





Lesson 5 Using WS2812 to Make Lights

In this lesson, we will learn how to use the WS2812 RGB LED module to make colorful lights that can change various colors.

5.1 Components used in this course

Components	Quantity	Picture
AdeeptPixie Drive Board	1	
Micro USB Cable	1	
3 pin jumper wire	1	
WS2812	1	

5.2 About WS2812 RGB LED module

5.2.1 WS2812 RGB LED module

WS2812 RGB LED module is a low-power RGB tri-color lamp integrated with a current control chip. Its appearance is the same as a 5050LED lamp bead, and each element is a pixel. The pixel contains an intelligent digital interface data latch signal shaping and amplifying drive circuit, as well as a high-precision internal oscillator and a 12V high-voltage programmable constant current control part, which effectively ensures that the color of the pixel is highly consistent.



5.2.2 Working principle of WS2812 RGB LED module

The data protocol of WS2812 adopts a single-wire return-to-zero code communication method. After the pixel is power-on reset, the DIN terminal accepts the data transmitted from the controller. The first 24bit data sent is extracted by the first pixel and sent to the pixel. After the remaining data is reshaped and amplified by the internal shaping processing circuit, the remaining data is forwarded and output to the next cascaded pixel with the DO port. After each pixel is transmitted, the signal is reduced by 24bit. The pixel adopts automatic shaping and forwarding technology, so that the number of cascaded pixels is not limited by signal transmission, only limited by the signal transmission speed requirement.

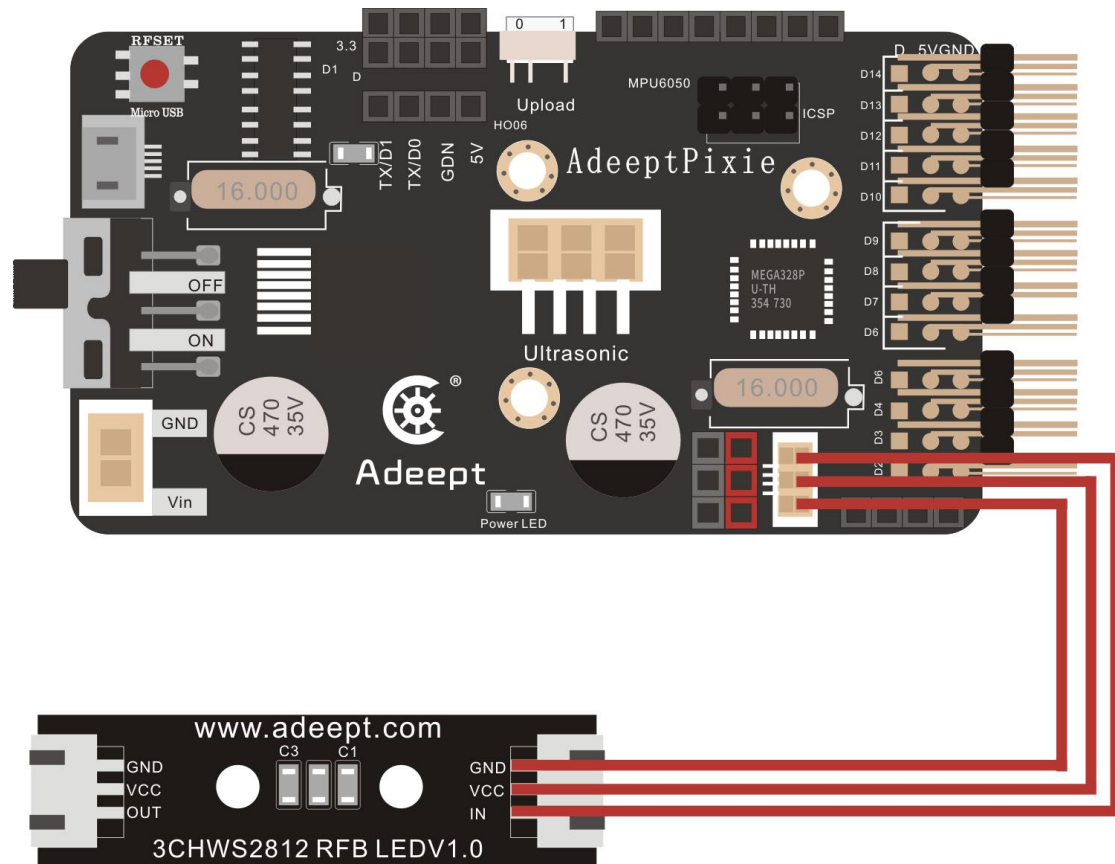
5.2.3 setPixelColor (i, color) method

The first parameter of setPixelColor(i,color) is the number of the LED in WS2812, the number closest to the MCU pin is 0; color describes the color of the pixel, representing the brightness levels of red, green and blue respectively, and 0 is the darkest. 255 is the maximum brightness; we need to use strip.Color(R,G,B) to convert the color into an integer value.

5.3 Wiring diagram (circuit diagram)

Before the experiment, we connected the components used in this lesson to the circuit as shown in the figure below. Connect the WS2812 RGB module to the

WS2812 port on the AdeeptPixie Drive Board, as shown in the figure below:

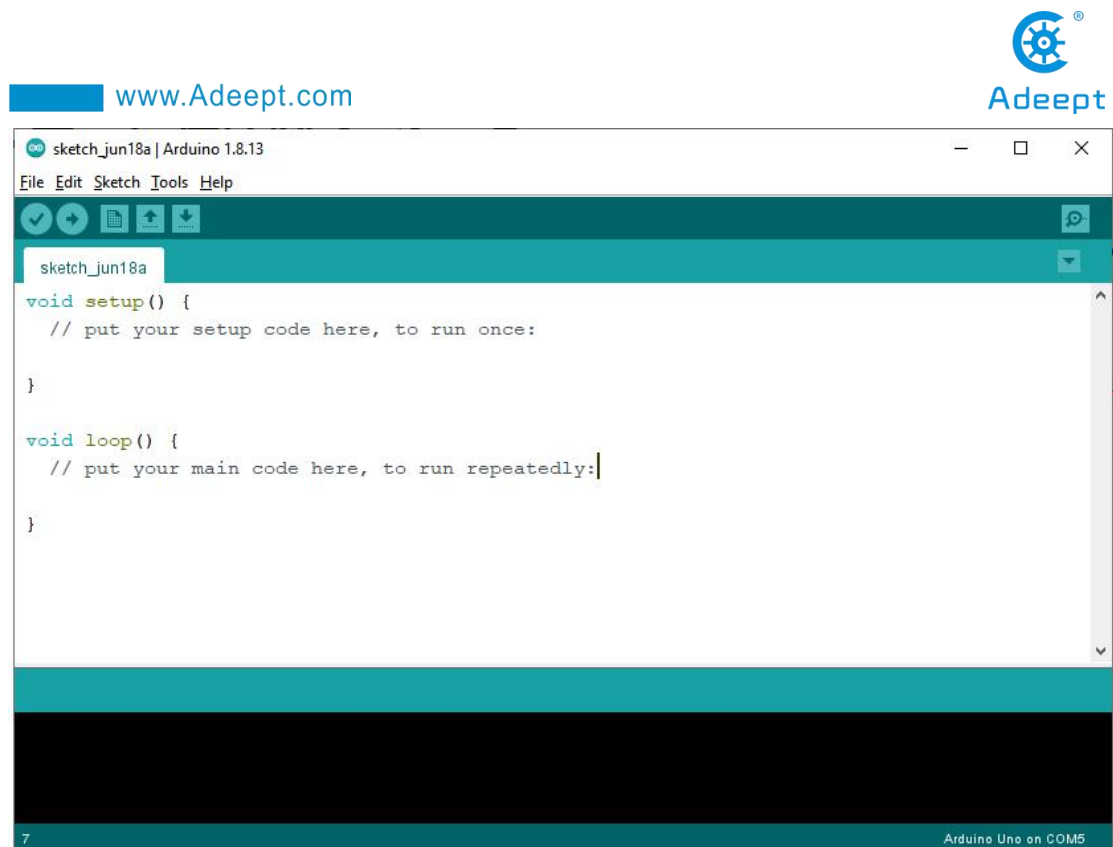


5.4 How to control WS2812 RGB LED module

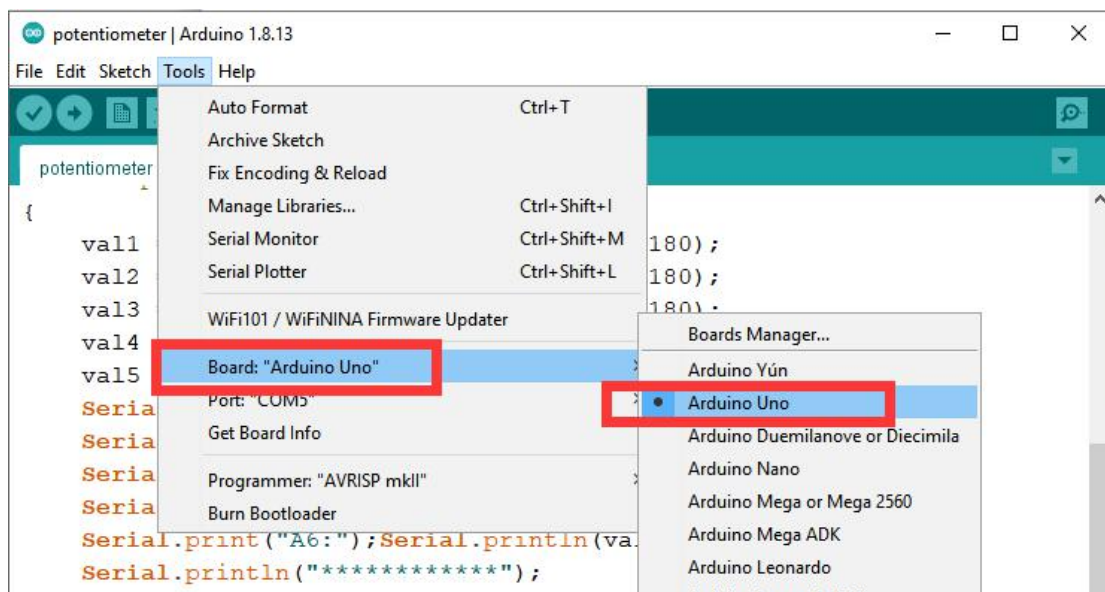
We use C language to program and control the WS2812 RGB LED module on the AdeeptPixie Drive Board with the Arduino IDE. You need to master the C language. Let's learn how to control the WS2812 RGB LED module.

5.4.1 Running the code program of this lesson

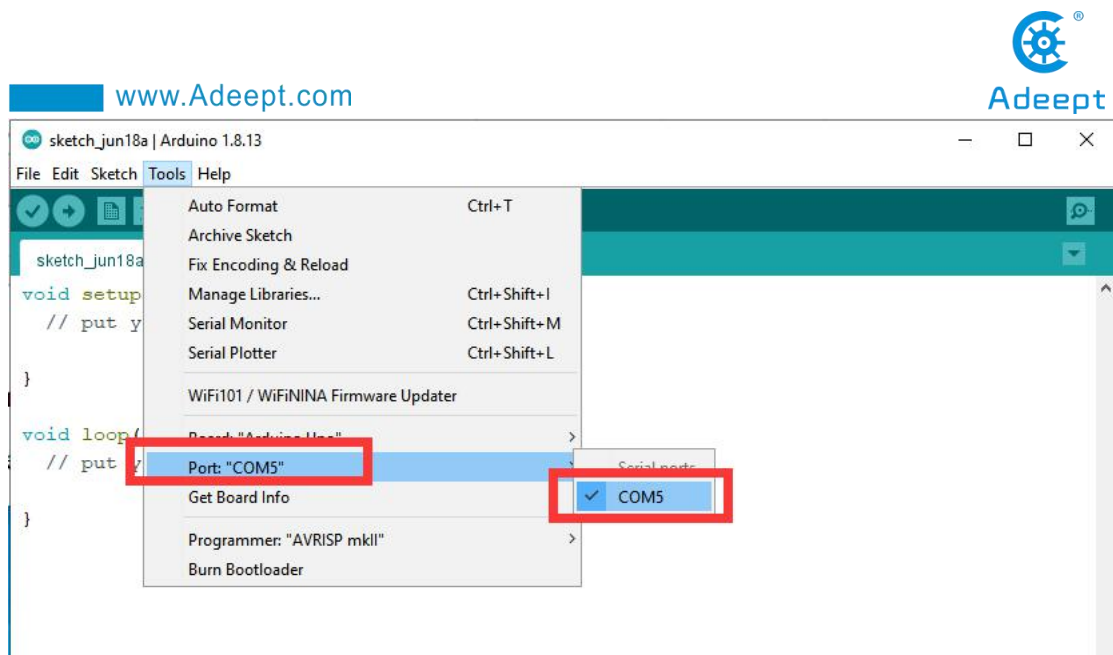
1. You need to use Micro USB Cable to connect AdeeptPixie Drive Board to your computer, and then open the Arduino IDE, as shown below:



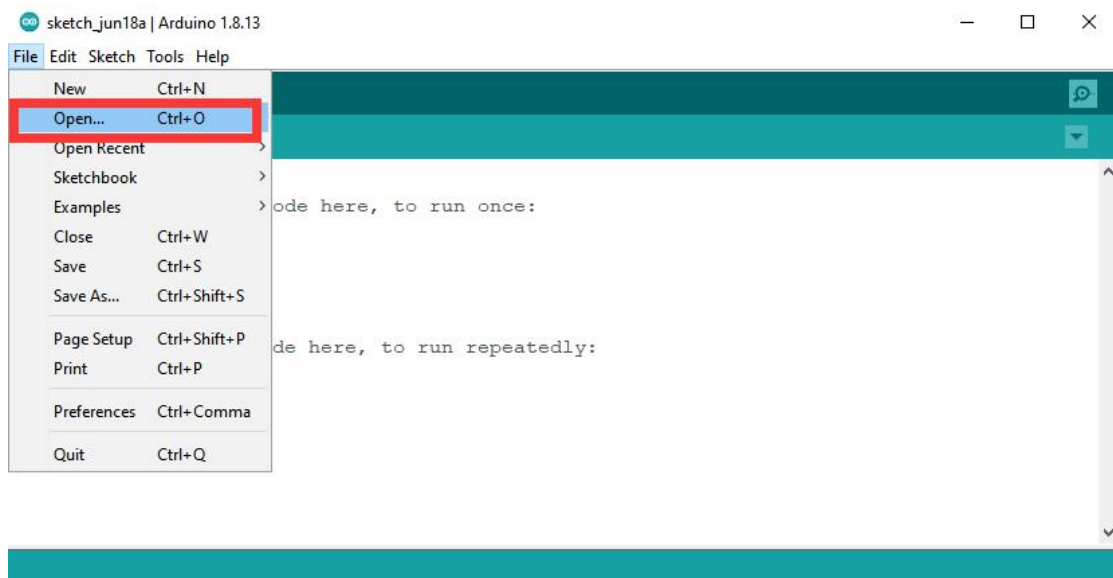
2. In the Tools toolbar, find Board and select Arduino Uno, as shown below:



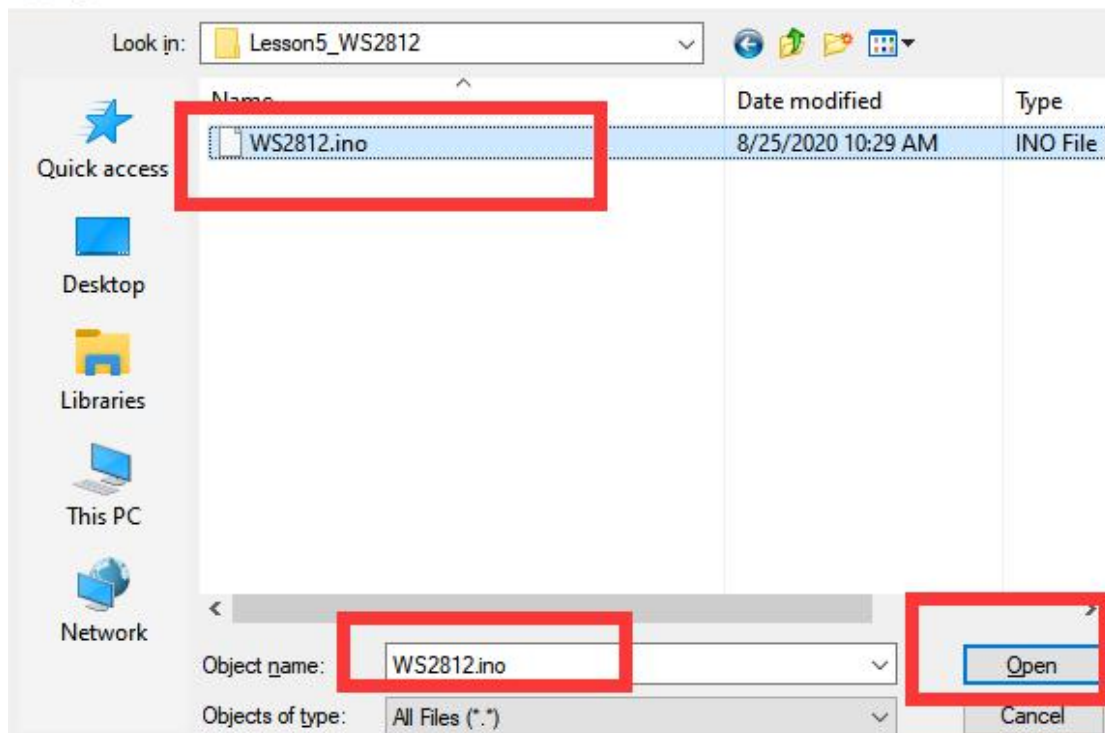
3. Click "Tools" and select the port number of the connected AdeeptPixie Drive Board in "Port": COM5, as shown in the figure below:




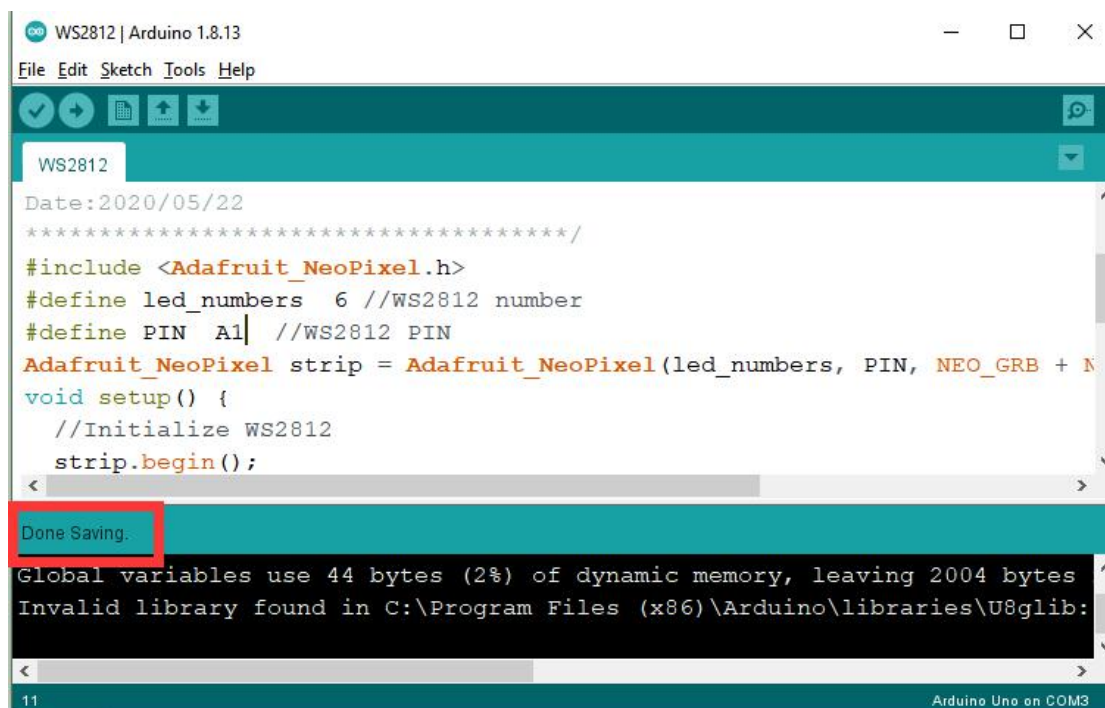
4. You need to open the code program of this lesson. In the File in the upper left corner, click Open, as shown below:



5. Find the file information provided by Adept: Hexapod 6 Legs Spider Robot Kit for Arduino\03Course code, open the Lesson5_WS2812 folder, select WS2812.ino, this file is the code program we need to use in this lesson, and then click Open.



6. After successfully opening the file, you need to click the button  to upload the code program to the AdeeptPixie Drive Board. After the upload is successful, the console will not appear a red warning, and the prompt text "Done uploading" appears in the upper left corner, as shown in the figure below:



7. After successfully uploading the program, pay attention to observe whether the color of the WS2812RGB LED module changes and flashes with different colors, indicating that the experimental test is successful.

5.4.2 Main code program

After the above practical operation, you must be very curious to know how we use the C language to program and control the WS2812 RGB LED module on the AdeptPixie Drive Board. Below we will introduce how the main code program is implemented.

In the `setup()` function, initialize the WS2812 RGB LED module with `strip.begin()`, and set the brightness of the WS2812 RGB LED module with the `strip.setBrightness(50)` function.

In the `loop()` function, use the `random()` function to randomly set the R, G, B values of the WS2812 RGB LED module, and use the for loop to light up the WS2812 RGB LED module, which has 6 LEDs. The first parameter of the `setPixelColor(i,color)` function is the number of the LED in the WS2812, the number closest to the MCU pin is 0; color represents the color of the pixel, which represents the brightness level of red, green and blue respectively, and 0 is the darkest, 255 is the maximum brightness; use `strip.Color(R,G,B)` to convert the color into a value.

```
void setup() {  
  //Initialize WS2812  
  strip.begin();  
  //Set the WS2812 brightness  
  strip.setBrightness(50);  
}  
void loop() {  
  //Get the color value at random  
  int R=random(0,255);  
  int G=random(0,255);  
  int B=random(0,255);  
  for(int i=0;i<led_numbers;i++){  
    //i:Which one lamp ,strip.Color(R,G,B):R、G、Bcolor value  
    strip.setPixelColor(i,strip.Color(R,G,B));  
    //Light WS2812  
    strip.show();  
    delay(50);  
  }  
}
```