Lesson4 Testing Mechanical Robot Claw

Support : cokoino@outlook.com

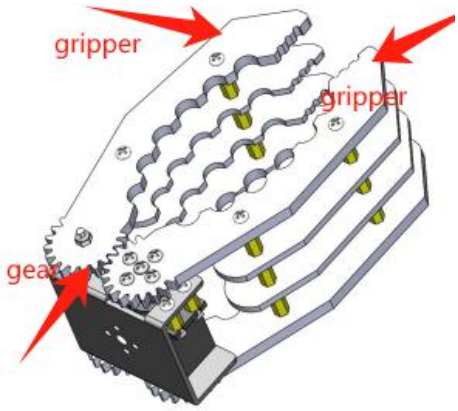
Preface

We have learned about the relevant knowledge of MG996R Servo through the previous Lessons and have learned how to control the MG996R Servo based on Arduino/Raspberry pi/Raspberry pi Pico. Now, we have assembled MG996 Servo and acrylic kit into a Mechanical Robot Claw according to the assembly tutorial. Let's learn how to use code to drive the operation of this mechanical robot claw together.

1. Safety and notes

Keep any part of the body, especially fingers, away from gears to prevent fingers or other parts from being caught and injured by gears while claws are working.

Keep any part of the body, such as fingers, away from the gripper to prevent fingers or other parts from being caught and injured by claws.



2. Drive the operation of this mechanical robot claw by Arduino Uno

2.1 What do you need to prepare

Components	Quantity	Picture	Remark

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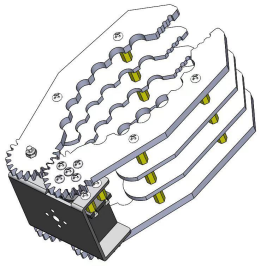
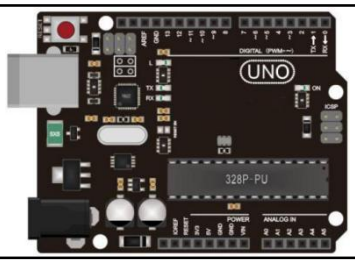
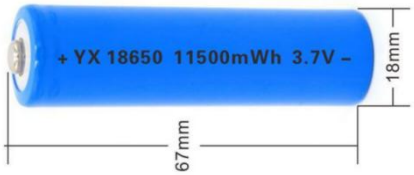
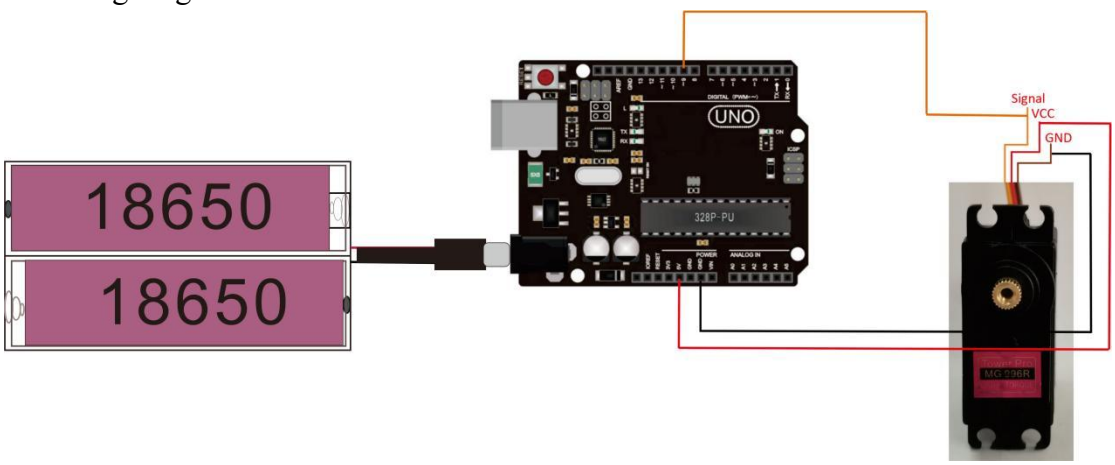
Mechaniacal Robot Claw	1		Assembled
Uno R3 BOard	1		Not included in the Kit,you should prepared by yourself
18650 Battery Box	1		Not included in the Kit,you should prepared by yourself
18650 Battery	2		Not included in the Kit,you should prepared by yourself

2.2 Connection circuit

Prepare a UNO R3 board, an 18650 battery case, and two 18650 batteries, and then connect the servo on the assembled Mechanical Robot Claw as shown in the following diagram.



The corresponding connection relationship is shown in the table below:

UNO R3 PIN	MG996R PIN

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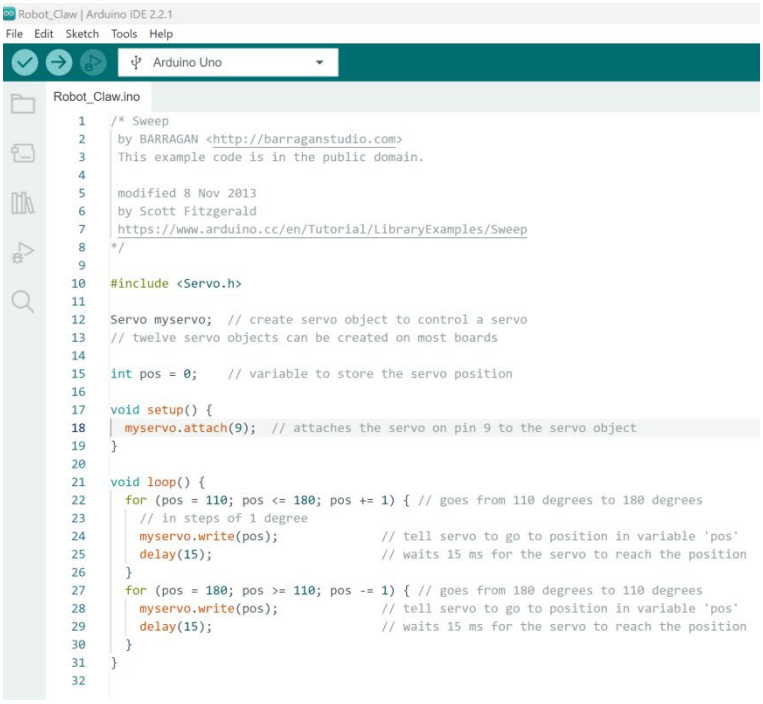
9	Signal
5v	VCC
GND	GND

2.3 Upload the code and test

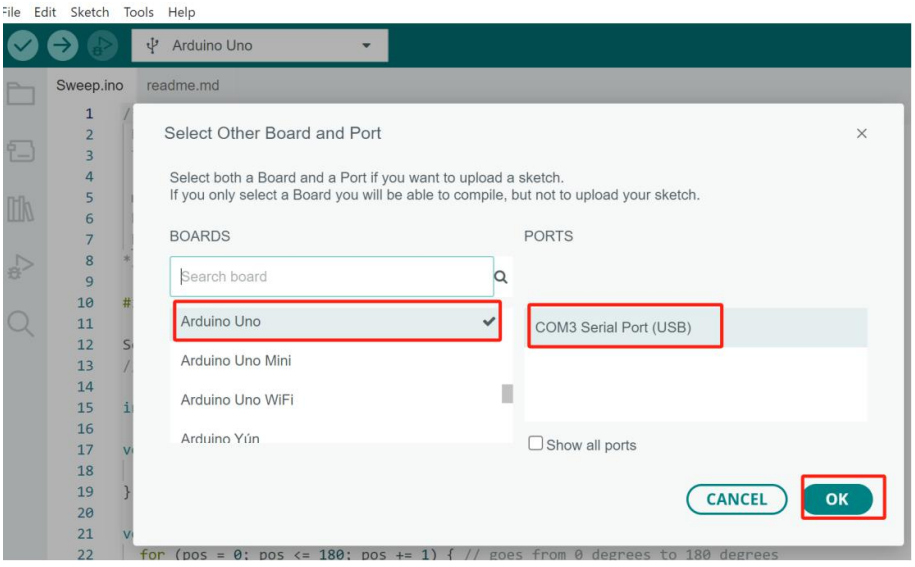
2.3.1 Open the code, code path:

CKK0016-main \ Tutorial \ Arduino \ RobotClaw

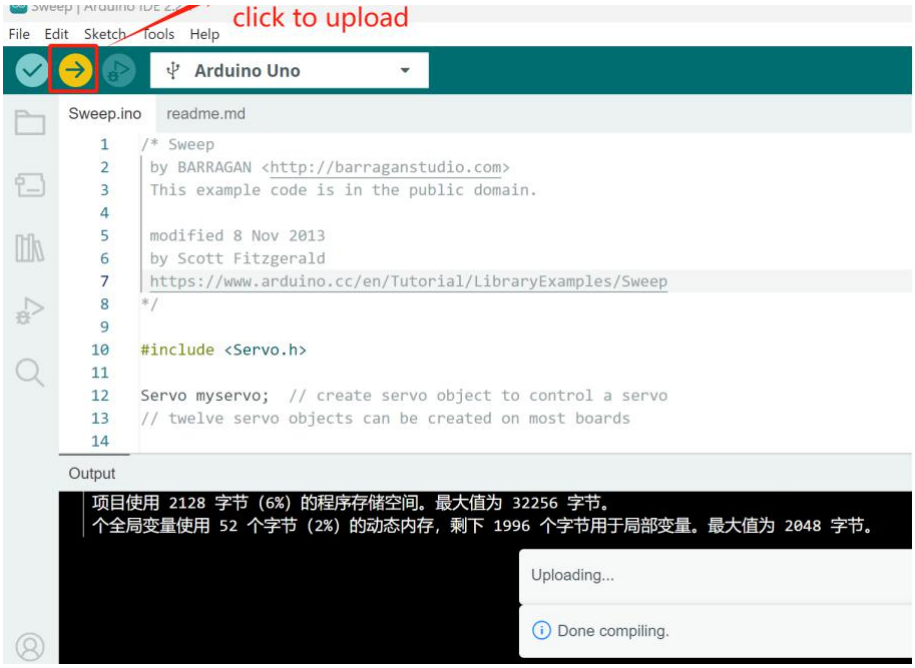
Double click on "RobotClaw. ino" to open the code as follows:



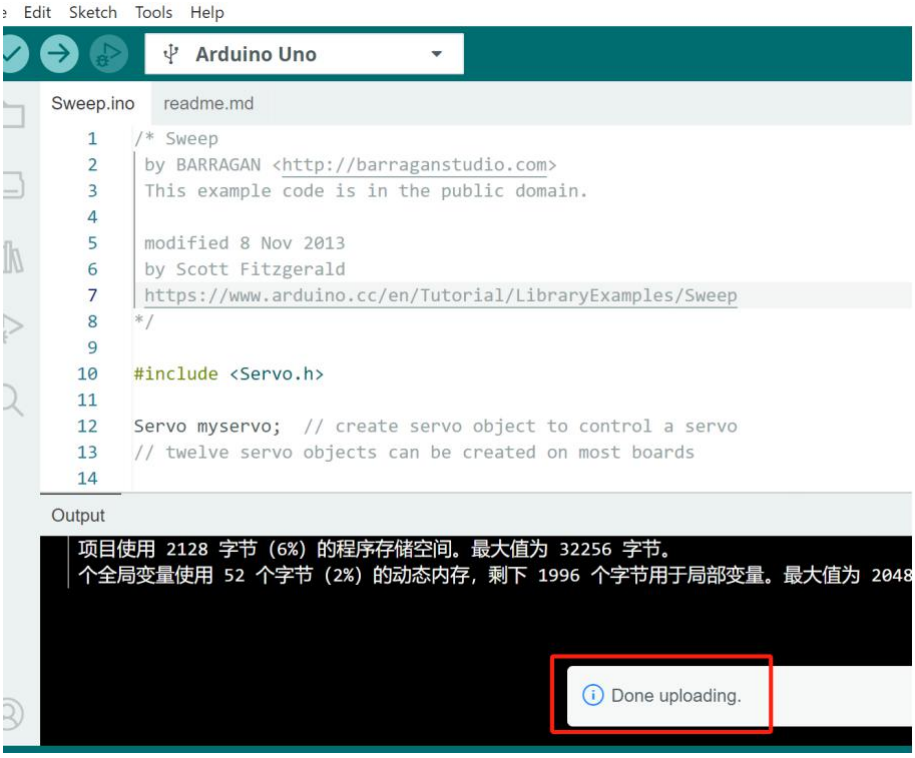
2.3.2 Connect the Arduino UNO board to the computer through a USB cable, click the "Select Other Board and Port" menu to select the Arduino Uno and Serial ports corresponding to the UNO board. This example here is com3.



2.3.3 Click the "upload" button on the IDE interface to start uploading the code to the UNO board.



2.3.4 "done uploading" will be displayed when the program upload is completed.



2.3.5 As UNO board is power on by the 18650 batterise, after the code is upload, you can see that the Robot Claw open and close in a loop.

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2.4 Arduino Code

```
/* Sweep
 by BARRAGAN <http://barraganstudio.com>
 This example code is in the public domain.

 modified 8 Nov 2013
 by Scott Fitzgerald
 https://www.arduino.cc/en/Tutorial/LibraryExamples/Sweep
*/

#include <Servo.h>

Servo myservo;  // create servo object to control a servo
// twelve servo objects can be created on most boards

int pos = 0;    // variable to store the servo position

void setup() {
  myservo.attach(9);  // attaches the servo on pin 9 to the servo object
}

void loop() {
  for (pos = 110; pos <= 180; pos += 1) { // goes from 110 degrees to 180 degrees
    // in steps of 1 degree
    myservo.write(pos);              // tell servo to go to position in variable 'pos'
    delay(15);                       // waits 15 ms for the servo to reach the position
  }
  for (pos = 180; pos >= 110; pos -= 1) { // goes from 180 degrees to 110 degrees
    myservo.write(pos);              // tell servo to go to position in variable 'pos'
    delay(15);                       // waits 15 ms for the servo to reach the position
  }
}
```


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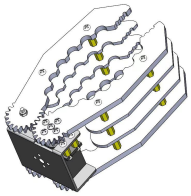
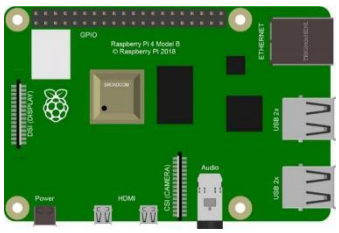
3. Drive the operation of this mechanical robot claw by Raspberry Pi

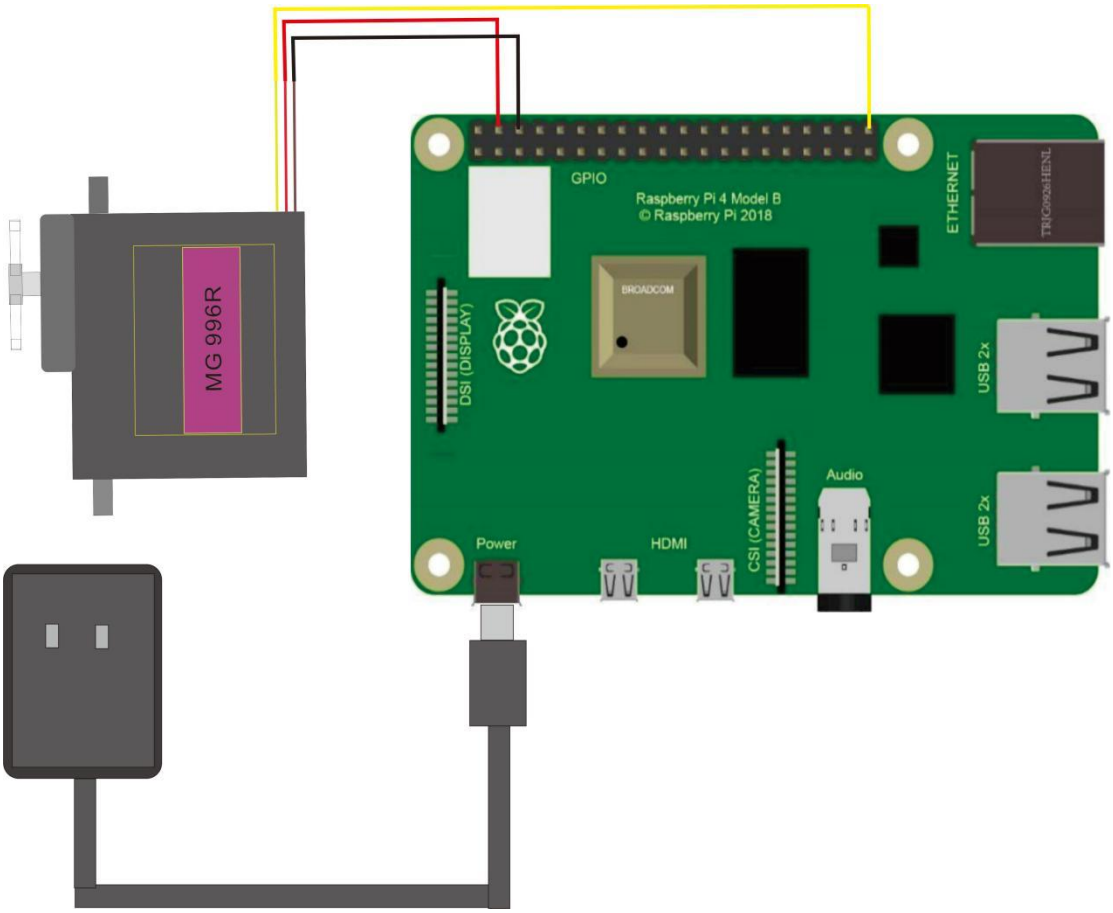
Taking Raspberry Pi 4B as an Example

3.1 What do you need to prepare

Components	Quantity	Picture	Remark
Mechanical Robot Claw	1		Assembled
Raspberry Pi 4B	1		Not included in the Kit,you should prepared by yourself
Raspberry Pi 4B Adaptor	1		Not included in the Kit,you should prepared by yourself

3.2 Connection Circuit

Prepare a Raspberry Pi 4B board and a power adapter, and then connect the servo on the assembled Mechanical Robot Claw as shown in the following diagram.



The corresponding connection relationship is shown in the table below:

Raspberry Pi 4B Board Pin	MG996R Servo Pin
21 (BCM)	signal
5V	VCC
GND	GND

3.3 Upload the code and test

you can visit our GitHub resources at (**https://github.com/cokoino**) to download the latest available project code.

Turn on and log in to your Raspberry Pi , In the pi directory of the RPi terminal, enterthe following command.

```
cd
git clone --depth 1 https://github.com/cokoino/ckk0016
```

After the download is completed, a new folder "CKK0016" is generated, which contains all of the tutorials and required code.

Click File manager,you will find the folder "CKK0016"

Use cd command to enter the directory of Python code.

```
cd ~/CKK0016/Tutorial/Python/Python_Codes/Test_Robot_Claw
```

1. Use python command to execute python code Test_Robot_Claw.py.

```
python Test_Robot_Claw.py
```

Then you can see that the Robot Claw open and close in a loop.

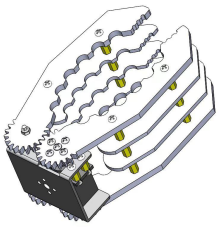
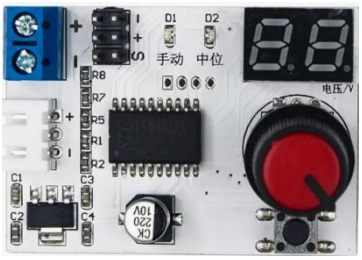
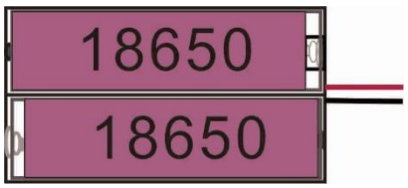
3.4 Python Code

```
1.  # -*- coding: utf-8 -*-
2.  #!/usr/bin/env python
3.
4.  import RPi.GPIO as GPIO
5.  import time
6.  import signal
7.  import atexit
8.
9.  atexit.register(GPIO.cleanup)
10.
11. servopin = 21
12. GPIO.setmode(GPIO.BCM)
13. GPIO.setup(servopin, GPIO.OUT, initial=False)
14. p = GPIO.PWM(servopin,50) #50HZ
15. p.start(0)
16. time.sleep(2)
17.
18. while(True):
19.   for i in range(110,181,10):
20.     p.ChangeDutyCycle(2.5 + 10 * i / 180) #set rotation angle
21.     time.sleep(0.02)                #wait 20ms for the cycle time
22.     p.ChangeDutyCycle(0)              #Initialize
23.     time.sleep(0.2)
24.
25.   for i in range(181,110,-10):
26.     p.ChangeDutyCycle(2.5 + 10 * i / 180)
27.     time.sleep(0.02)
28.     p.ChangeDutyCycle(0)
29.     time.sleep(0.2)
```

4. Drive the operation of this mechanical robot claw by RC Digital Servo Tester

It is very convenient to use the RC digital servo tester to test the servo because it has a built-in control program. Simply rotate the potentiometer knob on top to change the pulse width of the pulse signal. Different pulse width signals make the servo rotate to different angles.
When testing the MG996R Servo function and for simple use, it is recommended to use this solution without the need for additional programming control, which is more convenient.

4.1 What do you need to prepare

Components	Quantity	Picture	Remark
Mechanical Robot Claw	1		Assembled
RC digital servo tester	1		Not included in the Kit,you should prepared by yourself.This is a sample for your reference.And there are many kinds of RC digital servo tester on Amazon,you can choose what you want.
Battery box with 2pcs 18650 batteries	1		Not included in the Kit,you should prepared by yourself

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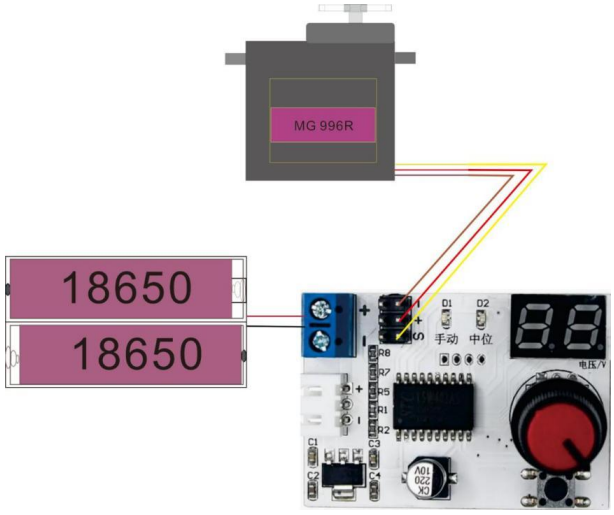
4.2 Connection Circuit

Before connecting the circuit, please rotate the potentiometer knob on the RC Digital Servo Tester to the middle position (the position indicated by the indicator line on the knob indicates the current potentiometer status position)

Connect the battery box containing two 18650 batteries to the RC digital servo tester, ensuring that the positive and negative poles are connected to the corresponding positions and not reversed. The RC digital servo tester in the example has two servo interfaces. Insert the MG996 servo into either interface, and note that the "signal vcc gnd" of the MG996 servo pin corresponds to the "**s + -**" on the RC digital servo tester.



4.3 Test

After the circuit is connected and checked for no issues, manually rotate the potentiometer knob on the RC digital servo tester. When rotating clockwise, the Mechanical Robot Claw is closing. When rotating counterclockwise, the Mechanical Robot Claw is opening.

4.4 Note

When turning the knob on the RC digital servo tester to control the claw to grasp the object, and then continuing to rotate the knob clockwise, the servo must have reached the limit position in the current state and then blocked, generating a large torque to grab the object.

Therefore, it is not advisable to grab heavy objects to prevent excessive torque from damaging the servo. It is recommended to grab weights below 500 grams.

When the servo is stuck, the current will exceed 2A, and the stuck power is high. The servo will continue to heat up. It is recommended to continue gripping for no more than 1 minute, release the claw in time, and put down the object to prevent the servo from working continuously in a stuck state, otherwise the servo may be damaged.

5. Make your suggestion and get support

THANK YOU for participating in this learning experience!

We have reached the end of this Tutorial. If you find errors, omissions or you have suggestions and/or questions about this lesson, please feel free to contact us: **cokoino@outlook.com**

We will make every effort to make changes and correct errors as soon as feasibly possible and publish a revised version.

If you want to learn more about Arduino, Raspberry Pi, Smart Cars, Robotics and other interesting products in science and technology, please continue to visit our Amazon Store by search for "LK COKOINO" on Amazon. We will continue to launch fun, cost-effective, innovative and exciting products.

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