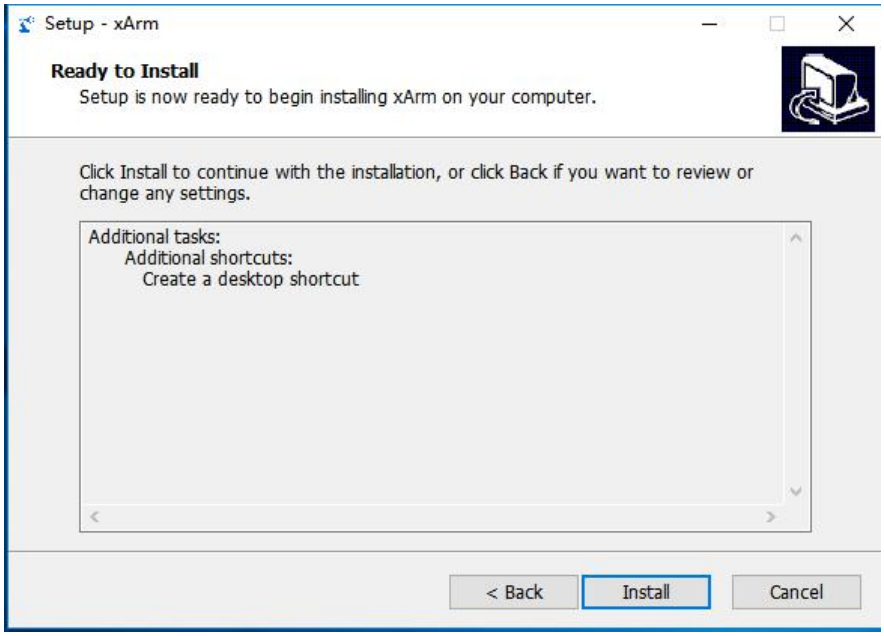
(1) Please open the Installation package and download it on your computer.

PC software

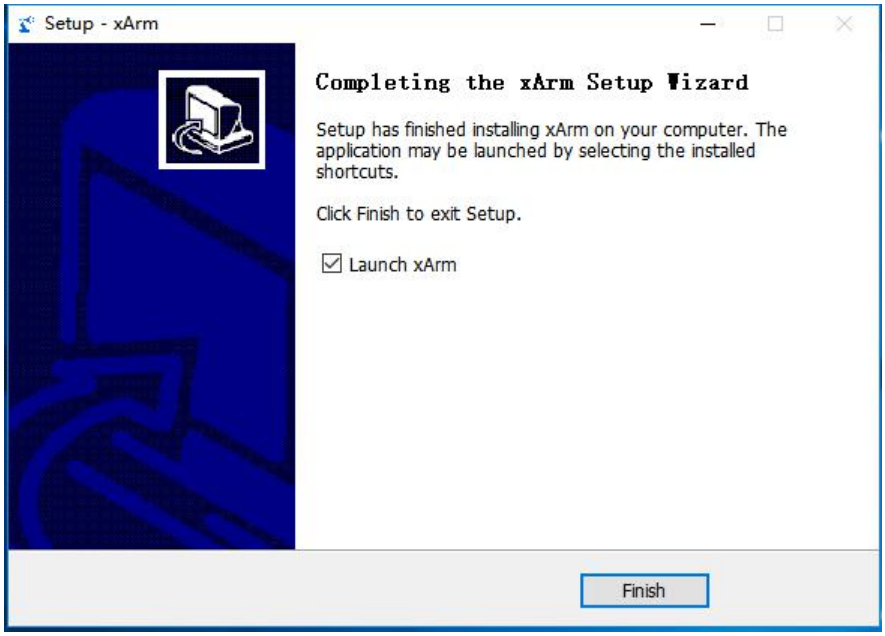
(2) Installation steps



To select the " Create a desktop shortcut" and click " Next" to continue.



The installer now prepare to install xArm into your computer click install to " Next" with this installer, you want to review or change the settings, please click " Back".



The xArm installation wizard finishes.

The installer has installed xArm into your computer, this application can be run by selecting the installed shortcut.

Click " Finish" exit the installer.

4.2 Mobile phone APP

Here are the link and QR code concerning mobile phone app of xArm:

Types	Android System	iOS System
Link	http://bit.ly/2Fvg3jr	https://apple.co/2Cv7ovh
QR code		

(1) Please open the Installation package and download it on your mobile phone.

Mobile App

xArm V1.6.apk

(2) After successful installation, you will see this icon on your mobile phone.

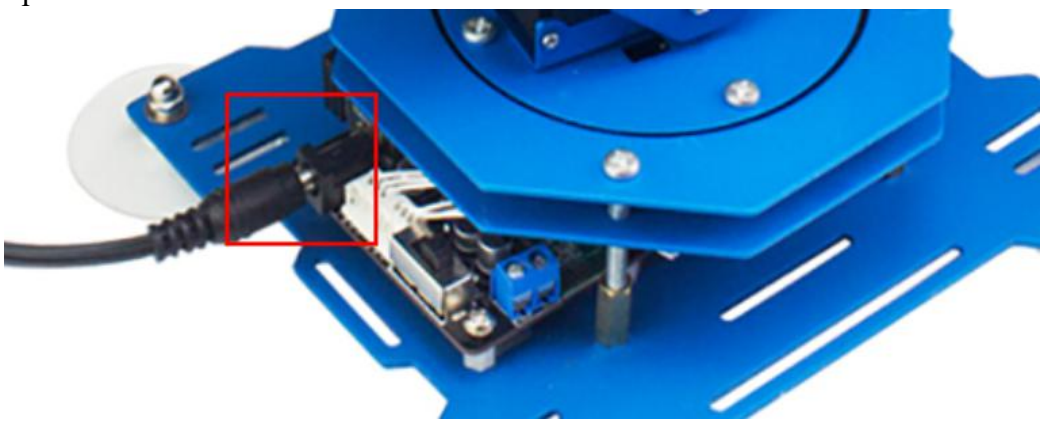
5 Control methods and Programming

5.1 Computer control (Computer programming)

Open the PC software, you can see the page like this. “ Normal mode” and “ Servo Test”.

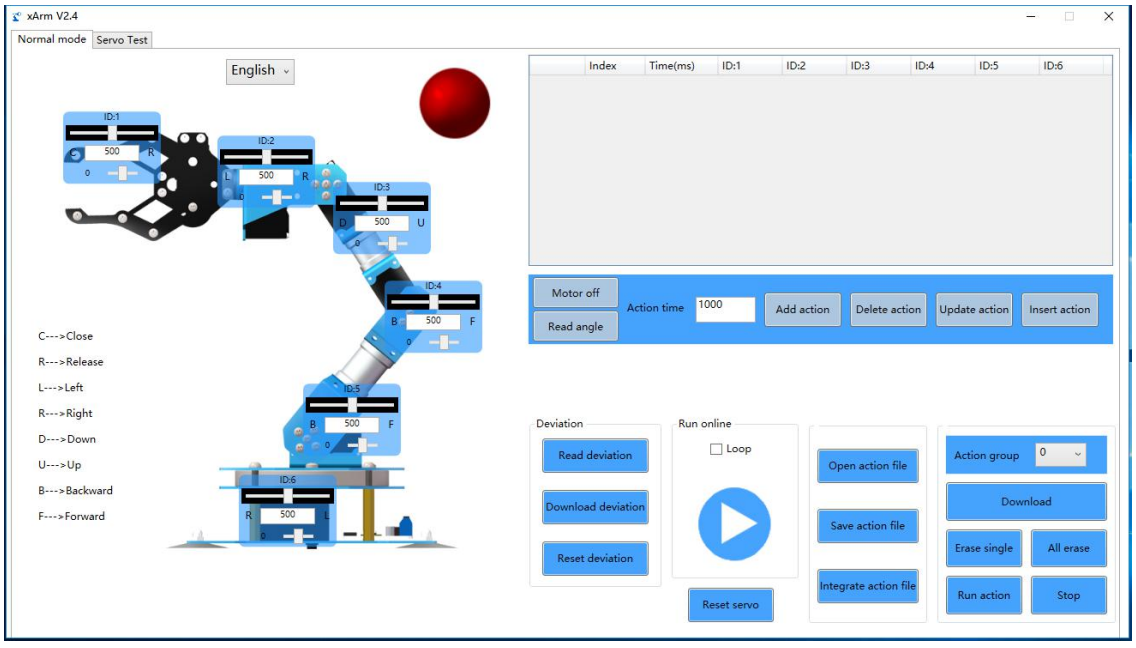
USB cable to connect the computer

Adapter to connect socket



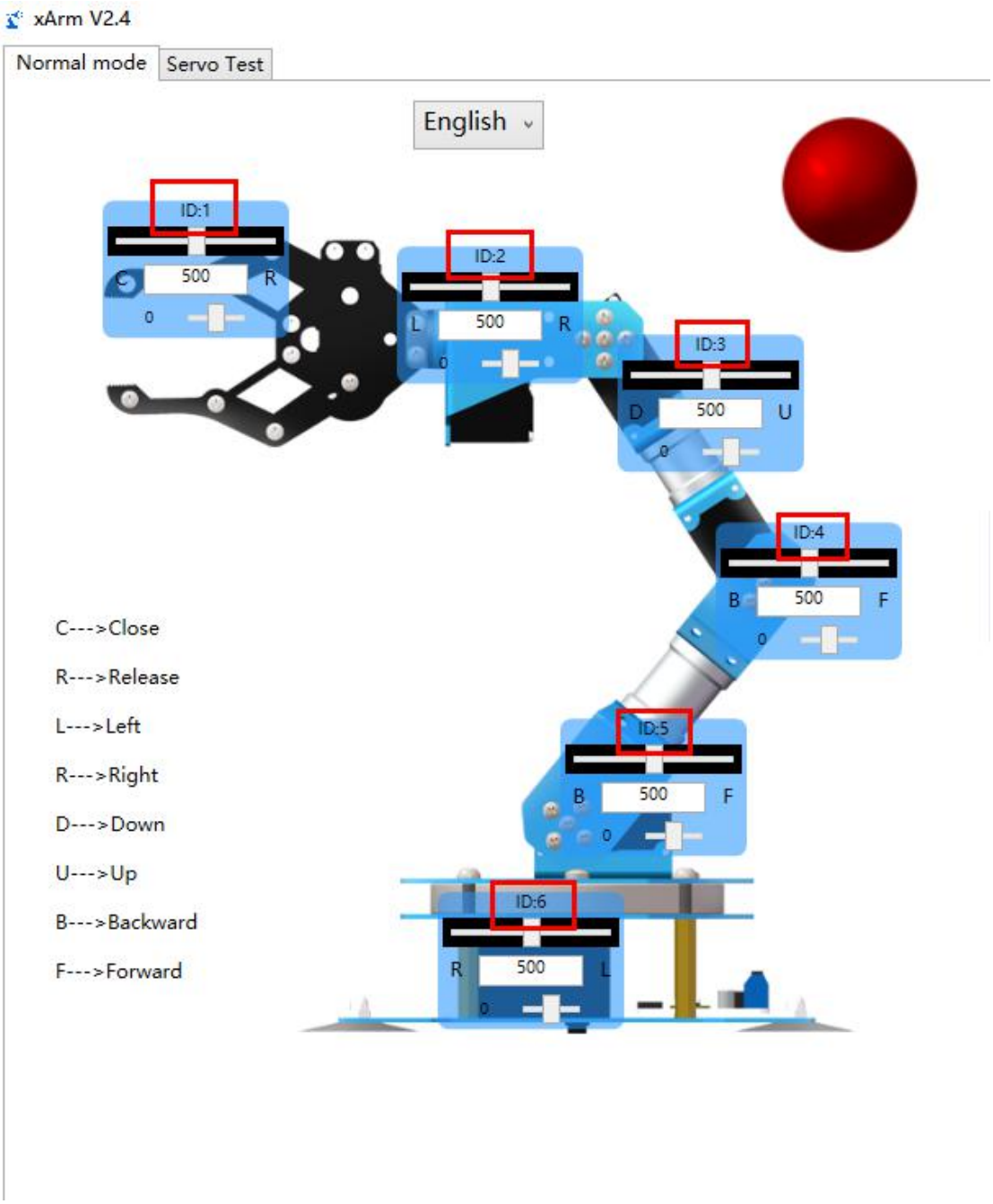
5.1.1 Normal mode

Here is the interface of PC software:



The introduction of servo

xArm has 6 servos, the order of the servos by number from up to bottom: ID:1, ID:2, ID:3, ID:4, ID:5, ID:6. When connect successfully, we can drag the slider to change the position of the robotic arm.The range of servo 1 is 0-1000.



Action group

Select the action group number, range 0~230.
For example, selected action group number is 10 , click download button , then the No.10 action group will be download to controller. When you add action group number is 10 on you phone APP, it will run the No.10 action group

The edited action group is downloaded to the controller and the controller will save the action group information.

After selecting the action group number, click this button and the corresponding action group information in the controller can be deleted.

Erase all action group in controller.
Tips: Be careful! Click this button and all group actions on you control will be erased.

Press this button to let the controller run the corresponding numbered action group

Stop action group operation.

Deviation

Display the deviation in the controller
Tips: xArm needs to adjust the deviation of the servo. It is because of the existence of the position value and the deviation value, so the actual position of the servo should be the position + deviation.

When the deviation of each servo is adjusted, click it and the all deviations will be downloaded to

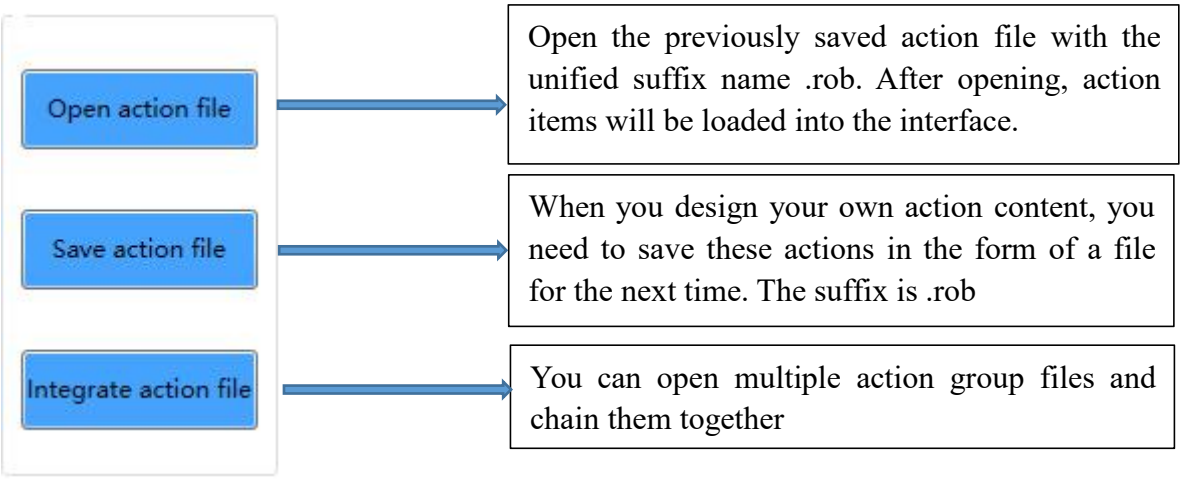
The reset deviation will not change the deviation parameter in the controller, only the deviation parameter in the reset interface is 0 when you click again to read the deviation. The actual deviation in the controller will be displayed again in the interface.

Run online

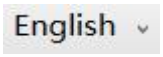
When you connect xArm and add a series of actions, you need to test your actions consistently, you can click this button to test, check the loop can always cycle your edited action.

The servo parameter is 1500. Back to middle position.

Action file



(1) Language



The software automatically recognizes languages(According to the system language), supports Simplified Chinese, Traditional Chinese, and English, and can also be manually switched.

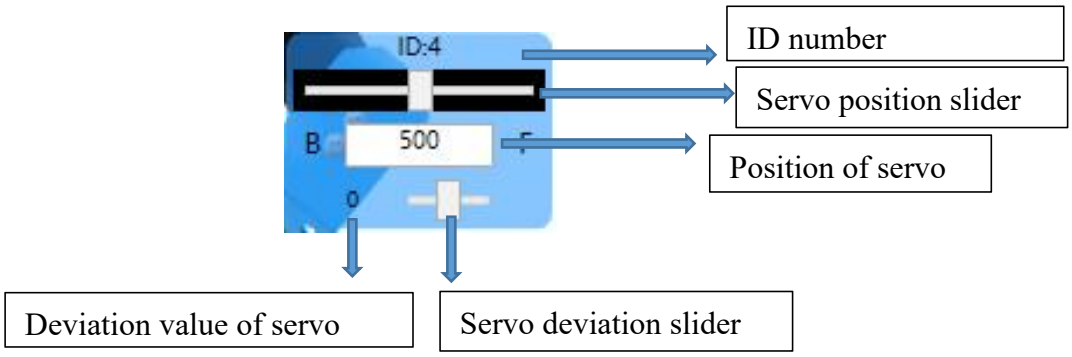
(2) Connection button

you can see a red light. Is it the connection indication.when you connect the PC software to the controller,it will change to green and you can begin your programming.

No connection
or connection failed

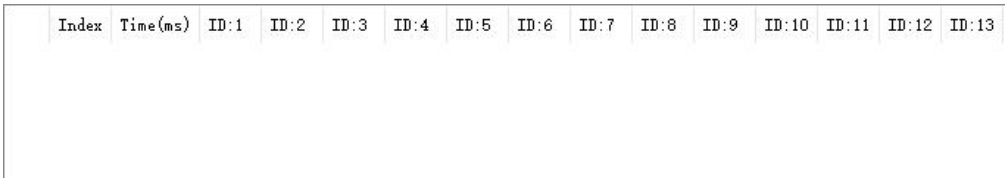
Connected

(3) Servo slider



Note: The servo slider can be dragged freely, with a range of 0-1000, the range of deviation is -125-125.

(4) Action adjustment

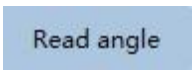


Index: Action sequence number

Time(ms): The longer the required running time, the slower the action.

The time for the action group to run. The longer the time, the slower the action(ms). We can adjust action group to run by time.

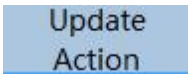
Turn off motor power.



To read the position of servo.

Record servo position value and action time information as an action item.

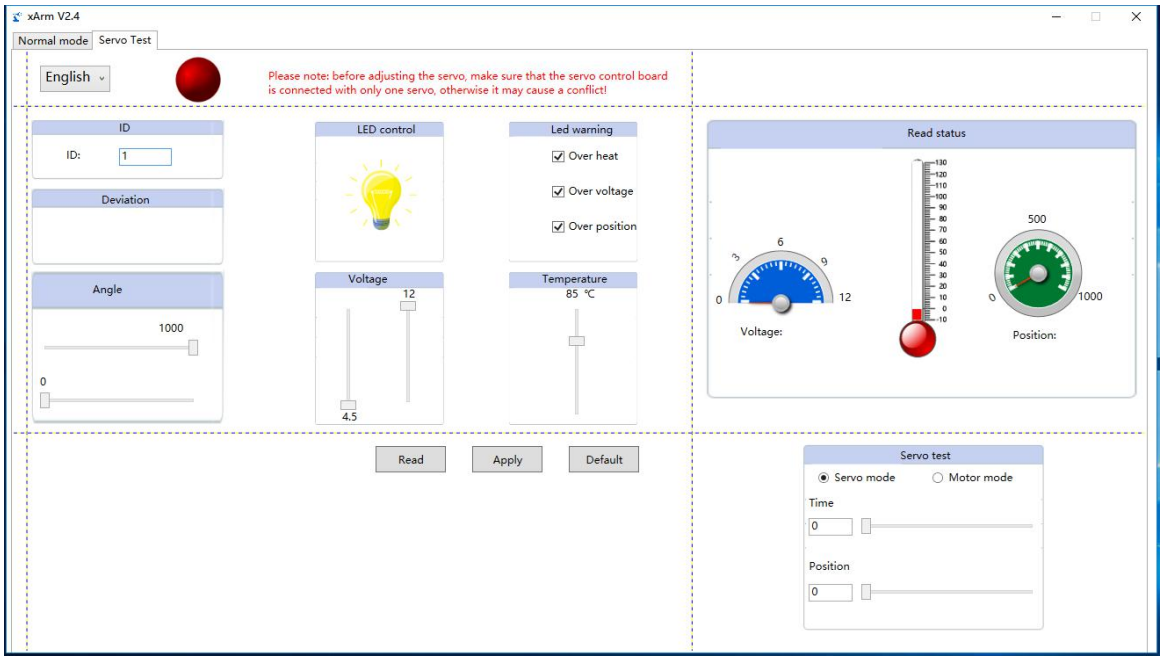
Select an action to delete.



After adjusting the servo value, click this button to update the selected action

Insert an action group action before the selected action group

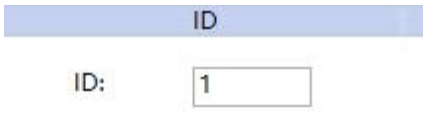
5.1.2 Servo test



Note:

1. Before adjustment the servo, make sure that the servo controller is connected only one servo, otherwise it may cause a conflict.

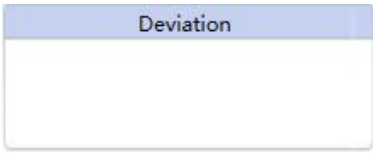
2. If the servo control board is connected with all the servos during adjustment. Then , click “Apply” icon, all the servos being set to the same ID. After it, all the servos are running at the same time, the xArm is not working properly.



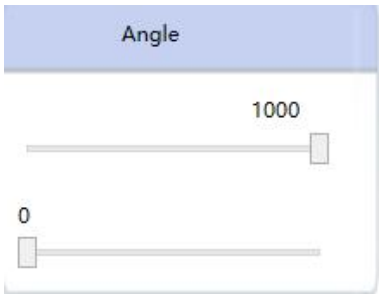
the ID number of servo

(1.Select the servo number being tested)

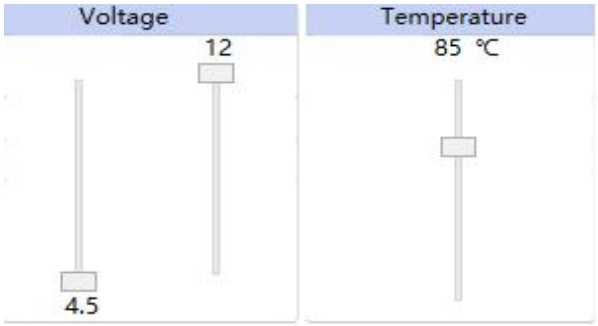
(2.Reset number for the servo)



the deviation of servo



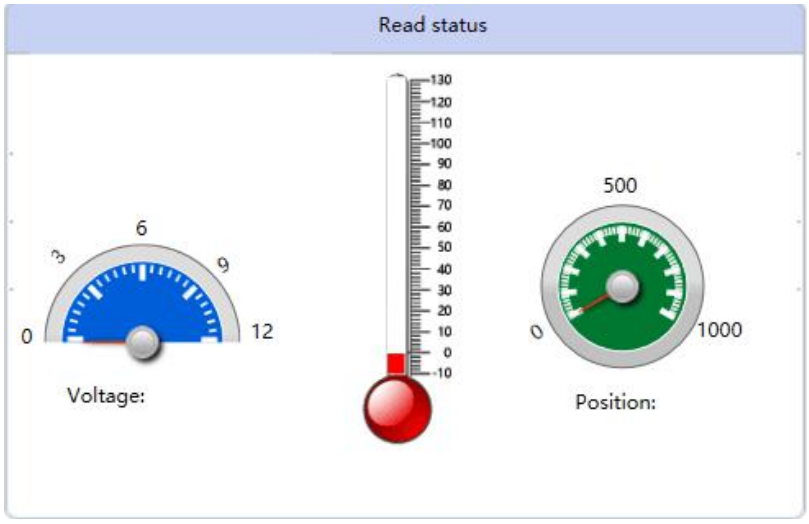
Angle range adjustment (the range is 0-1000)



If you select Led warning, when temperature, voltage or position higher than you set , the LED will flash.

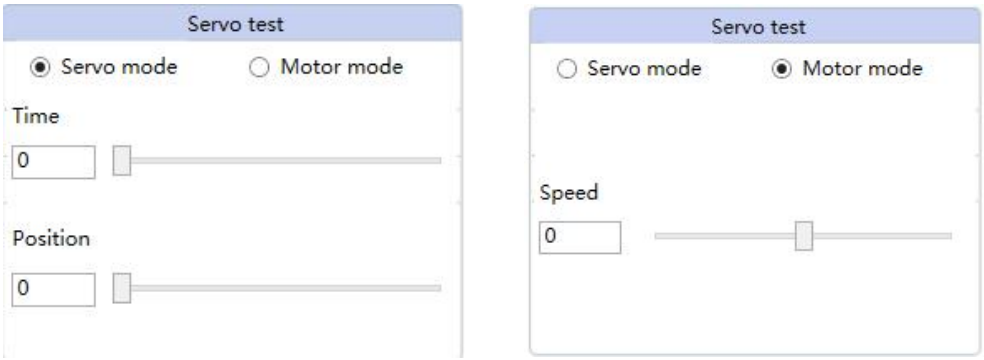
Voltage adjustment (the range is 4.5-12)

Temperature adjustment(the range is 50-100)



“ Read status” will display voltage, temperature, position of servo.

There are two modes: Servo mode and Motor mode.



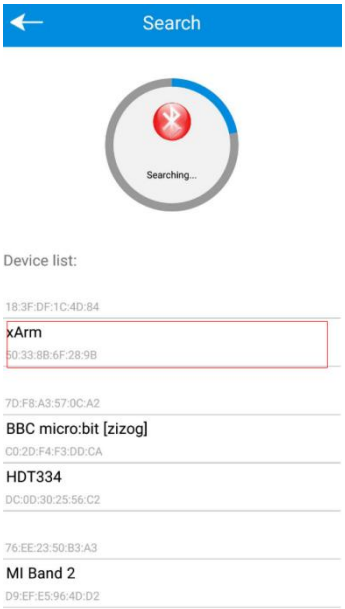
Please select the mode before the test .
There is “Speed adjustment” in the motor mode, the range is -1000 to 1000.
There are “ Time adjustment ”and “ Position adjustment” in the servo mode. The time adjustment range is 0-3000, the position adjustment range is 0-1000.

5.2 Mobile phone App control

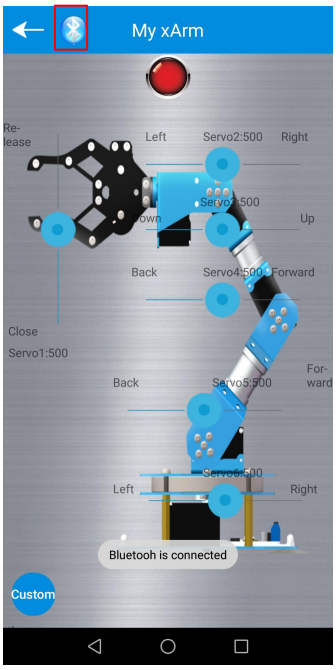
(Take Android as an example)

(1) Open the mobile phone and you will see this page. There are three parts. My xArm, Create and My action.

1. If you click the My xArm , you can connect xArm by Bluetooth. Please connect the power and turn on the power switch. The LED1 is bright. Open mobile phone APP and Bluetooth, search for xArm (Please remember using the bluetooth inside our phone app rather than using the one of the system.)

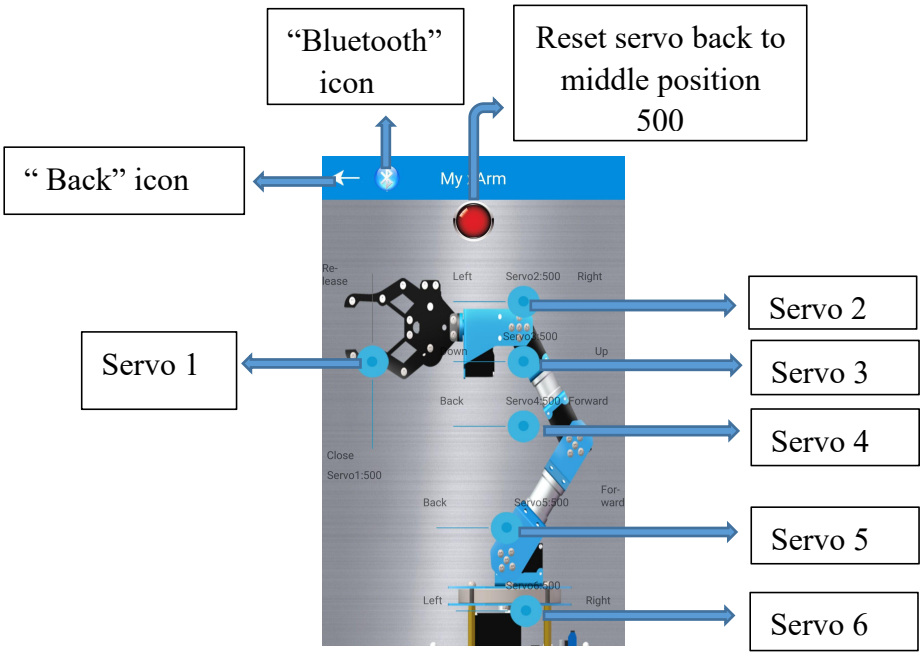


Select xArm and click it , Bluetooth indicator is blue which means the robot connected successfully



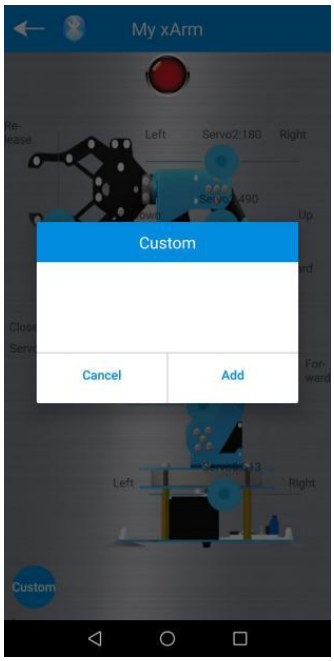
Here is a introduction of the 3 part of the icon:

1. If you click My xArm, it is a mobile programming process. Enter the programming mode, please adjust servos angle and add to the action group. You will see the picture below:

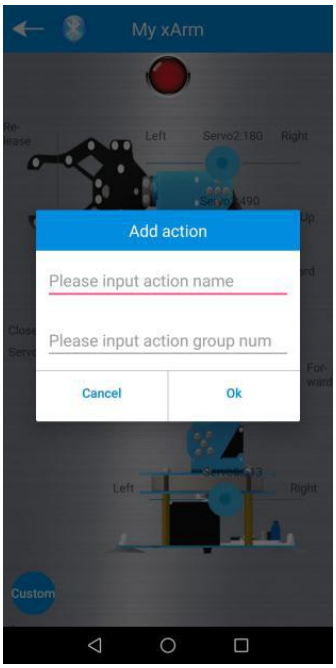


Servo	Instructions
Servo 1	Mechanical paw “Close” and “ Release” (the range is 0-1000)
Servo2	xArm Left and Right rotation(the range is 0-1000)
Servo3	xArm Down and Up movement(the range is 0-1000)
Servo4	xArm Back and Forward movement(the range is 0-1000)
Servo5	xArm Back and Forward movement(the range is 0-1000)
Servo6	xArm Left and Right rotation(the range is 0-1000)

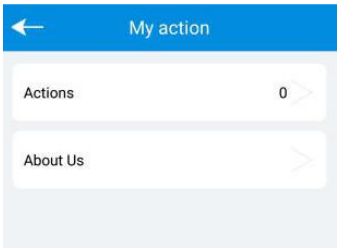
If you click Custom button in the lower left corner, you will see the screen shown below:



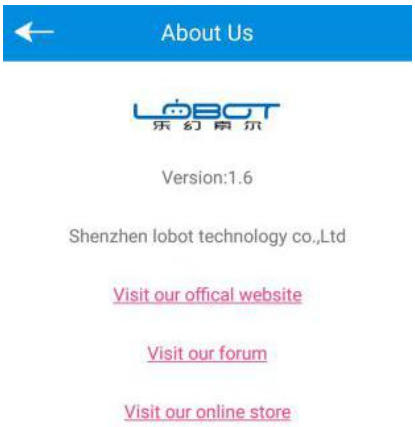
If you select “ Cancel” and back to initial page. But select “ Add”, you can add action group. Input action name and action group number,then to click “ Ok” . You have added action groups. You can add action that you have programmed before into xArm if you click Add, then you can operate it on your xArm.



2. If you click Create button, you will see the screen shown below:



If you click the Actions button, you can store actions you have added.
If you click About us button, it will show the version about the App and some other information, you will see the screen below:

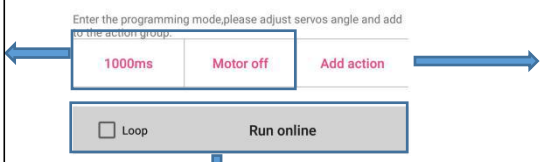


3. If you click My action button, you will see the screen below:

Click it you can download and save the action you have added.

To display action you have added.

Turn off power of motor.
Note: After performing the operation of motor power down, the xArm joint will become loose. Place the arm in a smooth and open place to avoid damage.



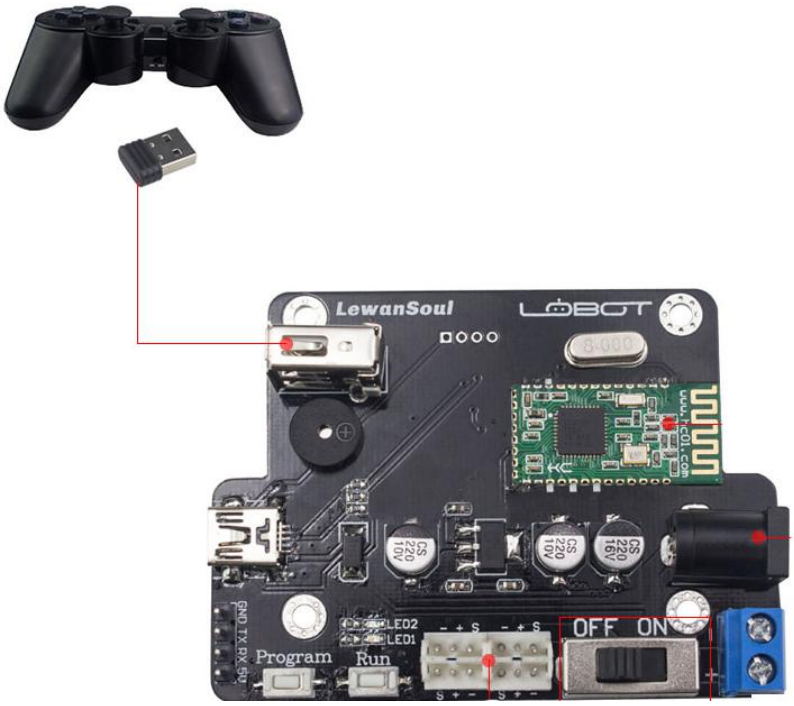
Add to action current operation of the servo.

Loop run the added action group.

5.3 Handle control

5.3.1 How to connect wireless handle

(1) First, connect wireless handle receiver to controller and open the switch on the xArm.



(2) The handle requires 2 AA batteries(self-provided), open the power switch of the handle. When the two LED lights on simultaneously, the connection is finished. Then you can run the action group saved by upper computer software.

5.3.2 function of wireless handle

There are two modes in wireless handle: action group mode and single servo mode. The following instruction the two modules.

A action group mode instruction

Action group mode is the default mode. In this mode, every button of wireless handle corresponds to one action group. We can download action group to servo controller and make servo controller execute one certain.

B single servo mode instruction

What if we want to change it to single servo mode? Click “Select” button first, keep pressing it and check “start” button, after hearing a sound of “beep”, it has changed single servo mode.

↑	No.5 Servo rotates counterclockwise
↓	No.5 Servo rotates clockwise
←	No.6 Servo rotates counterclockwise
→	No.6 Servo rotates clockwise
↑	No.4 Servo rotates counterclockwise
↓	No.4 Servo rotates clockwise
←	No.3 Servo rotates counterclockwise
→	No.3 Servo rotates clockwise

L1	No.2 Servo rotates clockwise
R1	No.2 Servo rotates counterclockwise
L2	Open mechanical claw
R2	Close mechanical claw

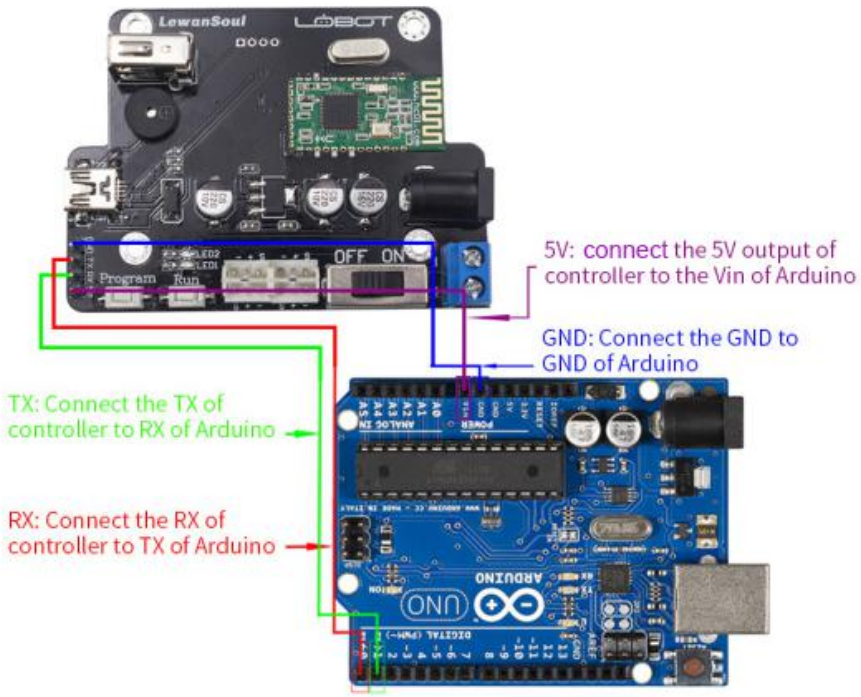
Note

1. You need to insert handle receiver into the pot, and then switch on before showing. (if you want to knowledge about using wireless handle to control xArm, please click it:

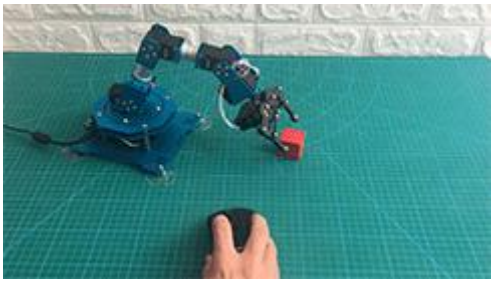
Link	QR code
http://bit.ly/2IQLdal	

5.4 How to connect Arduino board

RX: Connect the RX of controller to TX of Arduino
TX: Connect the TX of controller to RX of Arduino
GND: Connect the GND to GND of Arduino
5V: Connect the 5V output of controller to the Vin of Arduino



5.5 Mouse control(Support wired mouse and wireless mouse)



Whether it is a wireless mouse or a wired mouse, it can be manipulated. Using the cable to connect them. After being connected the xArm can be directly controlled. The rotation of each joint of the robotic arm by moving the mouse. We provide detailed video to show you how to control xArm by mouse, please refer to the link and QR code.

Link	QR code
http://bit.ly/2l4yAdK Lesson 9 Mouse control	

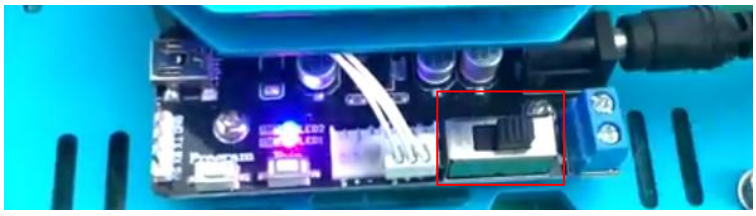
Moving the mouse wheel	Control the servo 1 and the release or close of the mechanical gripper	
Click the left button and move to left or right	servo2 being controlled	
Pressing right button move forward or backward	Control the servo3	
Forwards or backwards with left button	Control the servo4	
Without clicking any buttons only forward or backward or moving to the left or to the right	control the servo5 and servo6	

5.6 Hand offline control (Manual programming)

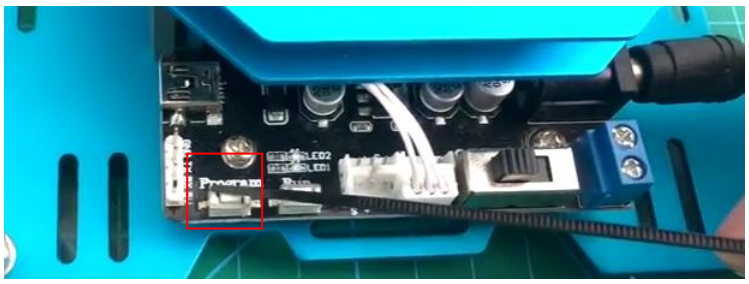
We provide detailed video to show you how to program xArm's action by hand, please refer to the link and QR code.

Link	QR code
http://bit.ly/2H6G6gm Lesson 14 How to program xArm's action by hand	

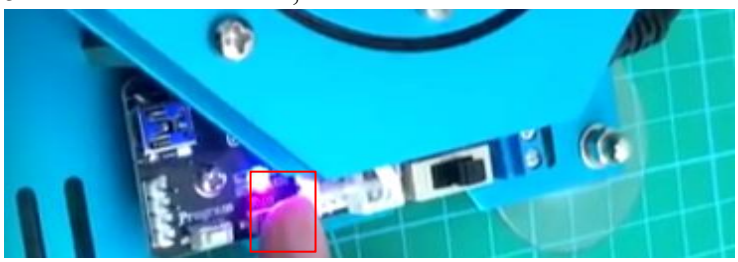
1. Turn on the switch.



2. Long pressing the " program" button and you hear a sound of beep means you can use your hand to control xArm.



3. After designing one action, you need to press " program" button again until finally.
4. If you finish all the actions do not forget to click " program" button again, which means recording all the actions.
5. Click " run" button, the xArm will be run actions.



Note: The function of this part is different from other control methods. It does not need to be programmed through mobile phones, computers, etc. It can be programmed directly by hand. This means that xArm can be programmed manually offline to make it feedback manual control of a series of operations.

6 Secondary development

6.1 Overview

This sensor and module kit is only for xArm robotic arm, It can't be used alone, you need to use it with xArm robotic arm.

To make xArm more functional and creative, we have prepared a secondary development package for everyone. With more than a dozen electronic modules and structural components, we can use Scratch or Arduino programming to implement various ideas and gameplay. We provide you with ten secondary development games for xArm, each with detailed program documentation and video tutorials. Help everyone to learn it!

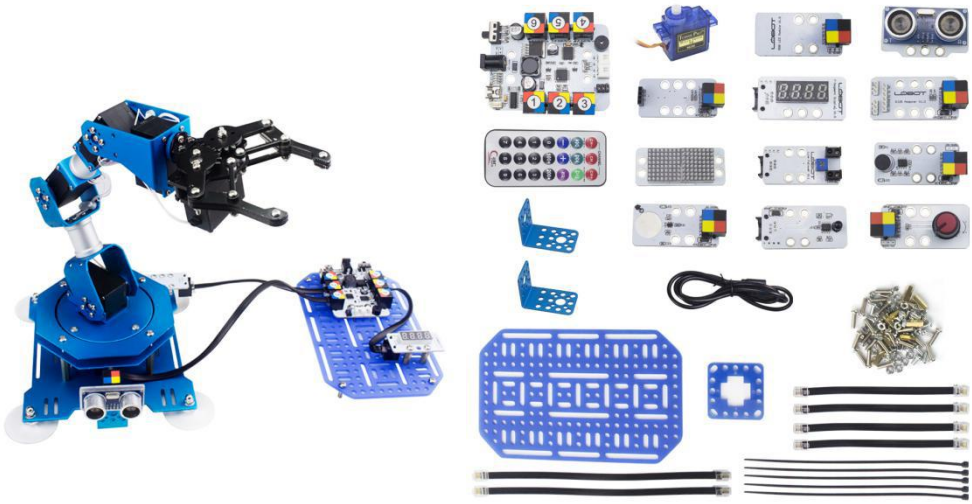
Here is the secondary development icon, link and QR code:

Icon	link	QR code
 Code of Secondary Dev... ent Kit	http://bit.ly/2BY4u6h	
Secondary development gameplay of xArm robotic arm	http://bit.ly/2BFiMYJ	

Here we briefly introduce the ten gameplay of secondary development and the sensors used in these ten methods.

Gameplay: NO.1 One-way Detect, NO.2 Multi-way Detect, NO.3 Distance Detection, NO.4 Sound Control, NO.5 Touch Control, NO.6 Dot Matrix Display, NO. 7 Gesture Control, NO.8 Infrared Remote Control, NO.9 Adjust Speed, NO.10 Coloured Lamp by Knob.

Sensor: Ultrasonic sensor module, touch button module, infrared module,sound sensor, line tracking sensor module, potentiometer module, digital tube module, LED matrix module, RGB LED module.



Software: WeMake

6.2 WeMake Software

6.2.1 What's WeMake Software

WeMake is a graphical programming tool based on Scratch 2.0, which is developed by our company. We can use this software to control. Through WeMake programming we can achieve the interaction between software and the physical world to make xArm do corresponding response according to the changes in the environment. WeMake's simple operability makes it possible for everyone to build their own intelligent robots without having to learn esoteric electronic knowledge.

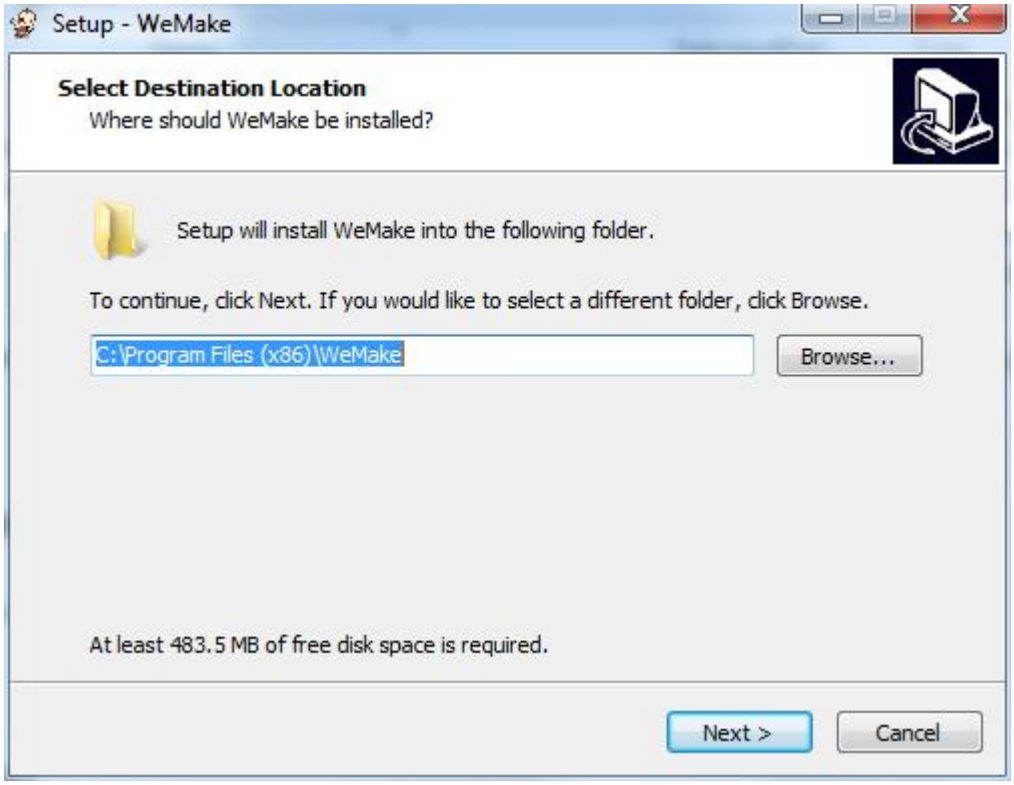
6.2.2 How to install WeMake on your computer

You can download the installation file of WeMake.

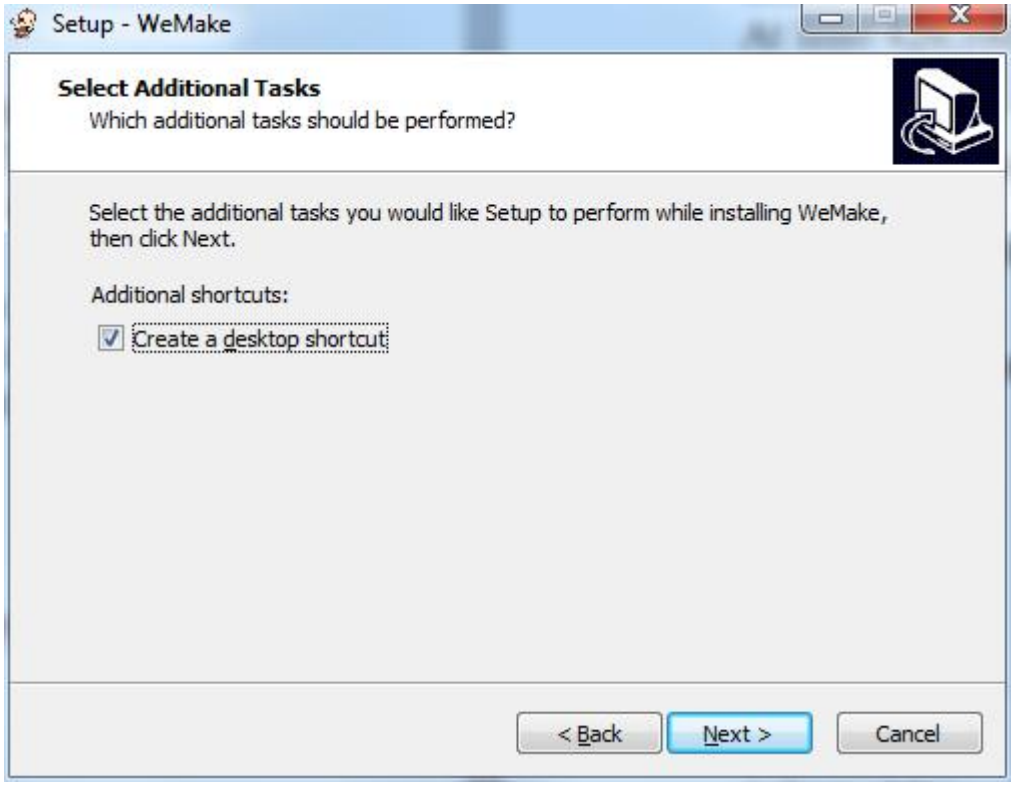
Table 1

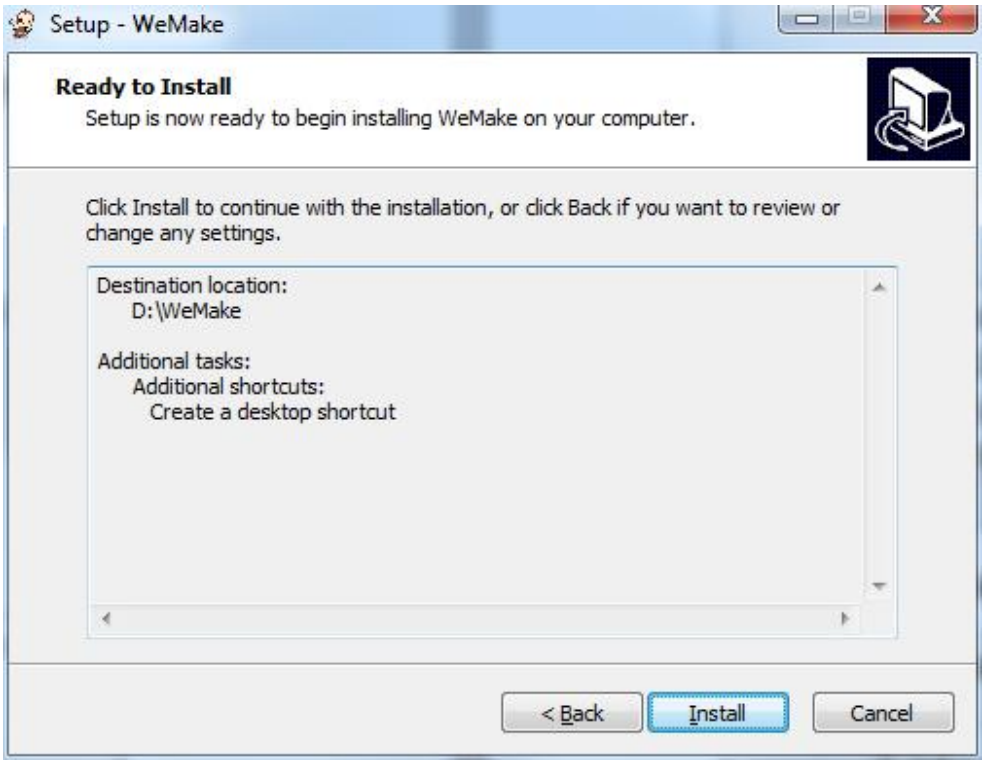
Icon	link	QR code
 WeMake Software	http://bit.ly/2BY4u6h	

Open installation file and select installation path.
Click " Next".

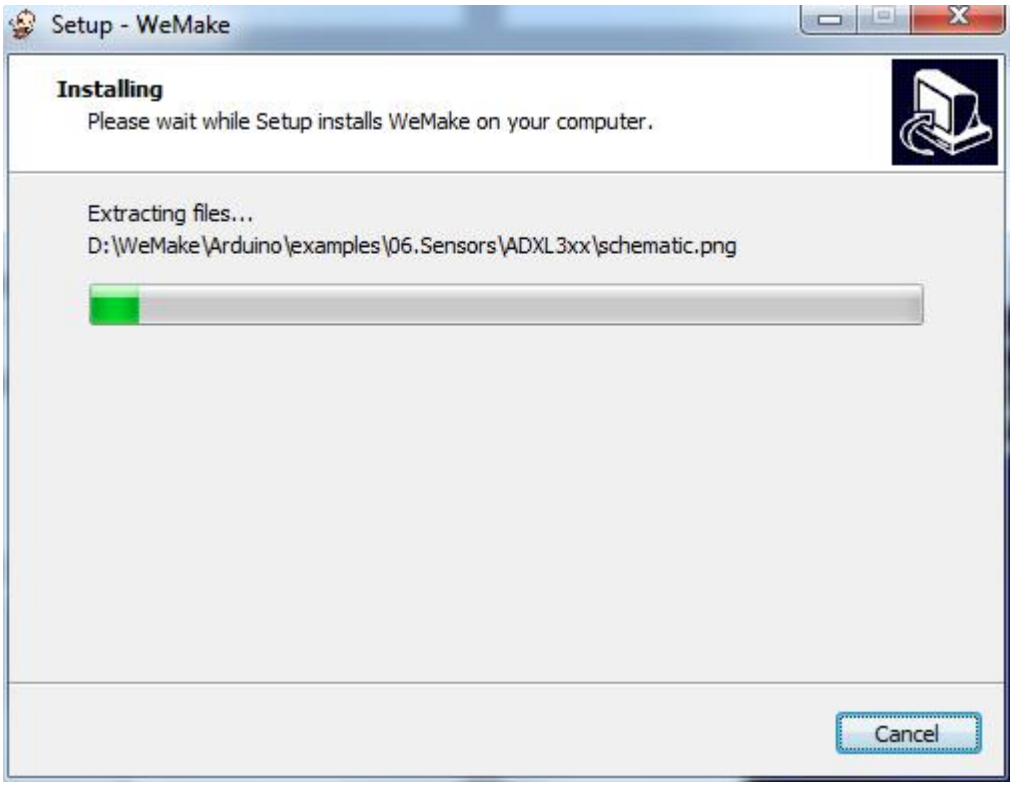


Select Destination Location.
The installer will install WeMake into the following folder.
Click Next to continue, if you want to select other folder, click”Browse”.

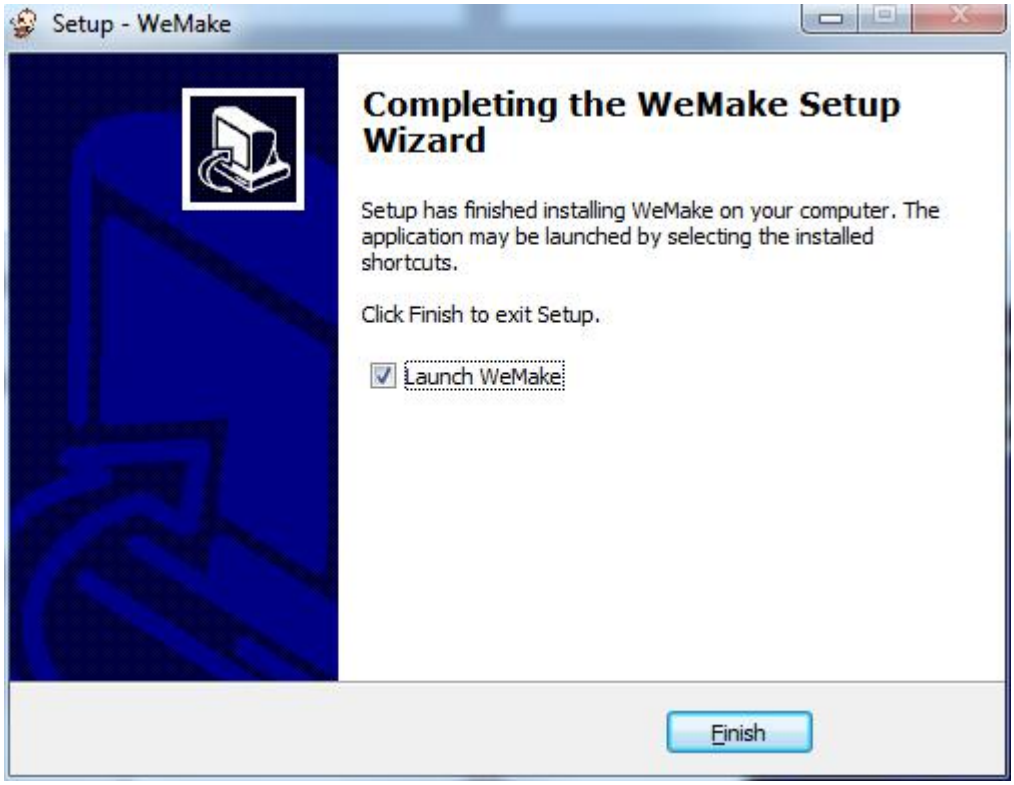




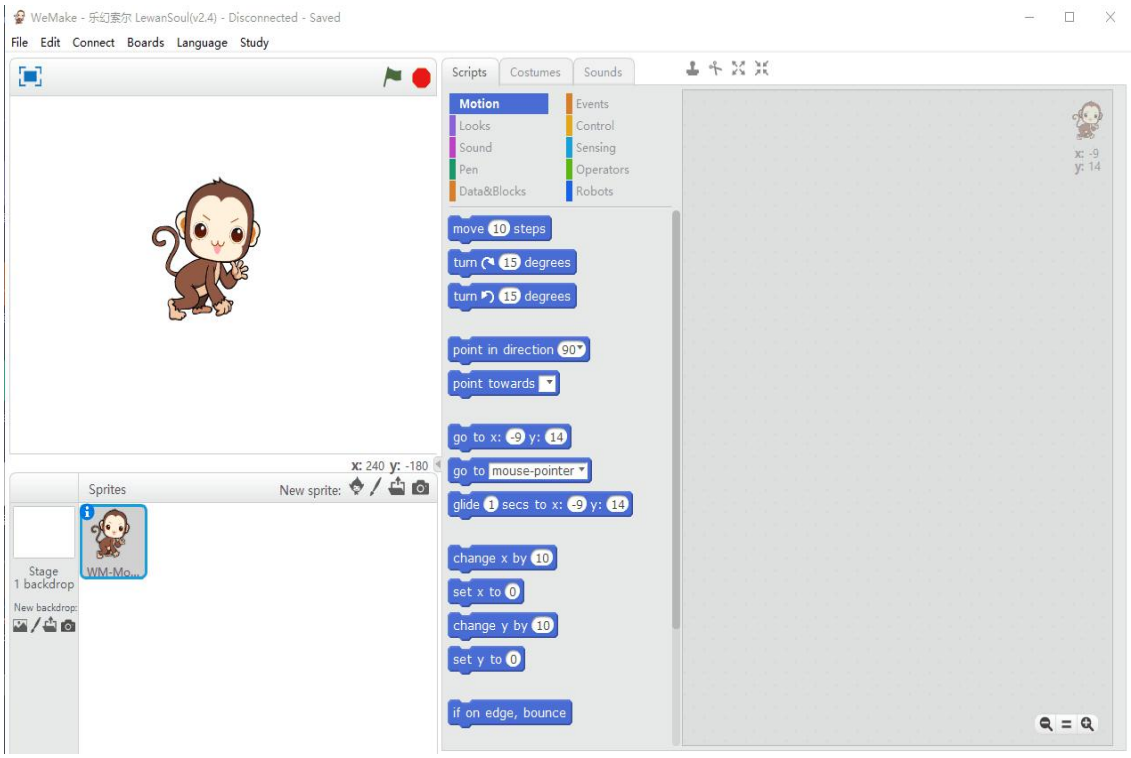
The installer is now ready to install WeMake into your computer.
Click install to continue with this installer, if you want to review or change the settings, please click " Back".



Installing.
The installer is installing WeMake into your computer, please wait.

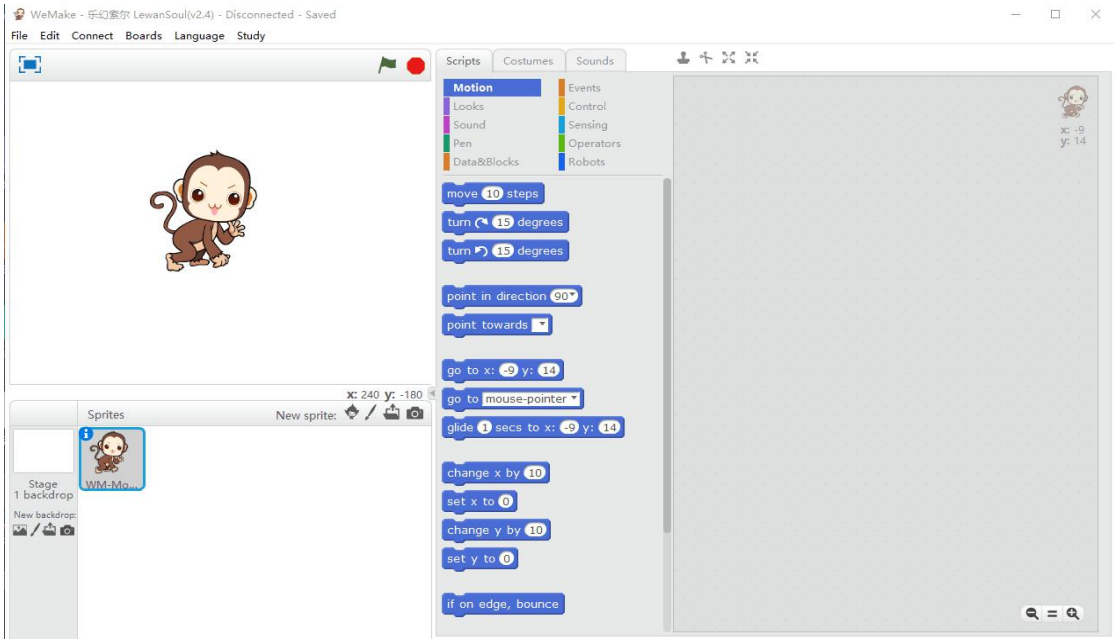


The WeMake installation wizard finishes.
The installer has installed WeMake into your computer, this application can be run by selecting the installed shortcut.
Click "Finish" exit the installer.

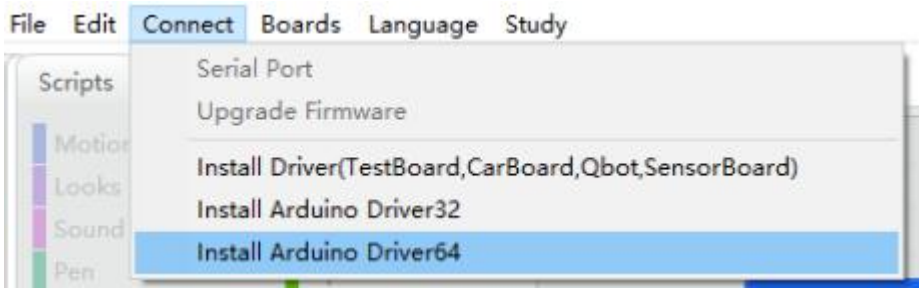


Next, we introduce WeMake. The figure below is the main interface for action editing,

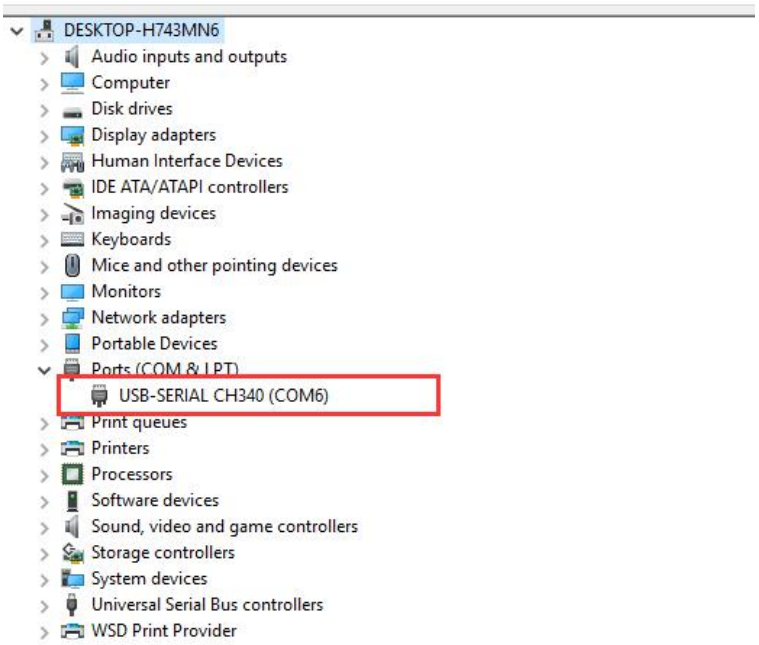
the script block module in the middle, and the edit page on the right.



First of all, we need to select the Arduino driver in the connection tab of the interface and choose 32-bit or 64-bit according to your computer.

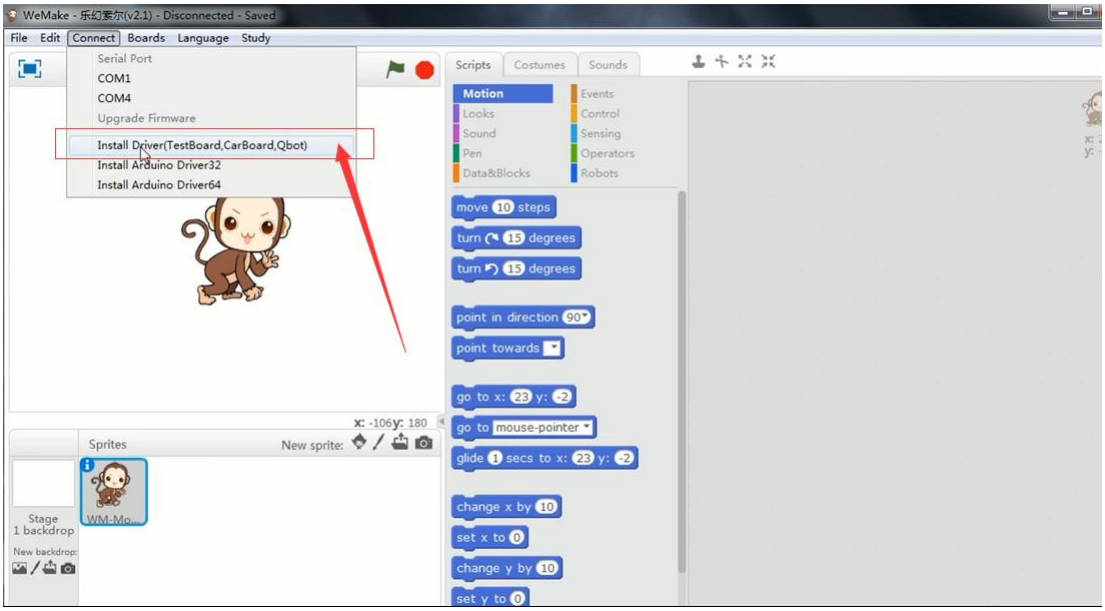


Use a USB cable to connect the computer to the xArm, and then check the serial port on the connection tab to see if it is connected.
Different computers may have different ports(Don’t choose COM1), you can open the Device Manager, expand “Ports (COM & LPT) ” .

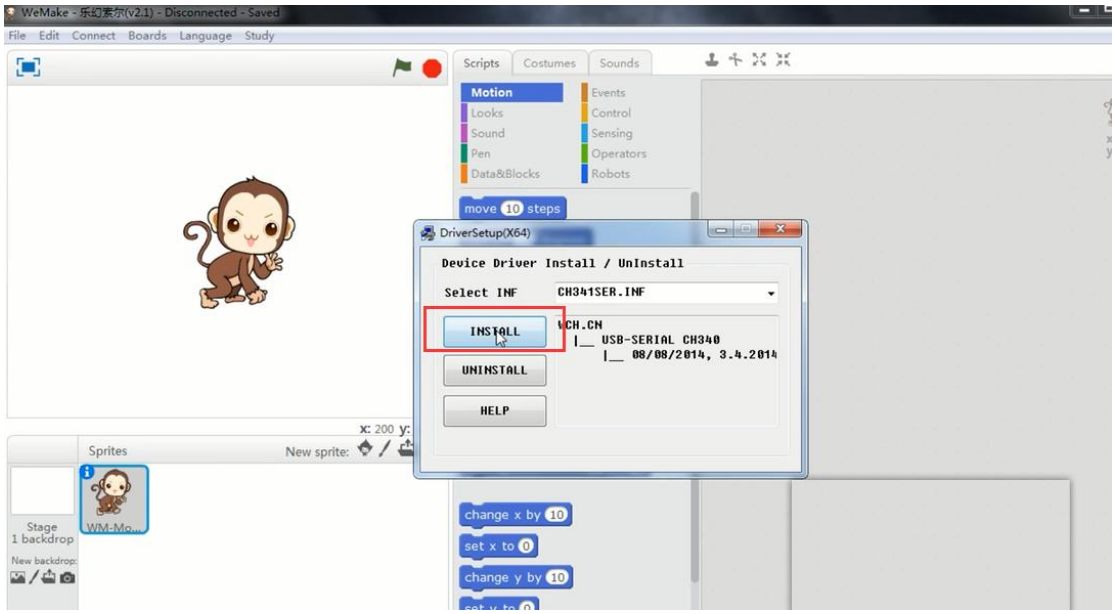


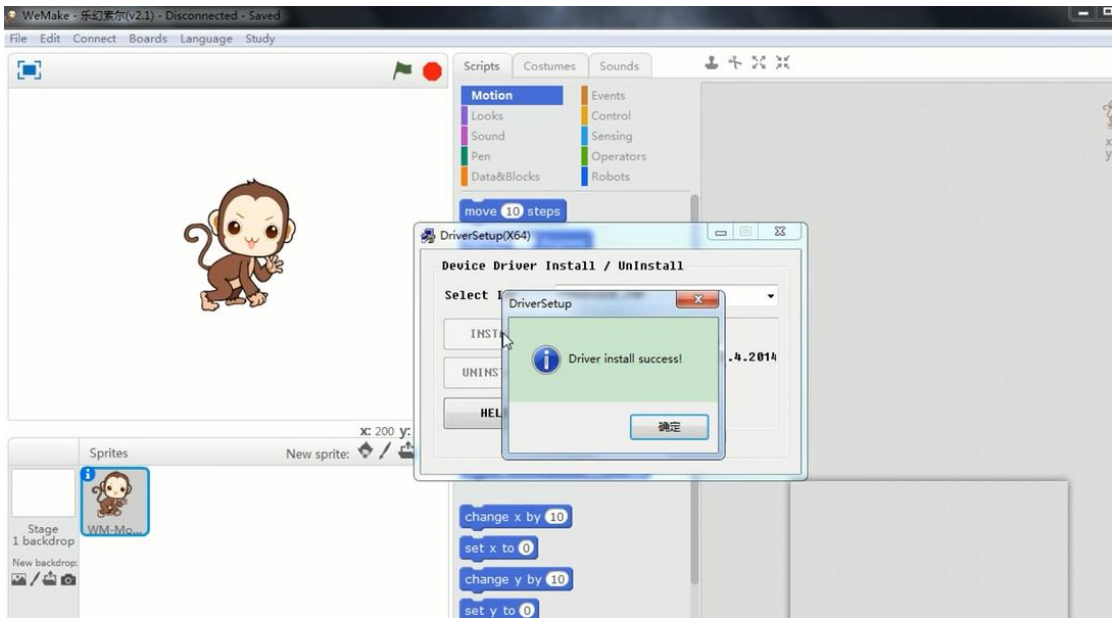
6.2.3 Install the driver

Use the WeMake at the first time, you should install the driver.
Select the corresponding path in Menu> Connect> Install Driver



Open the driver installation interface.

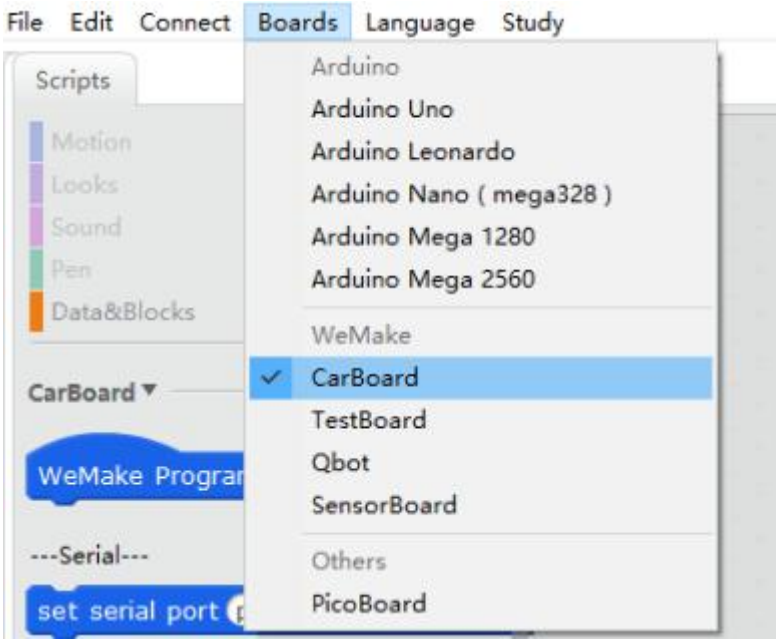




Wait for the installation to finish. After the installation is complete, the window will close automatically.

If the connection is successful, the script page lights will also show a green light.

Then select Car Board in the control board (must check, otherwise it will not be able to edit the action)



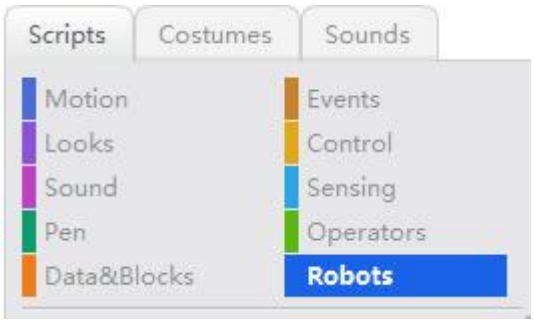
6.2.4 Gameplay and Programs

We provide detailed video to show you how to gameplay and programming about xArm, please refer to the link and QR code.

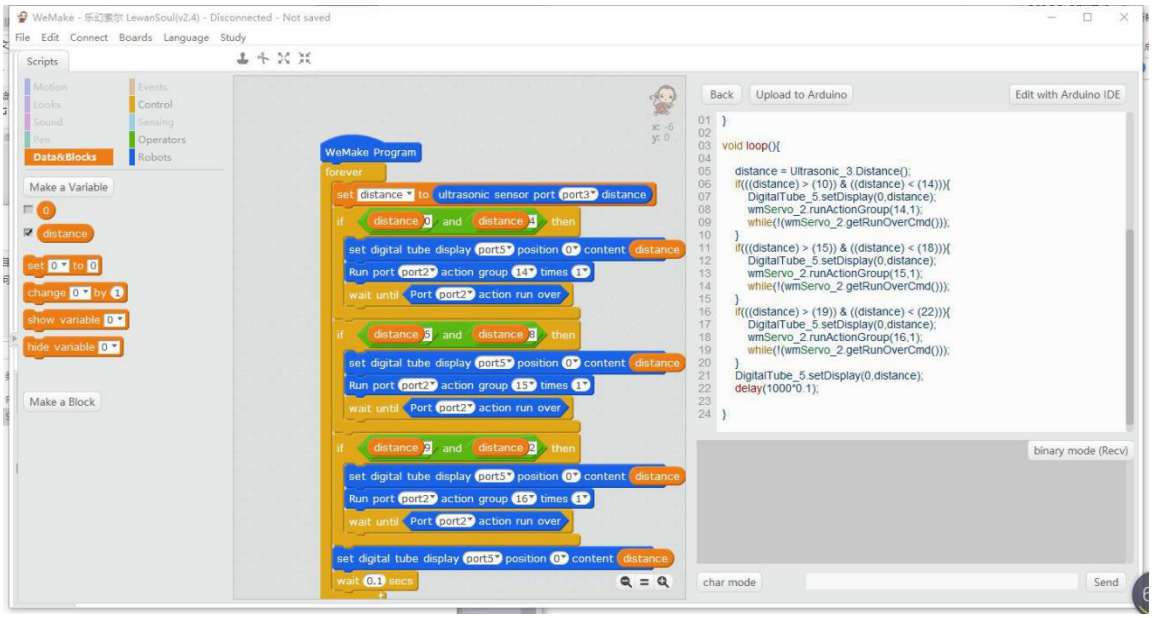
link	QR code
http://bit.ly/2BFiMYJ Lesson 3-Lesson31 Introduction gameplay	

（Take gameplay 10 as an example）

(1) Click on the robot module under the script in the middle of the screen.



Note: If you want to edit it yourself, you must first drag out the WeMake main program section. You can edit the module yourself, or you can drag the tutorial code file attached to the xArm data into the interface to load it. Take gameplay 10 coloured lamp by knob as an example(LED lattice module, RGB LED module), we use drag and drop to the right of the main interface.
As shown below:

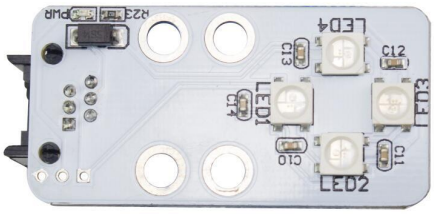


Gameplay 10: Control the action group through potentiometer

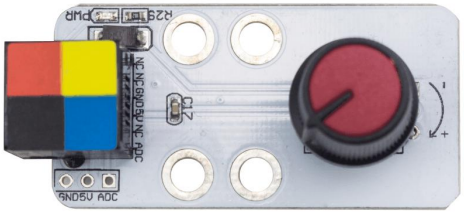
Hardware principle of Touch button: Touch button, that is, the capacitive touch button. Capacitive touch button can be identified by a capacitor switch when a conductive object, such as a finger, enters into an electric field.

Hardware principle of RGB indicator: RGB indicator is a light-emitting components and it can emit red, green and blue light. Users can control the ratio of red, green and blue respectively, or mix them into different colors.

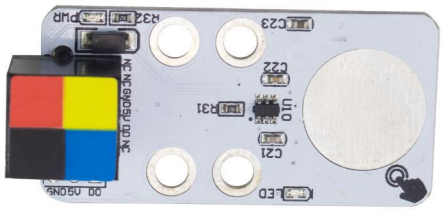
Hardware principle of potentiometer: The red potentiometer is an adjustable electronic component. The voltage and current can be changed through rotating or sliding, and the current can be used to control the system.



RGB module



Potentiometer module

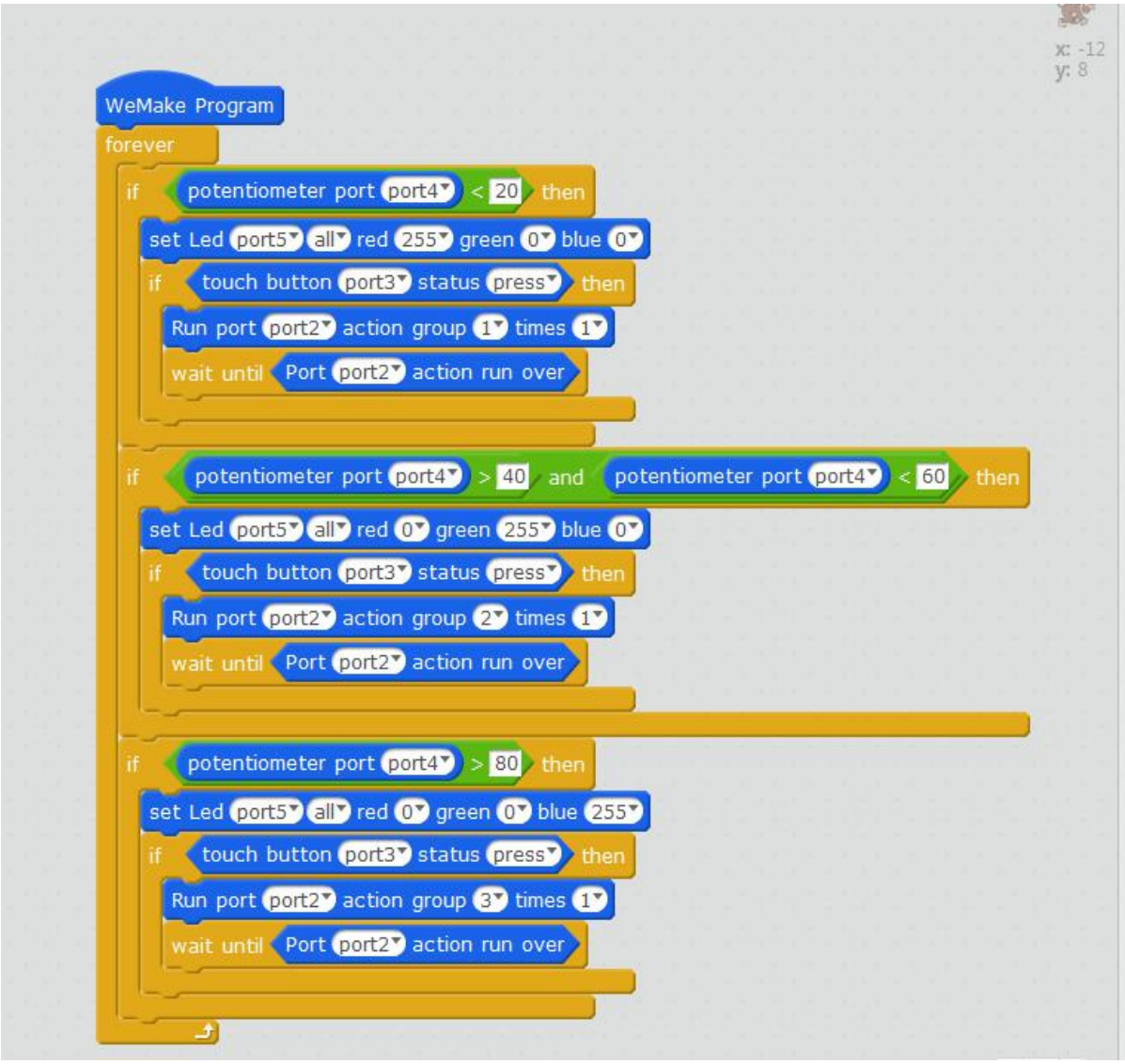


Touch button module

Software Command

Script Type	Command	Comment
Robots		Set the intensity of the red, green and blue lights on the RGB indicator module
Robots		Get the value of potentiometer
Robots		Get the situation of touch button
Robots		Set the running speed of robot's action group
Robots		Control the running times of the specified action group

Create a Target: The potentiometer value is divided into three phrase, which corresponds to three RGB lights. After pressing the touch button, it can perform different action groups according to the potentiometer value.



After you import the gameplay program into xArm, you can let it execute gameplay. Here we give a YouTube link and QR code to xArm's secondary development, you can watch the related videos yourself:

6 Contact us

1. We hope that you can carefully read the instructions and watch the video instruction so that you can have a good command of xArm.
2. Thank you for your support and purchasing LewanSoul products. If there is anything that you do not understand, please feel free to contact us.

Website: www.lewansoul.com
Forum: www.lewansoul.com/forum
Email: support@lewansoul.com

7 Troubleshooting

1.Turn on the power and xArm beeping like “Di Di Di”

Solution: The power supply voltage is too low.

(1) Please check whether the USB cable is used to connect the computer to the xArm directly. The USB cable is only for information transmission and cannot be used as a power cable, but it can be powered by an adapter and a battery.

(2) If you use battery, please note that after a long time, the battery will have a certain loss, the battery voltage will reduce and power shortage, please replace the battery in time.

(3) When selecting an adapter for power, please check whether the correct adapter is used and the output voltage can achieve the requirements.

2. Click the Bluetooth button to search for no Bluetooth devices.

Solution: First, please make sure your xArm work well. And to allow location permission during installation or go to Permissions Management to set location permissions, and restart the xArm and reconnect the APP.

3. The wireless handle can not control xArm.

Solution: First, you should check the handle receiver into the pot. Then turn on and make sure light work well. Connect it again.

4. The PC software always shows no connection

Solution: This issue may be caused by anti-virus software. PC software be considered is a virus. Resulting in the killing of anti-virus software. Please turn off the antivirus software or add our software to the white list of antivirus software to try it out.

5. After installation of xArm PC software, operation failed .

Solution: It may be due to anti-virus software deleting the file. Please close software and install again.

6. If you did something wrong with the "test servo" page and now all the servos are running at the same time and do not know how to reset it.

Solution: The issue is due to the servo control board is connected with all the servos during adjustment.

(1) You should make sure that the servo control board is connected with only one servo.

(2) Then, click “Apply” icon to test servo again.

(3) if you want to know more information please click the following link: http://www.lewansoul.com/product/detail-135.html to get xArm user manual-5

Control methods and Programming

8 The Historical version of the user manual

Version	Modification date	Instructions	Modifier
V2.2	2018.8.16	The add information: (1) Troubleshooting (2) 5.1.2 servo test (3) The introduction of servo (4) How to connect Arduino board	Carey