DIGITAL & ANALOG INPUT & OUTPUT

数字、模拟输入&输出

Day03_3

DIGITAL & ANALOG INPUT & OUTPUT

DIGITAL｜数字

Information expressed as a series of discrete values, often binary (0 or 1).

This form of information is easily expressed by a computer.

呈离散量状态的（数值）信息，比如二进制数，被视为数字信息 / 信号。这种形式的信息计算机很容易表示和理解

PHOTO BY BRIAN

ANALOG｜模拟

Information expressed as a continuously variable physical quantity such as a position or voltage. This form of data is not easily understood or expressed by a computer.

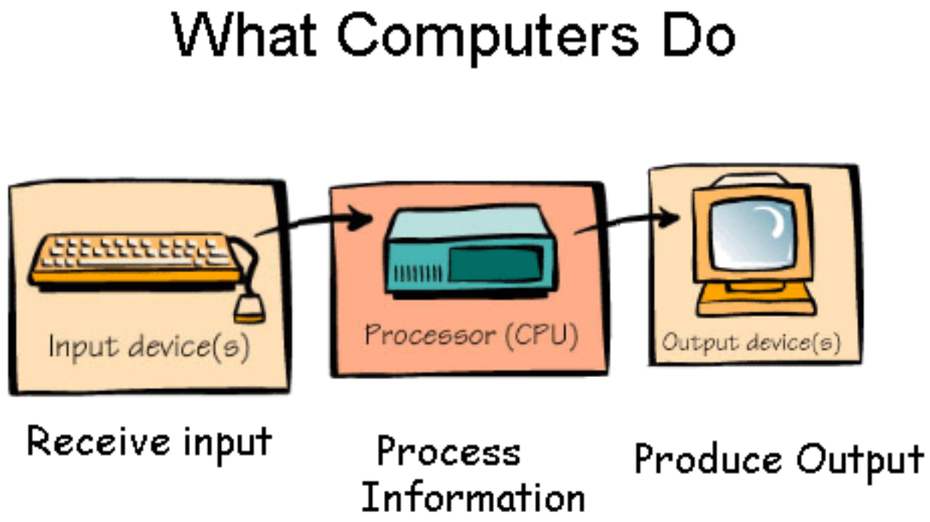
以连续物理量的形式呈现的信息数值，如位置或者电压，为模拟信号
这种形式的数据不容易被计算机理解和表达

PHOTO BY JASON J ONES

INPUT｜输入

Input is the feeding of information into a device or system.
In the case of an Arduino, input takes the form of electrical signal supplied by the circuit into the general purpose input output (GPIO) pins of the Arduino.

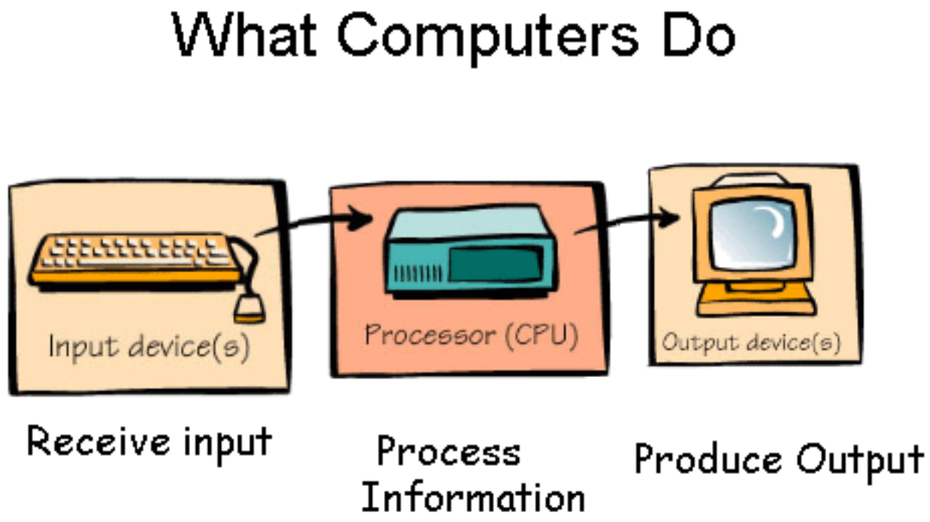
输入指信息进入设备或系统，对ARDUINO而言，输入指电子信号通过GPIO（通用型输入输出引脚）进入ARDUINO



OUTPUT｜输出

Output is the result supplied by a system or device. In the case of an Arduino, output takes the form of an electrical signal supplied by the general purpose input output (GPIO) pins of the Arduino into the circuit.

输出指设备或者系统提供结果反馈，对ARDUINO而言，输出指其通用型输入输出支持的电子信号



DIGITAL INPUT｜数字输入

Often it is enough to know if a condition in the real world is true or false. For example, if a door is open or closed, if someone has pressed a button or not, or if someone is present or not in a room. We can use digital input to convey this kind of information.

在真实的世界中，true / false就能表达大多数状况，比如门是开还是关，按钮是按下了还是没有，或者某个人在与不在某个空间中。数字输入信号可以表达这种信息

DIGITAL INPUT PINS｜数字输入引脚

An Arduino has 14 digital input pins, labeled 0 – 13.
common way to use these pins is to attach a circuit with a switch to one of them.
The switch can then express digital information to the Arduino by sending a high or low voltage to the pin.

ARDUINO共有14个数字输入引脚，依次标号为0-13，通常情况下我们可将开关连接到这些引脚上，通过这些引脚，开关即可向ARDUINO发送high或者low电压

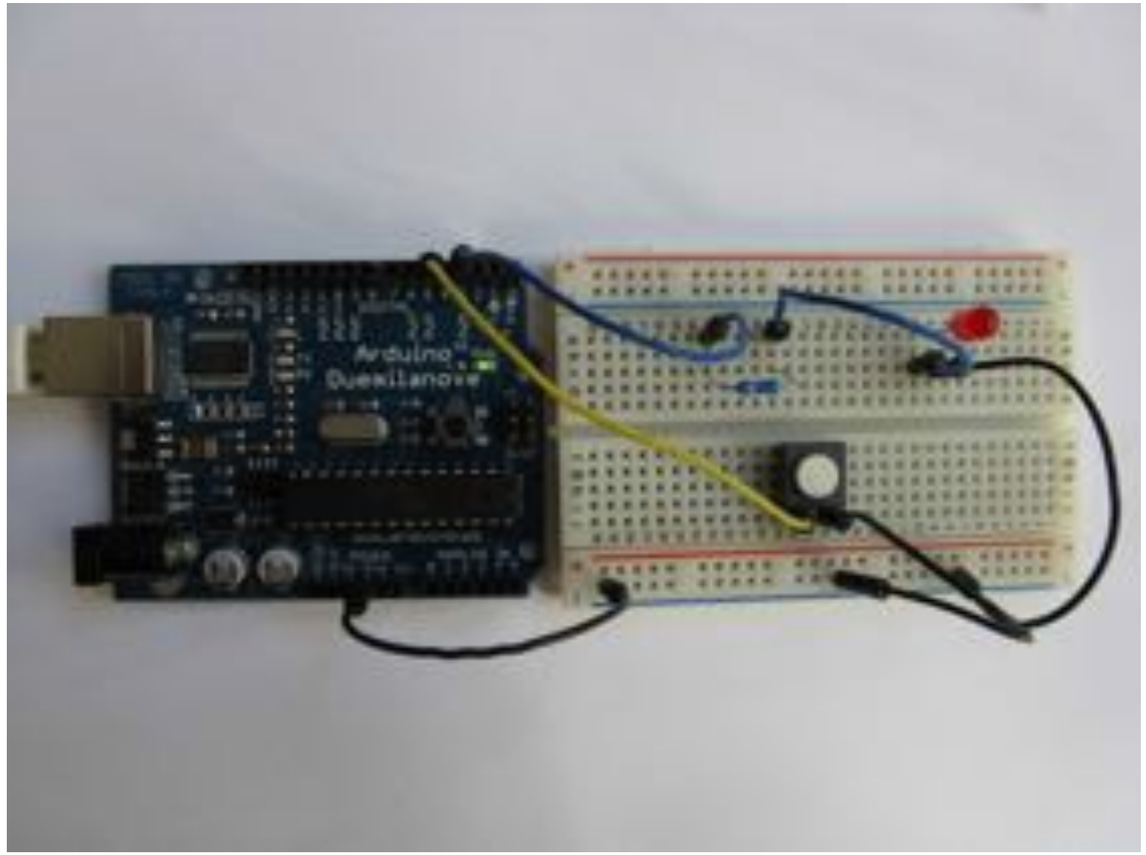


PHOTO BY JUSTIN MCLEAN

PINS 0 (RX) AND 1 (TX) | 0&1号引脚

Pins 0 and 1 are also the RX and TX pins respectively. RX receives data. TX sends data. Because you use these pins for sending and receiving data, you cannot use them while your arduino is connected to your computer via USB. Generally, don't use pins 0 and 1

基本上来讲，不要使用0号和1号引脚：0号（RX号）引脚是用于（USB）接收信号，1号（TX号）引脚用于输出信号，如果ARDUINO通过USB与电脑相连，这两个引脚将被占用

PHOTO BY WAIHUNG.NET

SWITCHES｜开关

Switches come in many different shapes, sizes, and configurations. Switches can be normally open (NO) or normally closed (NC).
A normally open switch does not conduct electricity until someone presses it.
A normally closed switch acts the opposite way, by conducting electricity until someone presses it.
开关的外观各不相同。而可根据其状态分为 normally open (NO) 常开开关or normally closed (NC)常合开关，常开开关一直处于开路断开状态直到按下才闭合接通。常合开关则一直处于闭合接通状态

PHOTO FROM WIKIPEDIA

DIGITAL OUTPUT｜数字输出

It is also often enough to set a condition in the real world to be true or false.
For example, to turn a light or a motor fully on or fully off. We can use digital output to convey this kind of information.

真实世界中，大多数情况都可以用true或者false表达。比如灯或者电机开或者是关，我们可以用数字输出去表达这种信息

DIGITAL OUTPUT PINS｜数字输出引脚

The same digital input pins can also be configured as digital output pins. When configured as outputs, these pins are capable of sending a high or low voltage out, which in turn activates the electrical component(s) that are connected to the pin.

数字输入引脚同样可以被用作输出引脚，当作为输出引脚使用时，我们可以向这个引脚发送HIGH和LOW指令／电压，并激活连接到这个引脚的电子元件。

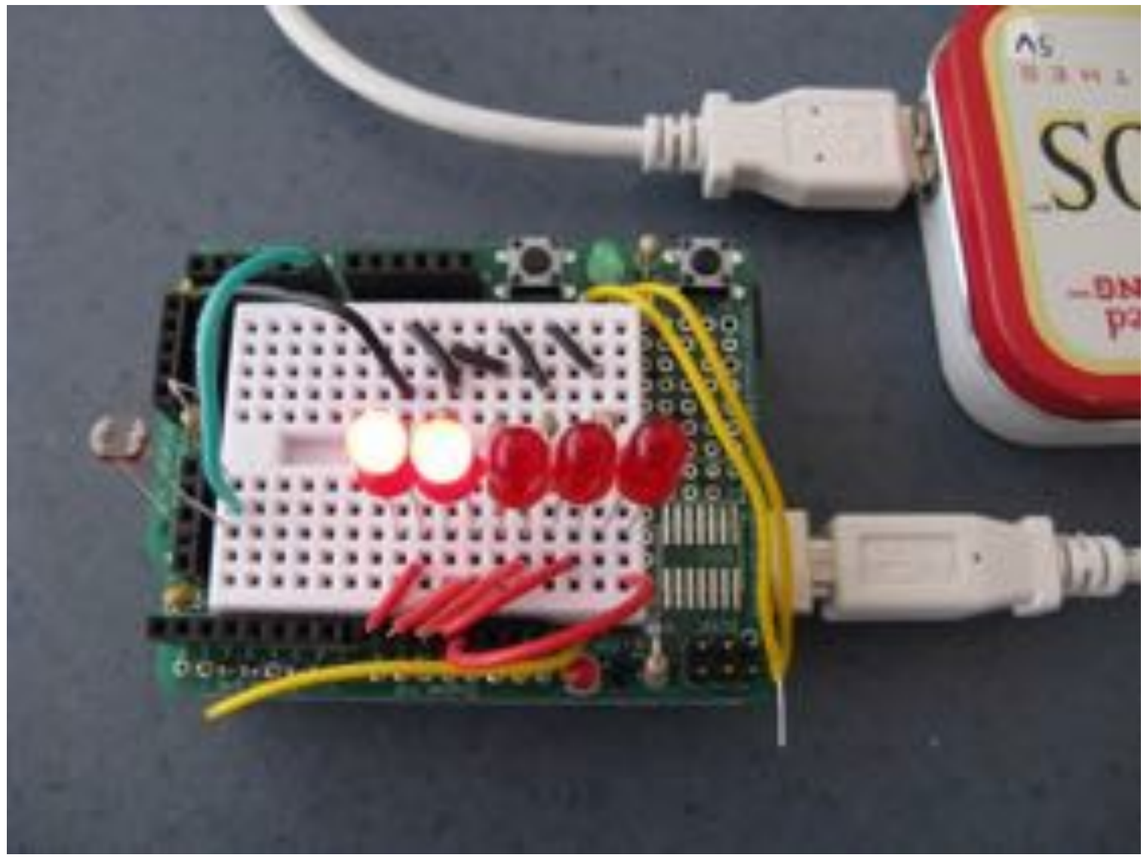


PHOTO BY LENP17

ANALOG INPUT｜模拟输入

Sometimes you need to know in greater specificity what is happening in the world. For example, the color of the sky, the temperature outside, or precisely where someone is standing in a room.
We can use analog input to convey this kind of information.

然而在有些情况下，你需要更加细致地知道正在发生的情况。比如天空的颜色，室内的温度或者你在房间里的位置。
我们需要使用模拟输入去传送这样的信息

ANALOG INPUT PINS｜模拟输入引脚

When an attached circuit sends a voltage range between 0 and 5V to an analog input pin, it is converted to a number between 0 and 1023 by the Arduino’s analog-to- digital converter (ADC).
The analog input pins are labeled A0 - A5.

模拟输入引脚通过ARDUINO的数模转换器将输入的0-5V的电压转化成0-1023的数字。
模拟输入引脚标记是A0－A5

PHOTO BY ROO REYNOLDS

SENSORS｜传感器

A sensor is a type of input circuit capable of converting a physical quality into an electrical signal that is acceptable to an input pin.

传感器指能将物理信号转化为能被输入引脚读取的电子信号的电路

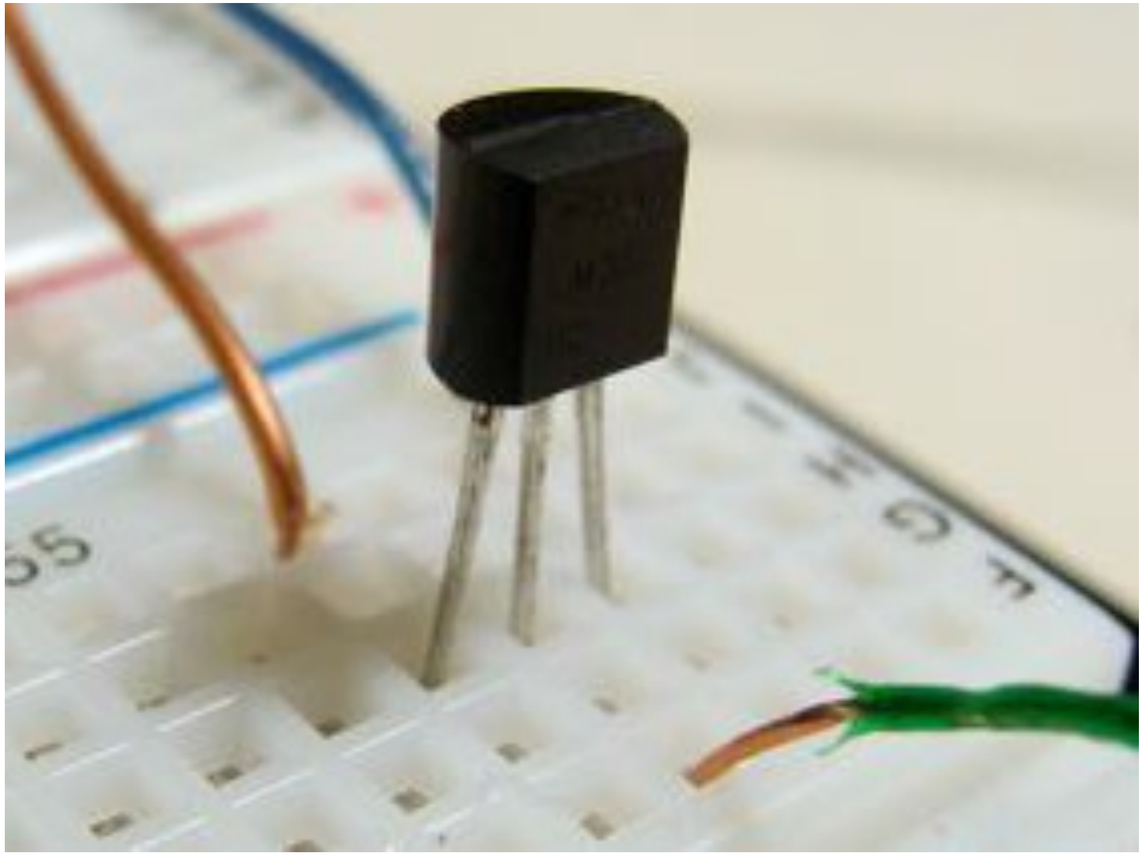


PHOTO BY DANIEL SPILLERE ANDRADE

ANALOG OUTPUT｜模拟输出

Sometimes you need to set a condition in the real world to be somewhere between fully on and fully off.For example, to vary the intensity of a light or the speed a motor.
We can use analog output to convey this kind of information.

某些情况下你会需要设定一个在绝对开和绝对关之间的数值。比如设置灯光强度、电机转速，可以使用模拟输出去传递这样的信息

PHOTO BY DENNIS CROWLEY

ANALOG OUTPUT PINS｜模拟输出引脚

Digital pins marked with a Tilde (~) symbol, are also capable of analog output. These pins are numbers 3, 5, 6, 9, 10 and 11. In the case of analog output, a number between 0 and 255 is converted to a voltage through a technique called Pulse- Width-Modulation.

标记有“～”的数字引脚（3, 5, 6, 9, 10 and 11号）也可以做输出引脚，数值0-255被转化为电压

PHOTO FROM MAKE MAGAZINE

PROGRAMMING THE ARDUINO

ARDUINO 编程

DIGITAL & ANALOG I/0 FUNCTIONS
数字&模拟输入输出function

Within the Arduino language there exists several functions that relate to digital and analog input and output.
These functions facilitate control of the Arduino's GPIO pins.

ARDUINO　语言中包含数个和数字模拟输入输出相关的function，这些function可以用来控制ARDUINO 的通用输入输出引脚

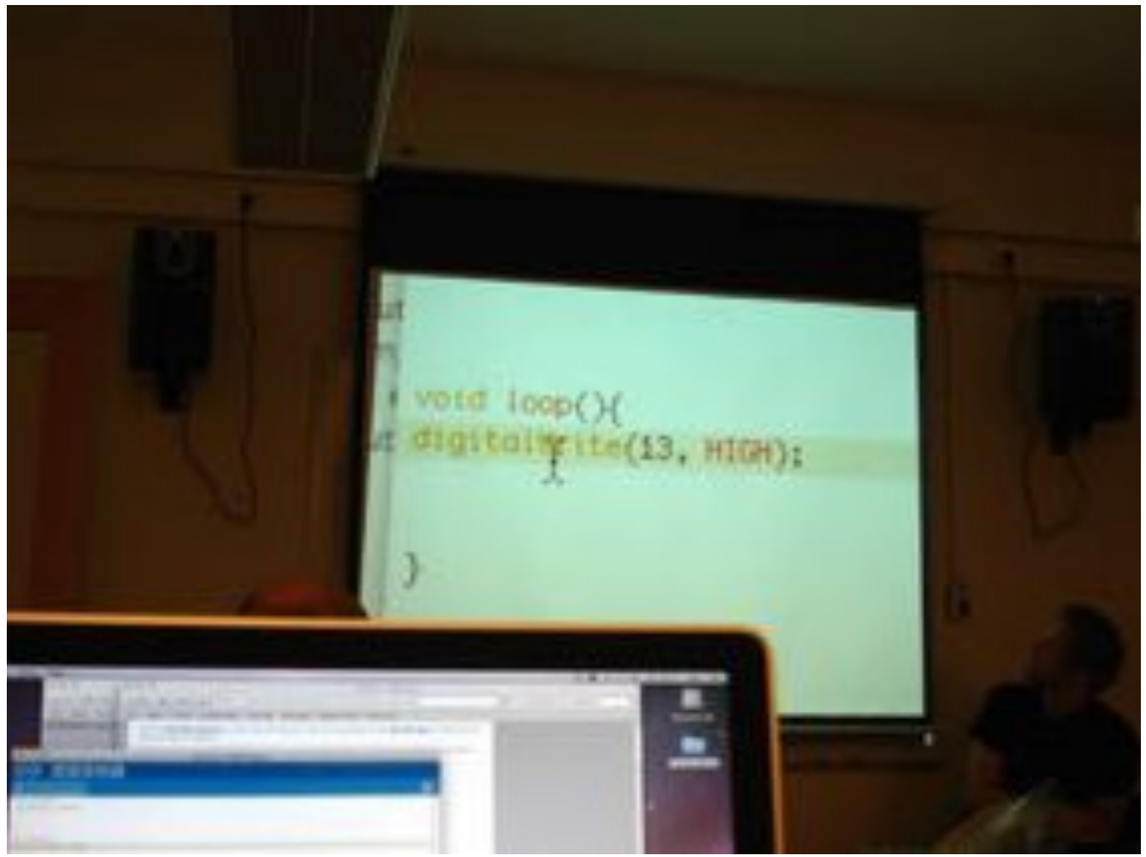


PHOTO BY LARS KRISTIAN FLEM

FUNCTIONS

```
// put your setup code here, to run once:
void setup() {
}

// put your main code here, to run repeatedly:
void loop() {
}
```

PINMODE()

pinMode() is used to configure the specified pin to behave either as an input or an output.

pinMode（）用于声明特定的引脚作为输入或者输出引脚

```
void  setup() {
  pinMode(13, INPUT);
  pinMode(13, OUTPUT);
}
```

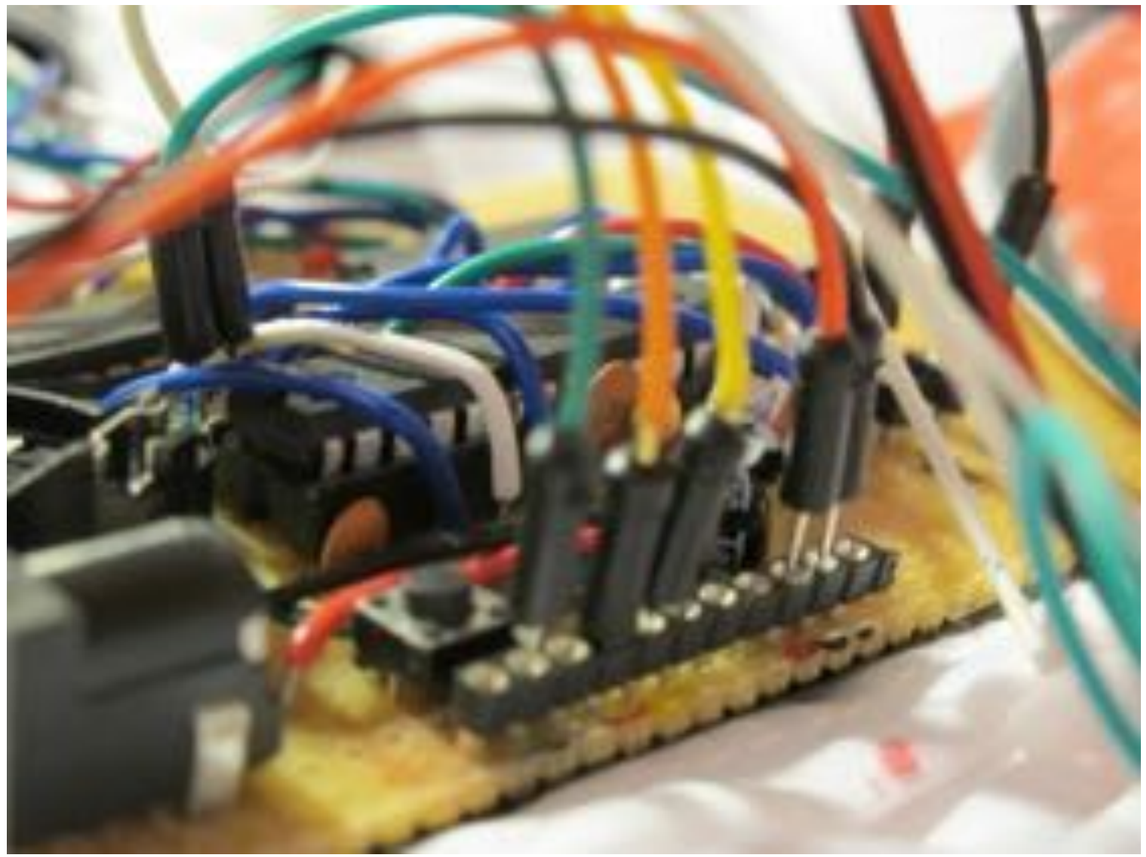


PHOTO BY RAIN RABBIT

DIGITALREAD() & DIGITALWRITE()
数字

digitalRead()：Reads as an input the value from a specified pin, interpreting it as either HIGH or LOW.
用于读取从特定引脚输入的信号值，区分为HIGH或者LOW
digitalWrite()：Writes as an output a HIGH or LOW voltage from the pin.
用于向特定引脚写入输出信号：HIGH / LOW

```
void loop() {

  digitalWrite(13, HIGH);
  digitalWrite(13, LOW);
}
```

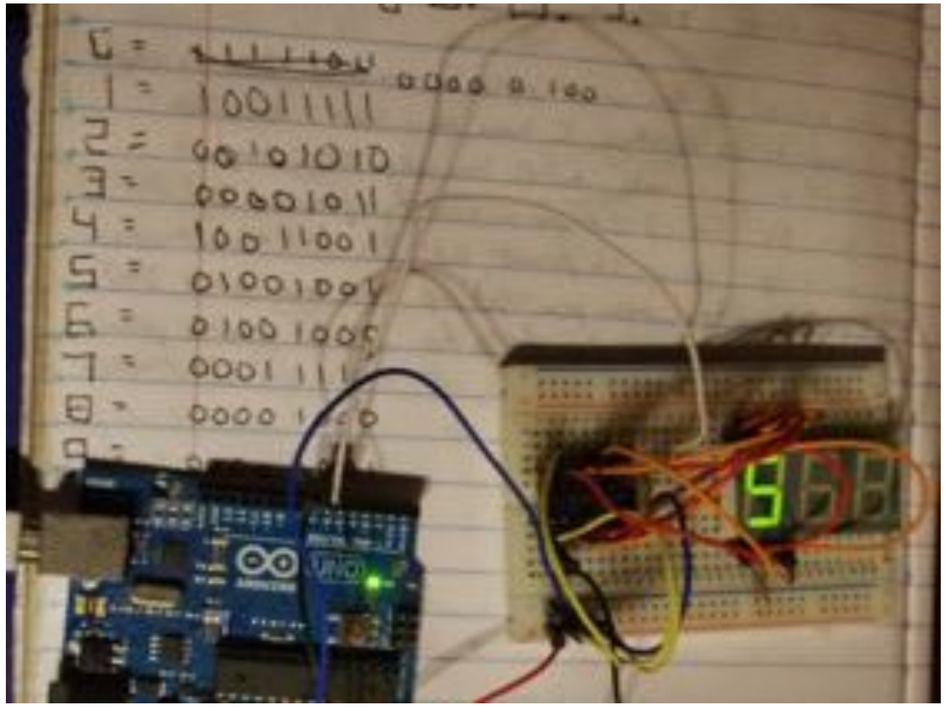


PHOTO BY MARK

DIGITAL I/0 FUNCTION USAGE
使用示例

```
void setup() {
  pinMode(13, OUTPUT);
}

void loop() {
  digitalWrite(13, HIGH);
  delay(1000);
  digitalWrite(13, LOW);
  delay(1000);
}
```

ANALOGREAD() & ANALOGWRITE()
模拟

analogRead()： reads as an input the voltage from the specified analog pin, converting it to a value between 0 and 1023.no pinMode() for analogRead() analogWrite() writes as an output a voltage between 0 and 5V based on a value specified between 0 and 255. pinMode(pin, OUTPUT) necessary for analogWrite()

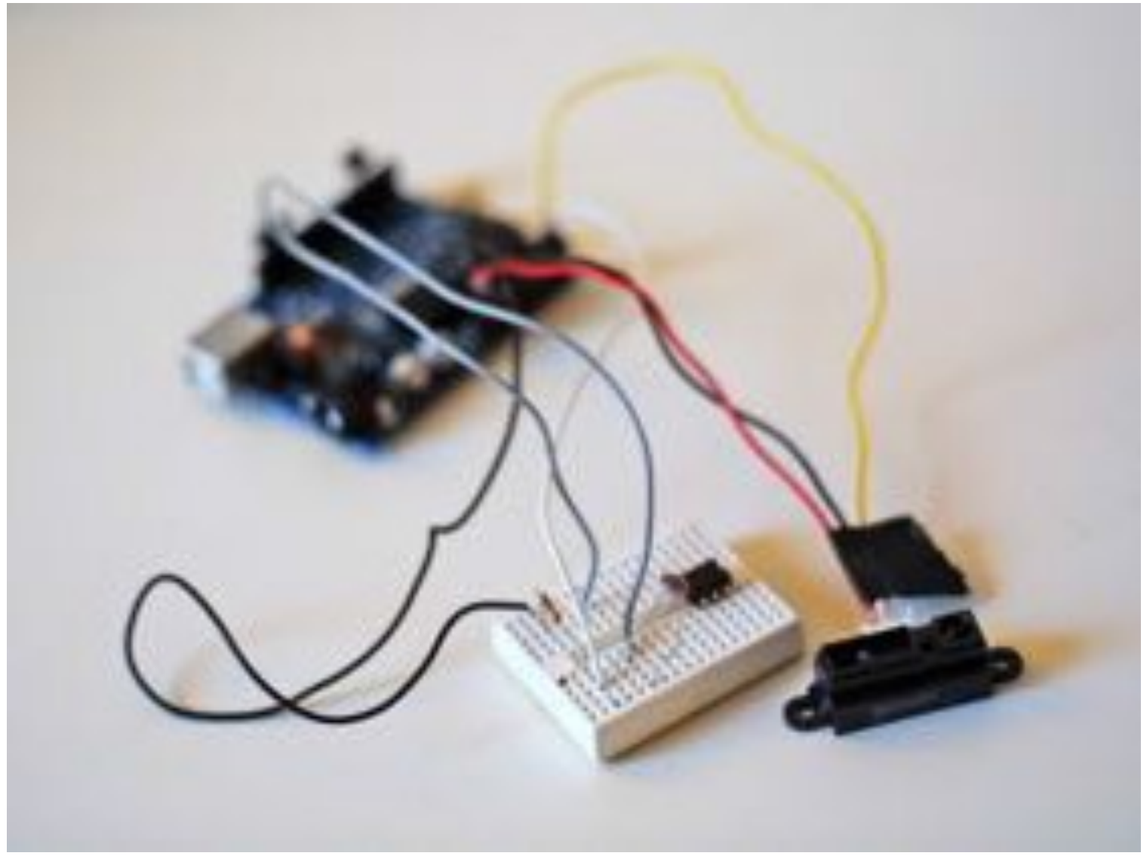


PHOTO BY JEANBAPTISTEPARIS

ANALOGREAD() & ANALOGWRITE()
模拟

analogRead（）从特定的模拟输入引脚读取区间为0-1023的值， 不需要pinMode定义annalogRead（因为使用独立的一组引脚）

analogWrite（）向特定的模拟输出引脚写入区间为0-255的值， 需要pinMode（pin,OUTPUT）

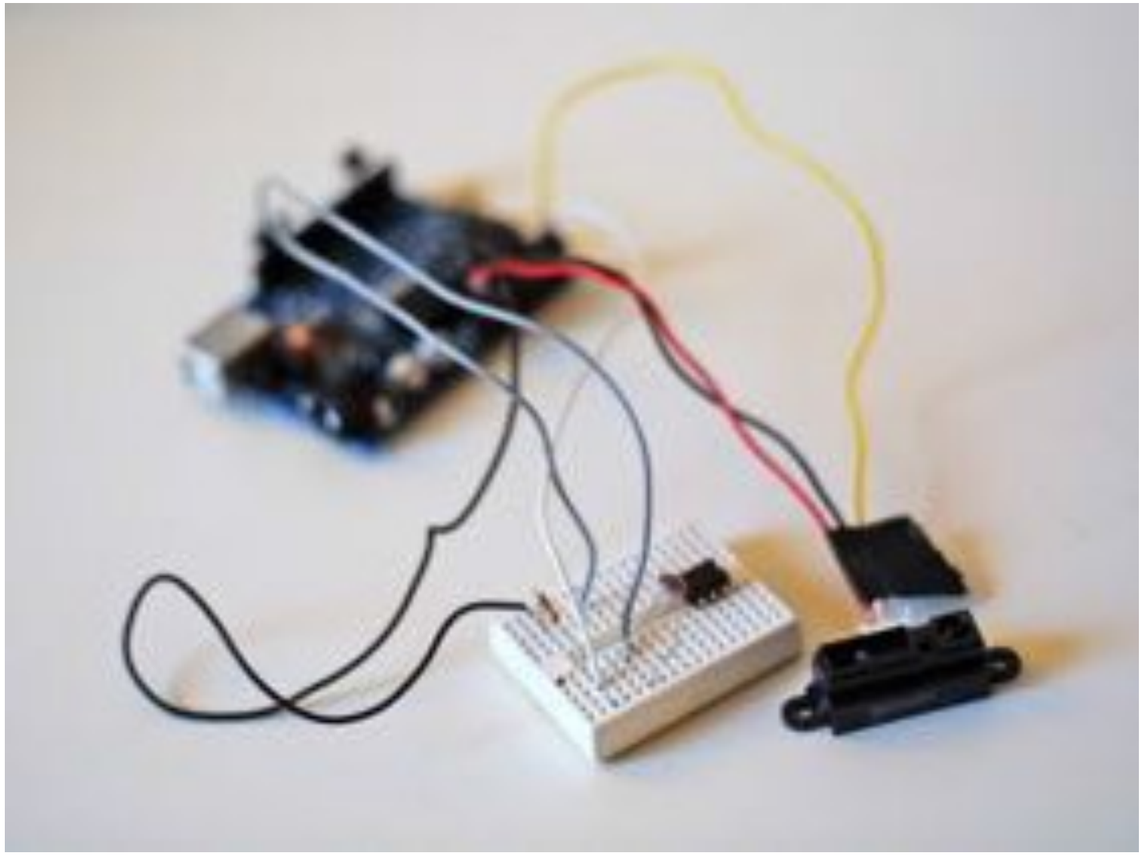


PHOTO BY JEANBAPTISTEPARIS

ANALOG I/0 FUNCTION USAGE
使用示例

```
int val = 0;  // this is a variable

void setup() {
  pinMode(9, OUTPUT);
}

void loop() {
  val = analogRead(0);
  analogWrite(9, val / 4);
}
```

ARDUINO TUTORIALS
ARDUINO教程

ARDUINO TUTORIALS

Arduino tutorials are available on the Arduino website here:

- arduino.cc/en/Tutorial/

By following these examples, you will be provided with an introduction to various important concepts.

PHOTO BY ARDUINO

BLINK & FADE TUTORIALS

Complete the Blink Tutorial available here: arduino.cc/en/Tutorial/blink

Once you have that working, try completing the Fade tutorial:

arduino.cc/en/Tutorial/fade

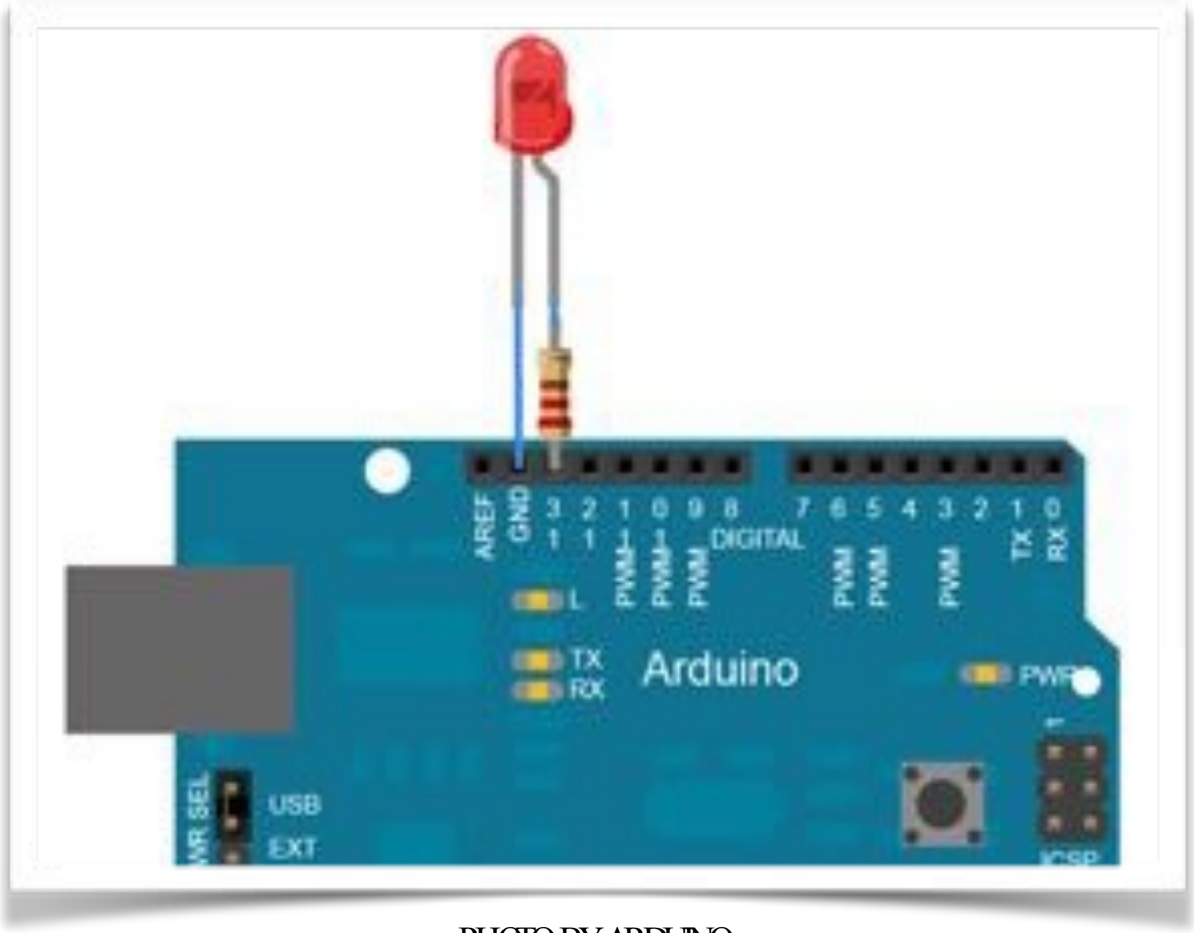


PHOTO BY ARDUINO

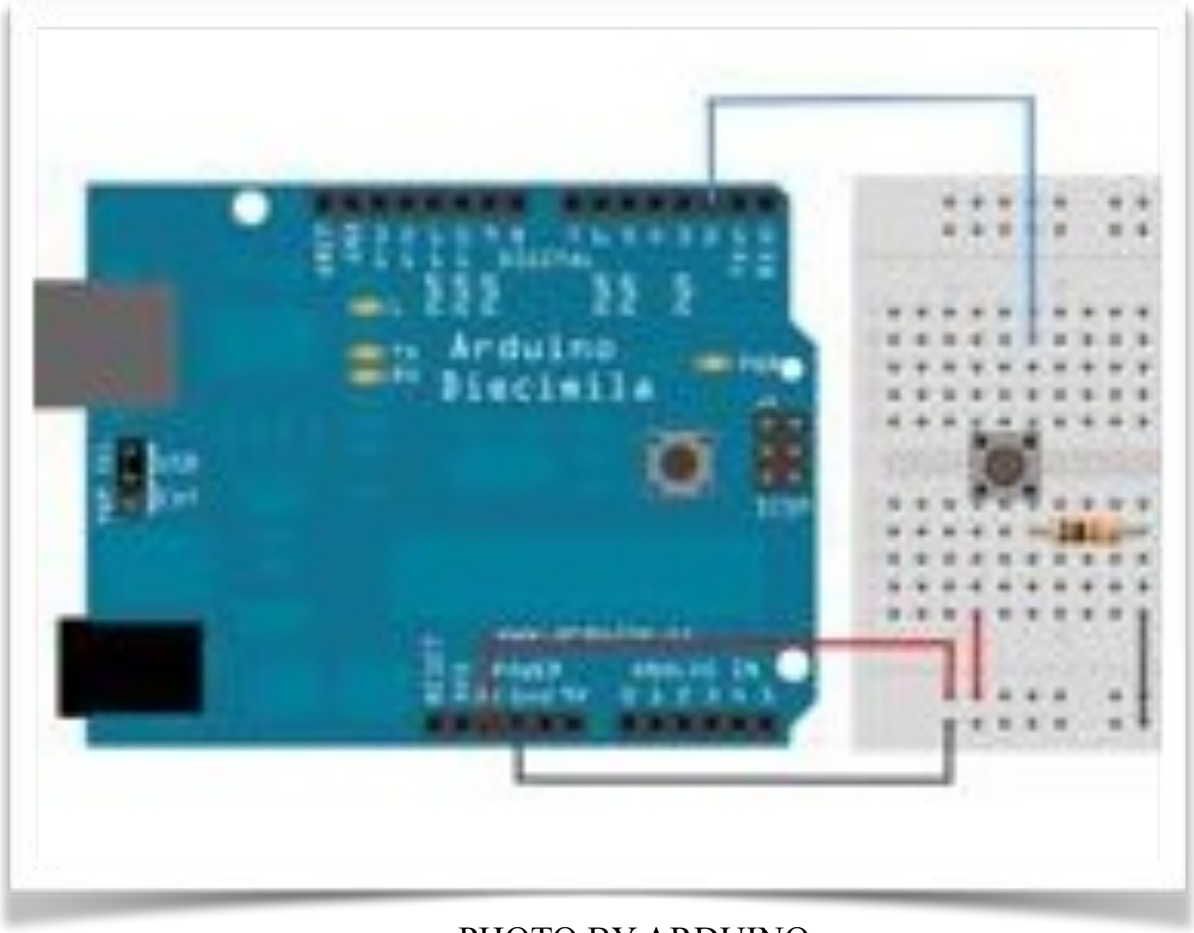
BUTTON & ANALOG INPUT TUTORIALS

Complete the Button Tutorial available here:

- arduino.cc/en/Tutorial/Button

Once you have that working, try completing the Analog InOutSerial tutorial:

- arduino.cc/en/Tutorial/AnalogInOutSerial



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