Line Walking

The purpose of the experiment:

After uploading the program, unplug the USB data cable, put the BatCar on the patrol tarck.Adjust the potentionmeterSW3 and SW4 so that the photoelectric sensor can recognize the black line.Press the start button K1, the BatCar starts running along the black line.

List of components required for the experiment:

BatCar*1

USB data cable*1

Patrol tarck*1

Experimental code analysis:

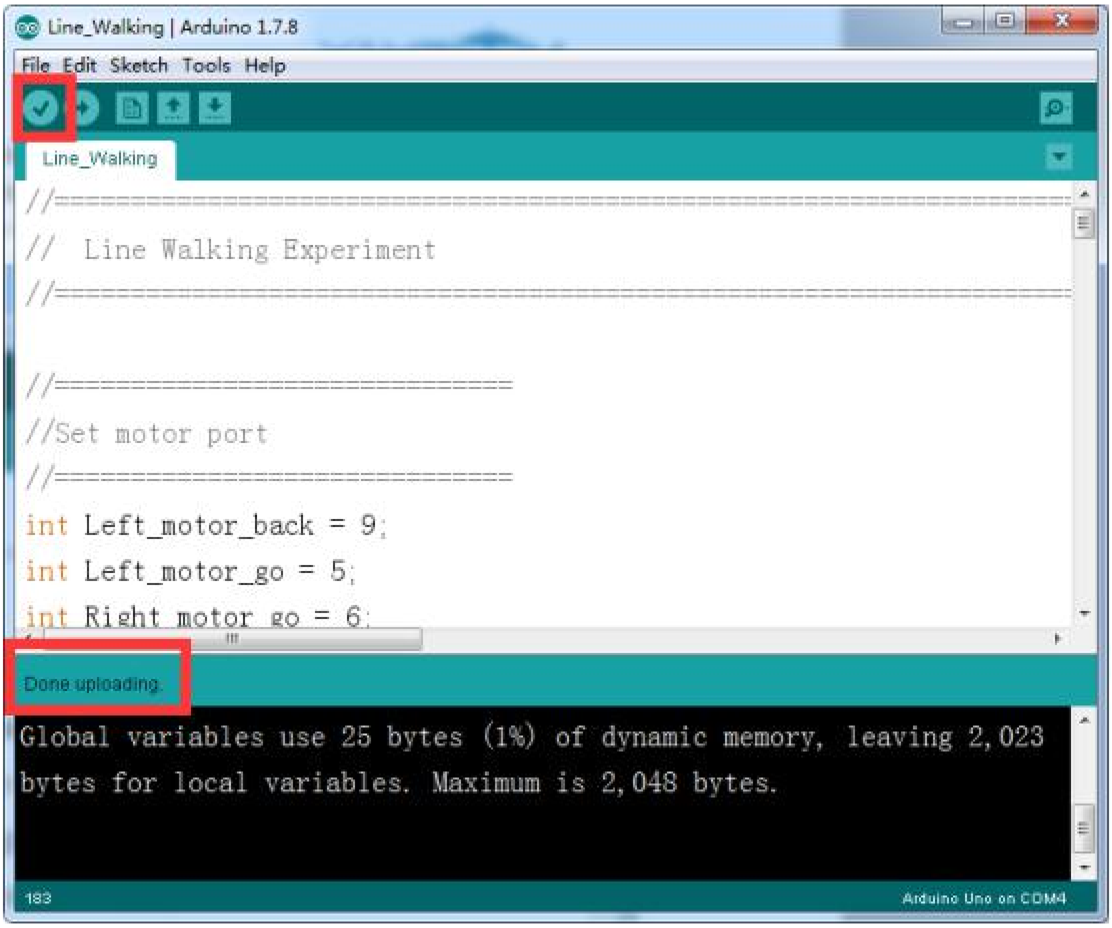
```
int Left_motor_back = 9;
int Left_motor_go = 5;
int Right_motor_go = 6;
int Right_motor_back = 10;
int Right_motor_en = 8;
int Left_motor_en = 7;
/*Set Button port*/
int key=4;
/*Set BUZZER port*/
```

```
int beep=3;
/*Line Walking*/
const int SensorRight = A3;     // Set Right Line Walking Infrared sensor port
const int SensorLeft = A2;       // Set Left Line Walking Infrared sensor port
int SL;     // State of Left Line Walking Infrared sensor
int SR;     // State of Right Line Walking Infrared sensor
void setup()
{
  //Initialize motor drive for output mode
  pinMode(Left_motor_go,OUTPUT);
  pinMode(Left_motor_back,OUTPUT);
  pinMode(Right_motor_go,OUTPUT);
  pinMode(Right_motor_back,OUTPUT);
  pinMode(key,INPUT);// Set button as input
  pinMode(beep,OUTPUT);// Set buzzer as output
  pinMode(SensorRight, INPUT); // Set Right Line Walking Infrared sensor as
input
  pinMode(SensorLeft, INPUT); // Set left Line Walking Infrared sensor as input
  digitalWrite(key,HIGH);//Initialize button
  digitalWrite(beep,HIGH);// set buzzer mute
}
 //======================Motor=========================
void run()
{
  digitalWrite(Right_motor_go,HIGH);// right motor go ahead
  digitalWrite(Right_motor_back,LOW);
  analogWrite(Right_motor_go,100);//PWM--Pulse Width Modulation(0~255). It
can be adjusted to control speed.
  analogWrite(Right_motor_back,0);
  digitalWrite(Left_motor_go,HIGH);// set left motor go ahead
  digitalWrite(Left_motor_back,LOW);
  analogWrite(Left_motor_go,100);//PWM--Pulse Width Modulation(0~255). It
can be adjusted to control speed.
  analogWrite(Left_motor_back,0);
}
void brake() //stop
```

```
{
  digitalWrite(Right_motor_go,LOW);
  digitalWrite(Right_motor_back,LOW);
  digitalWrite(Left_motor_go,LOW);
  digitalWrite(Left_motor_back,LOW);
}
void left()//turn left
{
 digitalWrite(Right_motor_go,HIGH); // right motor go ahead
  digitalWrite(Right_motor_back,LOW);
  analogWrite(Right_motor_go,100);
  analogWrite(Right_motor_back,0);// PWM--Pulse Width Modulation(0~255)
control speed
  digitalWrite(Left_motor_go,LOW);     // left motor stop
  digitalWrite(Left_motor_back,LOW);
  analogWrite(Left_motor_go,0);
  analogWrite(Left_motor_back,0);// PWM--Pulse Width Modulation(0~255)
control speed
}
void spin_left(int time)         //Left rotation
{
   digitalWrite(Right_motor_go,HIGH); // right motor go ahead
  digitalWrite(Right_motor_back,LOW);
  analogWrite(Right_motor_go,100); // PWM--Pulse Width Modulation(0~255)
control speed
  analogWrite(Right_motor_back,0);
  digitalWrite(Left_motor_go,LOW);     // left motor back off
  digitalWrite(Left_motor_back,HIGH);
  analogWrite(Left_motor_go,0);
  analogWrite(Left_motor_back,100); // PWM--Pulse Width Modulation(0~255)
control speed
  delay(time * 100);
}
void right() //turn right
{
  digitalWrite(Right_motor_go,LOW);     // right motor stop
  digitalWrite(Right_motor_back,LOW);
  analogWrite(Right_motor_go,0);
  analogWrite(Right_motor_back,0);
  digitalWrite(Left_motor_go,HIGH);// left motor go ahead
  digitalWrite(Left_motor_back,LOW);
  analogWrite(Left_motor_go,100);
  analogWrite(Left_motor_back,0);// PWM--Pulse Width Modulation(0~255)
control speed
}
void spin_right(int time)        //Right rotation
{
  digitalWrite(Right_motor_go,LOW);    // right motor back off
  digitalWrite(Right_motor_back,HIGH);
  analogWrite(Right_motor_go,0);
  analogWrite(Right_motor_back,200);// PWM--Pulse Width Modulation(0~255)
control speed
  digitalWrite(Left_motor_go,HIGH);// left motor go ahead
  digitalWrite(Left_motor_back,LOW);
  analogWrite(Left_motor_go,200);
  analogWrite(Left_motor_back,0);// PWM--Pulse Width Modulation(0~255)
control speed
  delay(time * 100);
}
void back(int time)   //back off
{
  digitalWrite(Right_motor_go,LOW);   //right motor back off
  digitalWrite(Right_motor_back,HIGH);
  analogWrite(Right_motor_go,0);
  analogWrite(Right_motor_back,150);// PWM--Pulse Width Modulation(0~255)
control speed
  digitalWrite(Left_motor_go,LOW);   //left motor back off
  digitalWrite(Left_motor_back,HIGH);
  analogWrite(Left_motor_go,0);
  analogWrite(Left_motor_back,150);// PWM--Pulse Width Modulation(0~255)
control speed
  delay(time * 100);
}
//===========================================================
void keysacn()
{
  int val;
  val=digitalRead(key);// Reads the button ,the level value assigns to val
  while(digitalRead(key))// When the button is not pressed
  {
    val=digitalRead(key);
  }
  while(!digitalRead(key))// When the button is pressed
  {
   delay(10); //delay 10ms
    val=digitalRead(key);// Reads the button ,the level value assigns to val
    if(val==LOW)   //Double check the button is pressed
    {

      digitalWrite(beep,LOW);//The buzzer sounds
      delay(50);//delay 50ms
      while(!digitalRead(key)) //Determine if the button is released or not
        digitalWrite(beep,HIGH);//mute
    }
    else
      digitalWrite(beep,HIGH);//mute
  }
}
/*main loop*/
void loop()
{
  keysacn();//Press the button to start
  while(1)
  {
  /***************************************************************************************
  Infrared signal back means white undersurface ,returns low level and led lights up.
  Infrared signal gone means black undersurface ,returns high level and led lights off.
  ***************************************************************************************/
  SR = digitalRead(SensorRight);//Right Line Walking Infrared sensor against white undersurface,then LED[L2] light illuminates and while against black undersurface,LED[L2] goes off
  SL = digitalRead(SensorLeft);//Left Line Walking Infrared sensor against white undersurface,then LED[L3] light illuminates and while against black undersurface,LED[L3] goes off
  if (SL ==LOW&&SR== LOW)// Black lines were not detected at the same time
    run();    // go ahead
  else if (SL == LOW & SR == HIGH)// Left sensor against white undersurface and right against black undersurface , the car left off track and need to adjust to the right.
    right();
  else if (SR == LOW & SL ==   HIGH) // Rihgt sensor against white undersurface and left against black undersurface , the car right off track and need to adjust to the left.
    left();
  else // Black lines were detected at the same time , the car stop.
    brake();
  }
}
```

Experimental steps:

1. We need to open the code of this experiment: **Line_Walking.ino**, click“√” under the menu bar to compile the code, and wait for the word "**Done compiling** " in the lower right corner, as shown in the figure below.

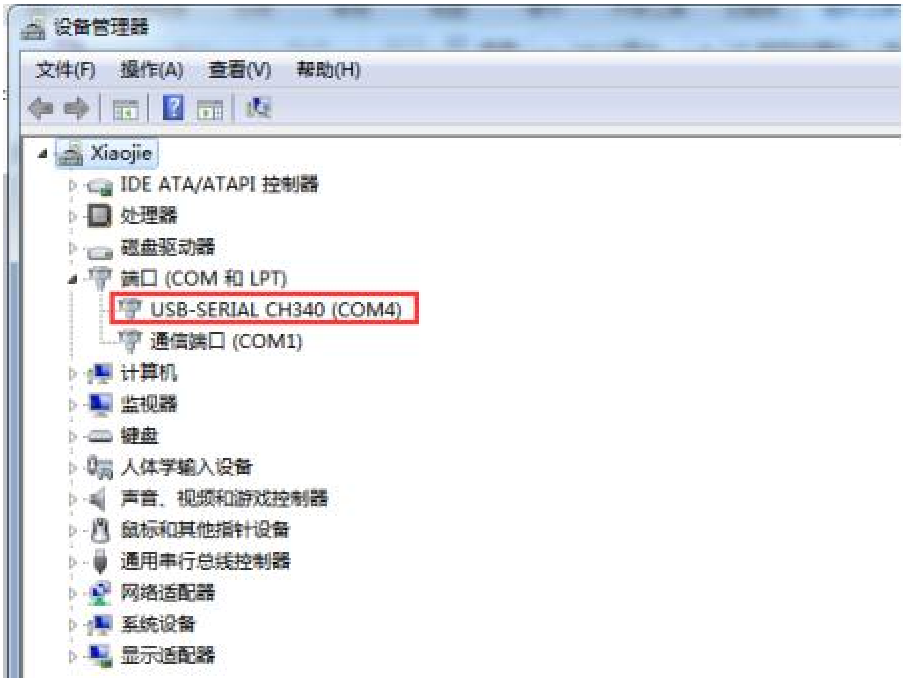


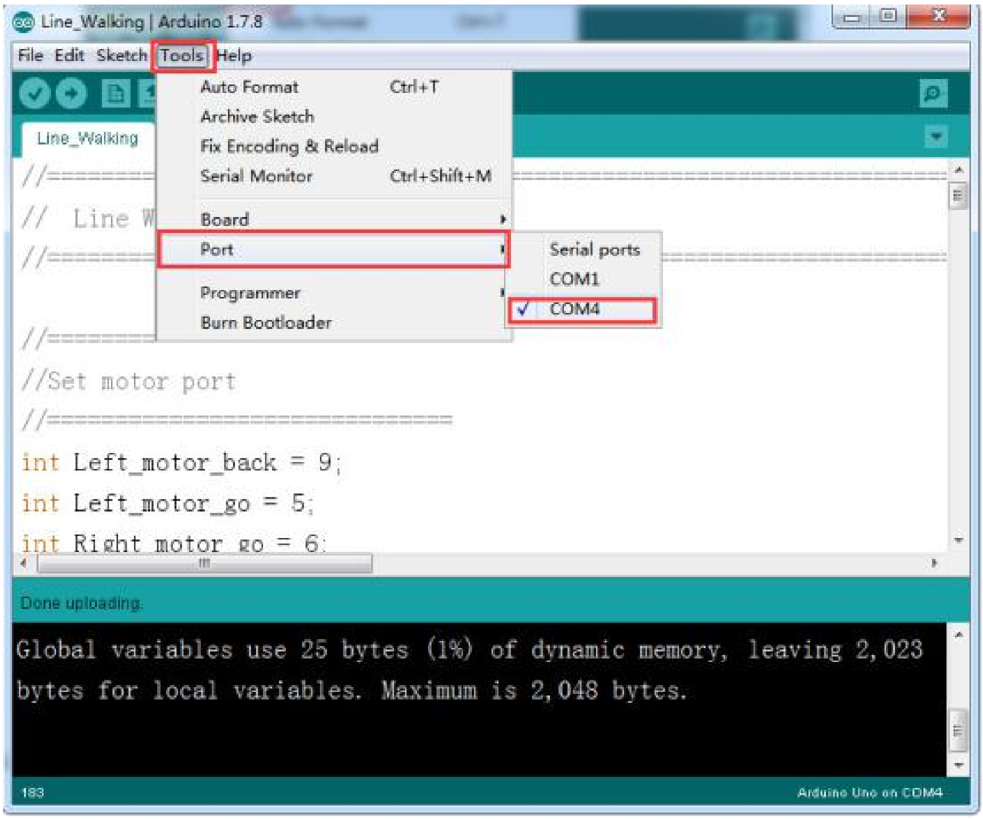
```
//======================================================================
//  Line Walking Experiment
//======================================================================


//==============================
//Set motor port
//==============================
int Left_motor_back = 9;
int Left_motor_go = 5;
int Right_motor_go = 6;
```

Done uploading.

```
Global variables use 25 bytes (1%) of dynamic memory, leaving 2,023
bytes for local variables. Maximum is 2,048 bytes.
```

2. In the menu bar of Arduino IDE, we need to select 【Tools】---【Port】--- selecting the port that the serial number displayed by the device manager just now, as shown in the figure below.





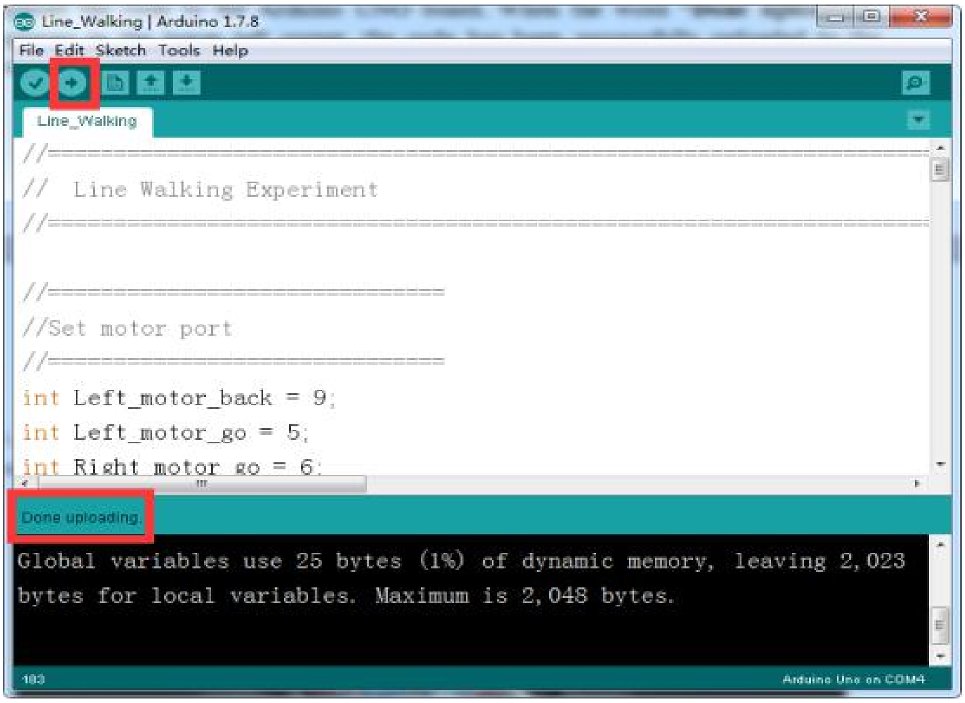
```
//=======
//  Line W
//=======

//=======
//Set motor port
//=============================
int Left_motor_back = 9;
int Left_motor_go = 5;
int Right_motor_go = 6;
```

Done uploading.

```
Global variables use 25 bytes (1%) of dynamic memory, leaving 2,023
bytes for local variables. Maximum is 2,048 bytes.
```

183 Arduino Uno on COM4

3. After the selection is completed, you need to click “→”under the menu bar to upload the code to the Arduino UNO board. When the word “**Done uploading**” appears in the lower left corner, the code has been successfully uploaded to the Arduino UNO board, as shown in the figure below.



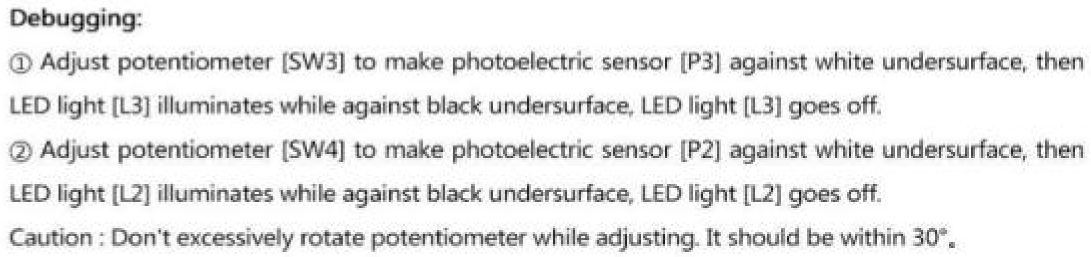
```
//==========================================================================
//  Line Walking Experiment
//==========================================================================

//=============================
//Set motor port
//=============================
int Left_motor_back = 9;
int Left_motor_go = 5;
int Right_motor_go = 6;
```

Done uploading.

```
Global variables use 25 bytes (1%) of dynamic memory, leaving 2,023
bytes for local variables. Maximum is 2,048 bytes.
```

183 Arduino Uno on COM4

4. After the program is successfully downloaded, adjust potentiometers SW3 and SW4 to the correct angle.

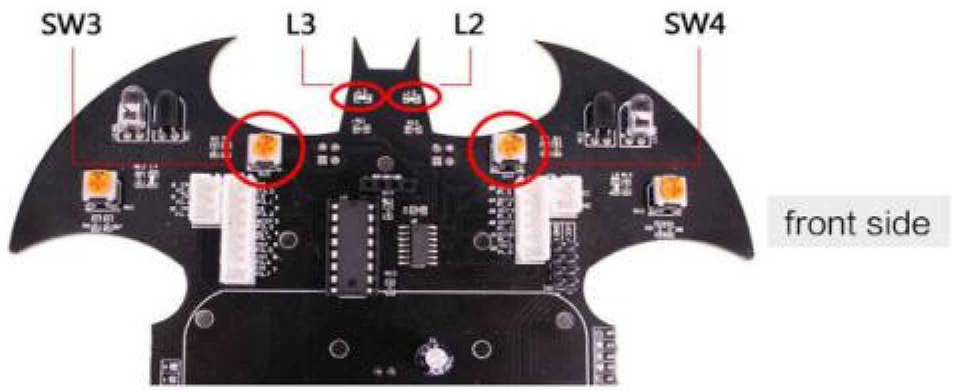


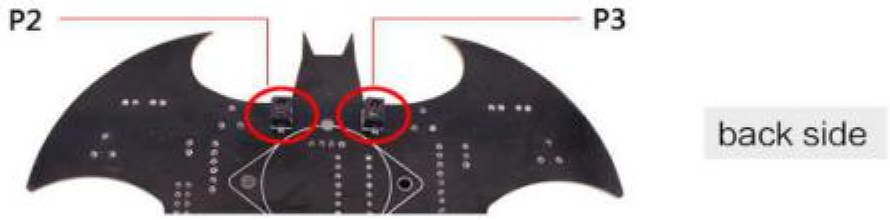
Debugging:

① Adjust potentiometer [SW3] to make photoelectric sensor [P3] against white undersurface, then LED light [L3] illuminates while against black undersurface, LED light [L3] goes off.

② Adjust potentiometer [SW4] to make photoelectric sensor [P2] against white undersurface, then LED light [L2] illuminates while against black undersurface, LED light [L2] goes off.

Caution : Don't excessively rotate potentiometer while adjusting. It should be within 30°.





5.Put the BatCar on the patrol tarck and press the start button K1. With a short whistle, the BatCar starts running along the black line.