創意編程設計大賽

CREATIVE CODER COMPETITION

進階工作坊 <Arduino>

Advanced Training Workshop

主辦機構
Organizer

香港青年協會
the hongkong federation of youth groups

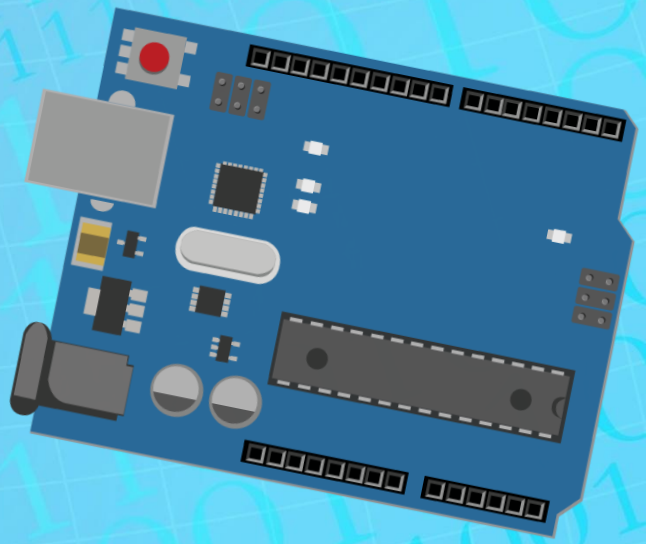
贊助
Sponsor

創新科技署
Innovation and Technology Commission

HKSTP 香港科技園

初階工作坊流程

- Arduino使用（第二部分）
- 2017/18創意編程設計大賽
  - 任務挑戰項目(ME)



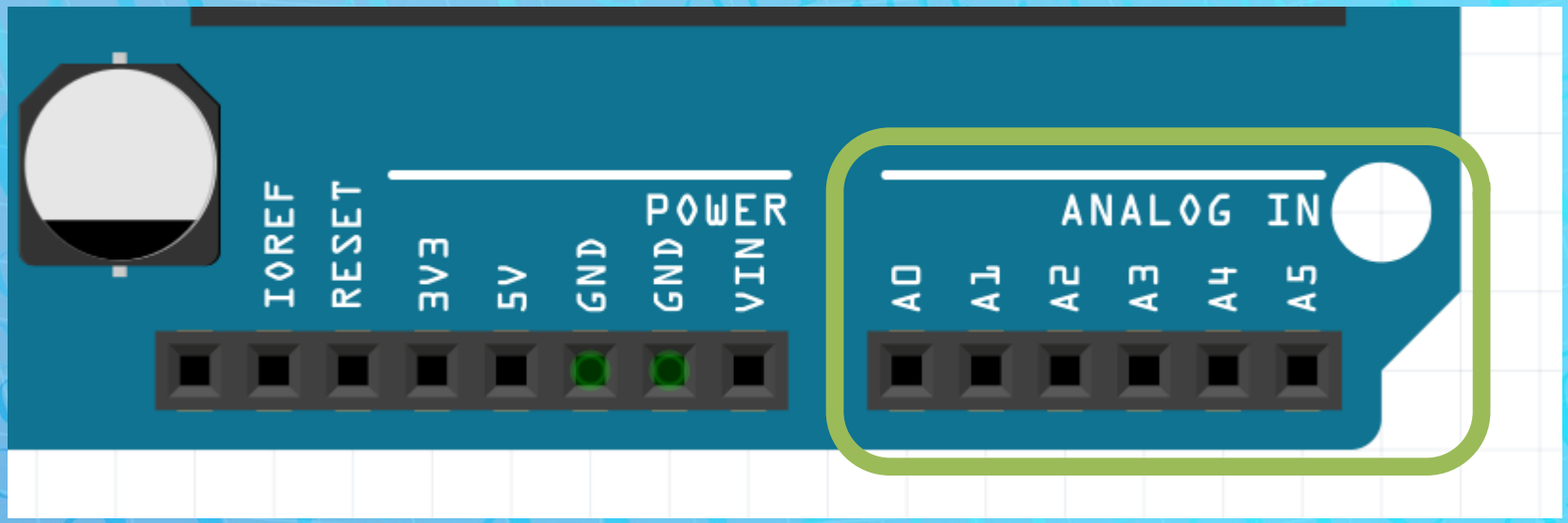
使用mBlock步驟

1. 電腦連接Arduino UNO
2. 開啟mBlock程式
3. 選擇語言(English)
4. [Connect] →於[Serial Port]中選擇最大COM Port (Windows) 或最大modem (MacOS)
5. [Board] → 選擇Arduino UNO
6. [Edit] →[Arduino mode]

如果連接出現任何問題，請重覆以上步驟

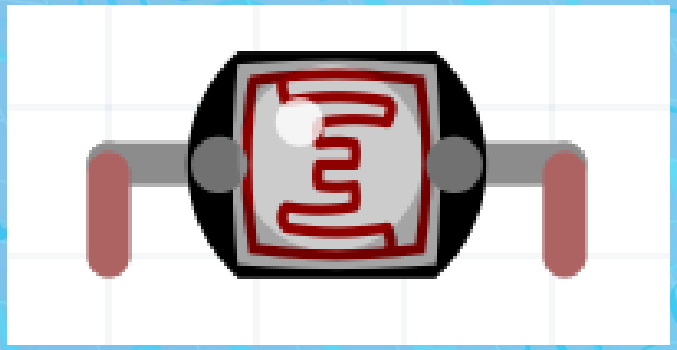
重溫一下：類比輸入 Analog-in

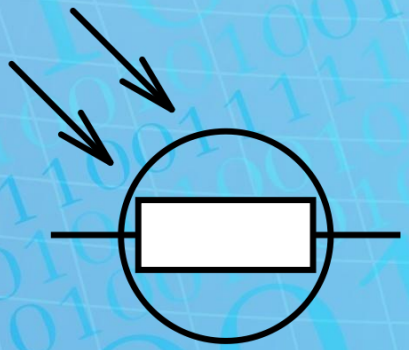
1. Arduino部分接腳位設定為類比數碼轉換器 (Analog to Digital Convertor, ADC)
2. 數值由0至1023 (總數：1024或2^{10})
3. 例子：可變電阻 (繼電器)、光敏電阻 (LDR)

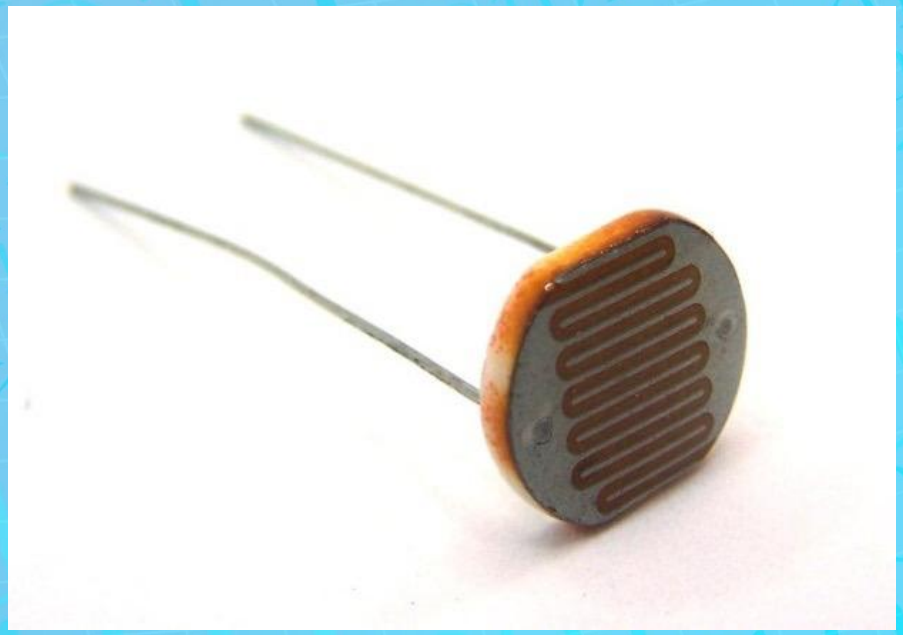


光敏電阻
Light dependant Resistor, LDR

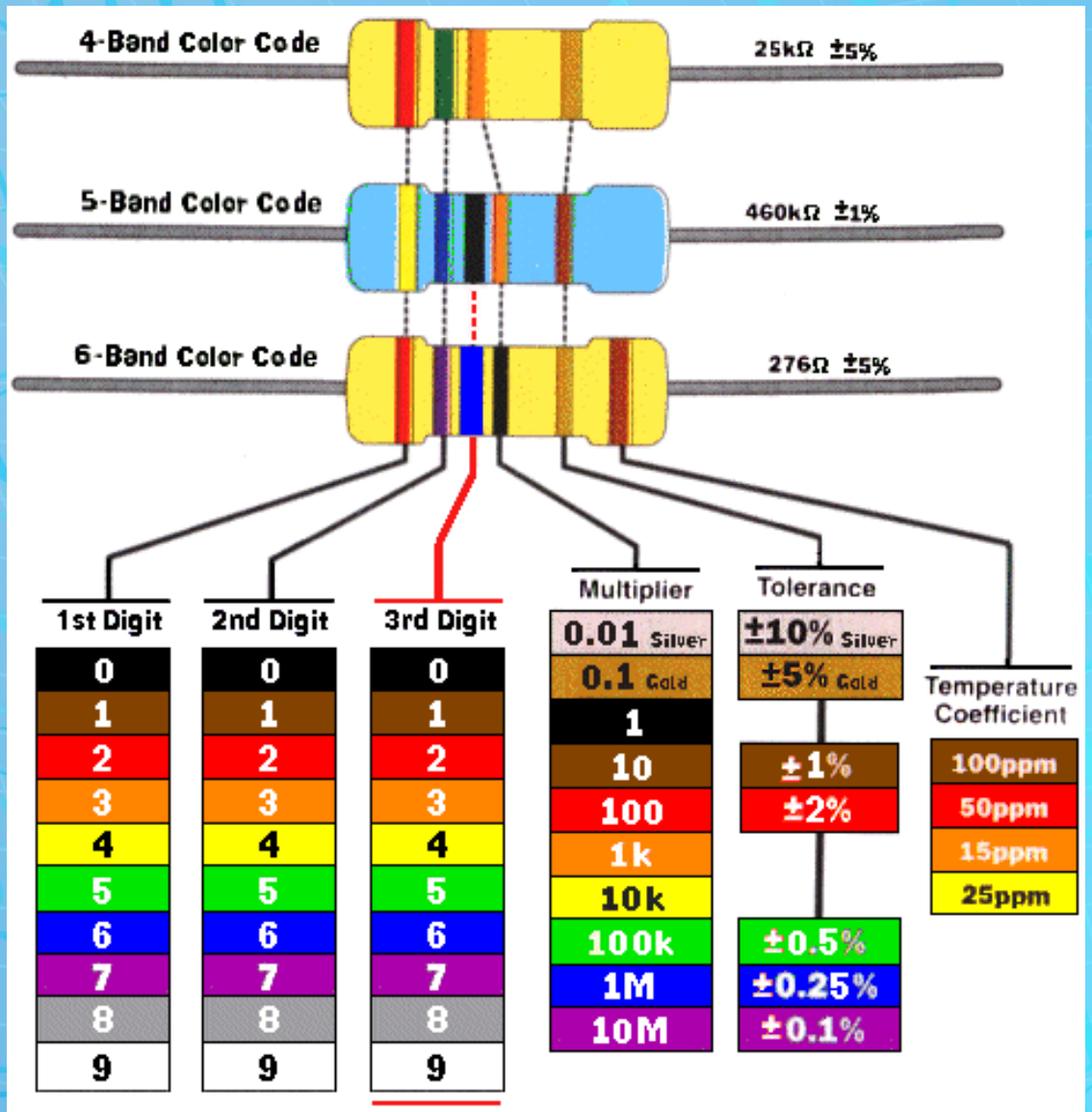
- 光度增加 -> 電阻下降



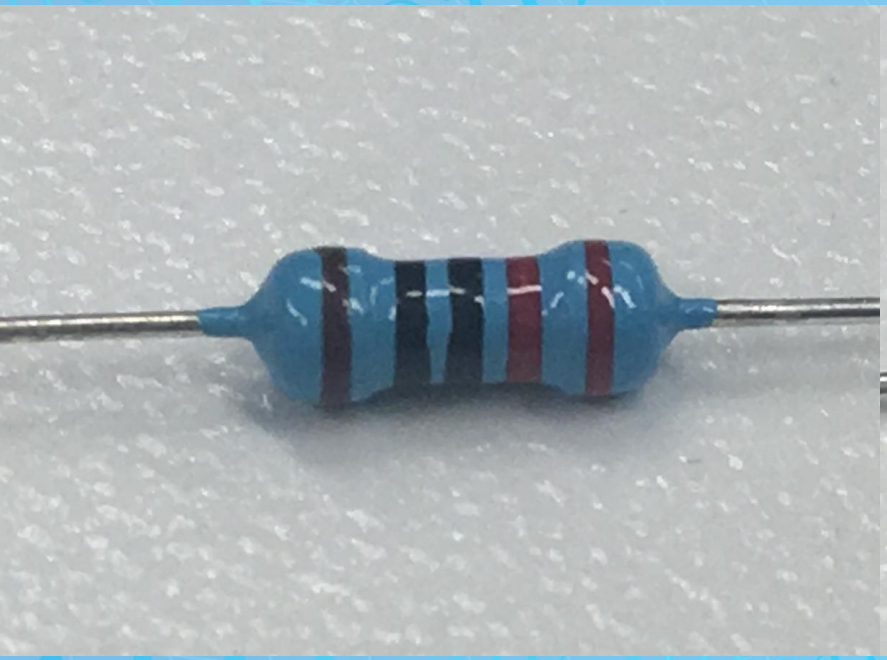




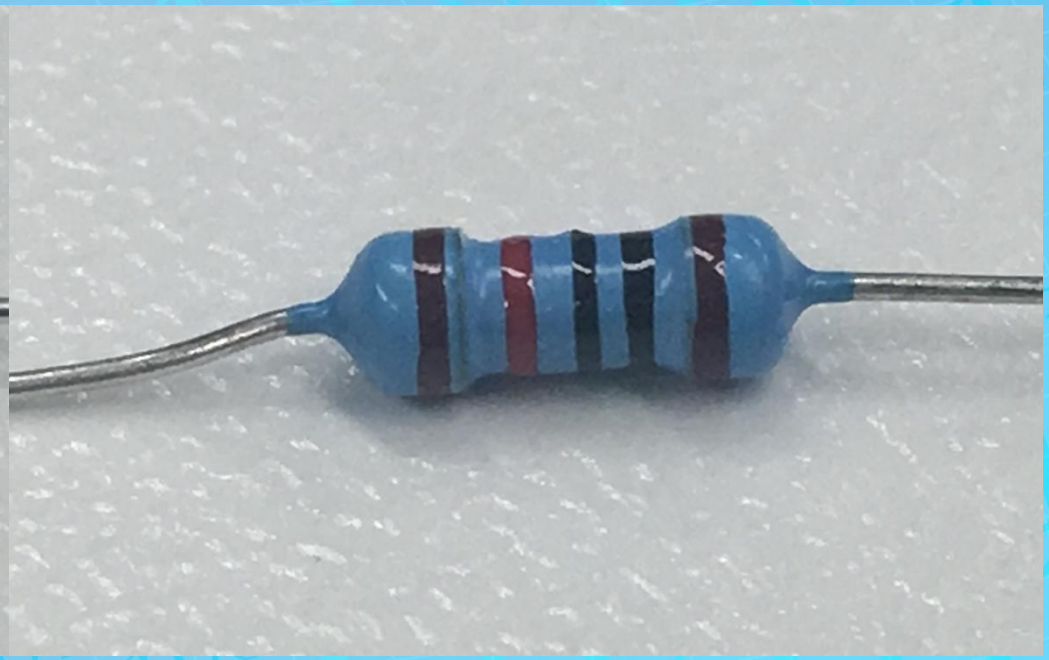
固定電阻


4-Band Color Code
25kΩ ±5%
5-Band Color Code
460kΩ ±1%
6-Band Color Code
276Ω ±5%
1st Digit
2nd Digit
3rd Digit
Multiplier
Tolerance
Temperature Coefficient
0
1
2
3
4
5
6
7
8
9
0.01 Silver
0.1 Gold
1
10
100
1k
10k
100k
1M
10M
±10% Silver
±5% Gold
±1%
±2%
±0.5%
±0.25%
±0.1%
100ppm
50ppm
15ppm
25ppm

固定電阻

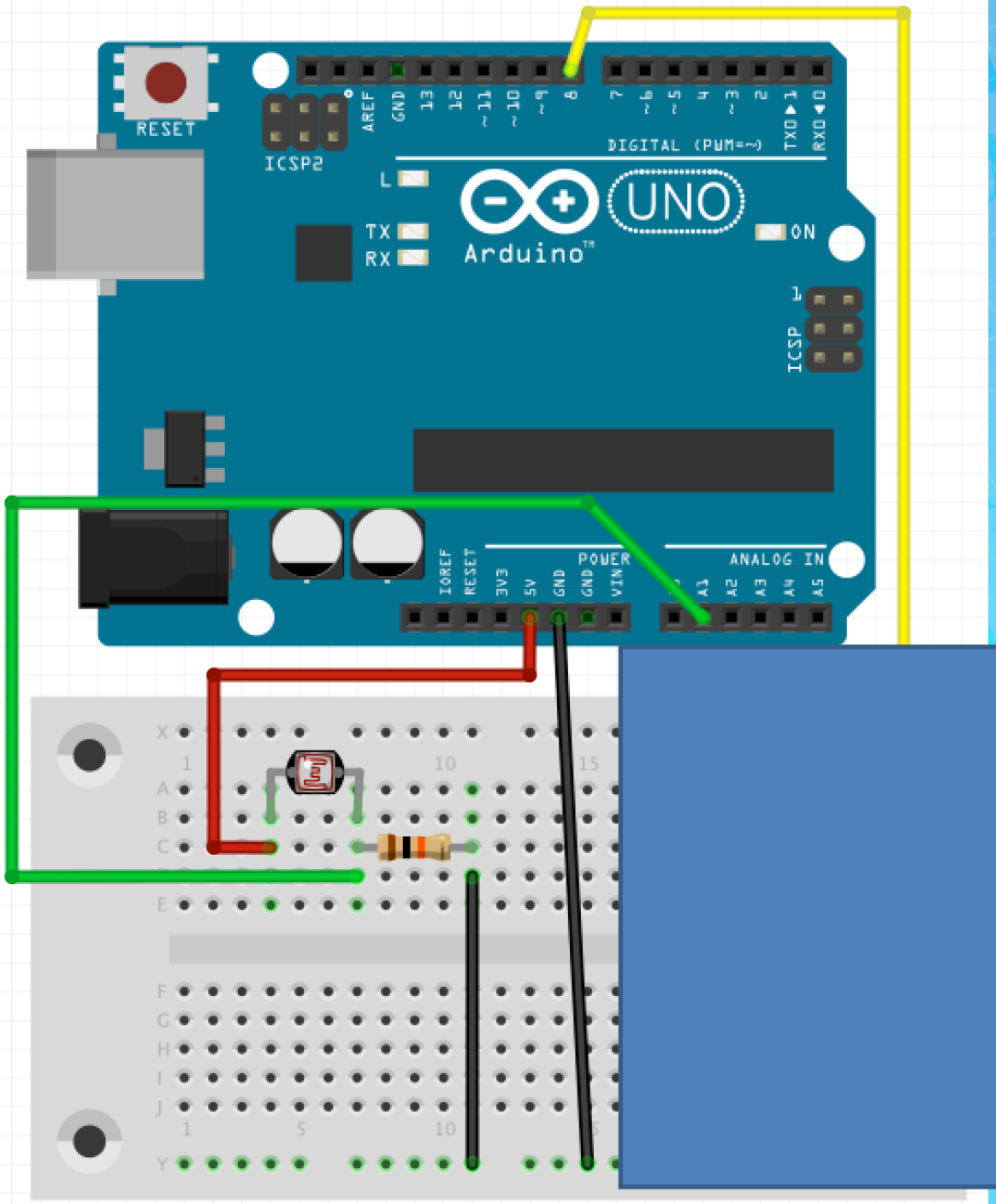


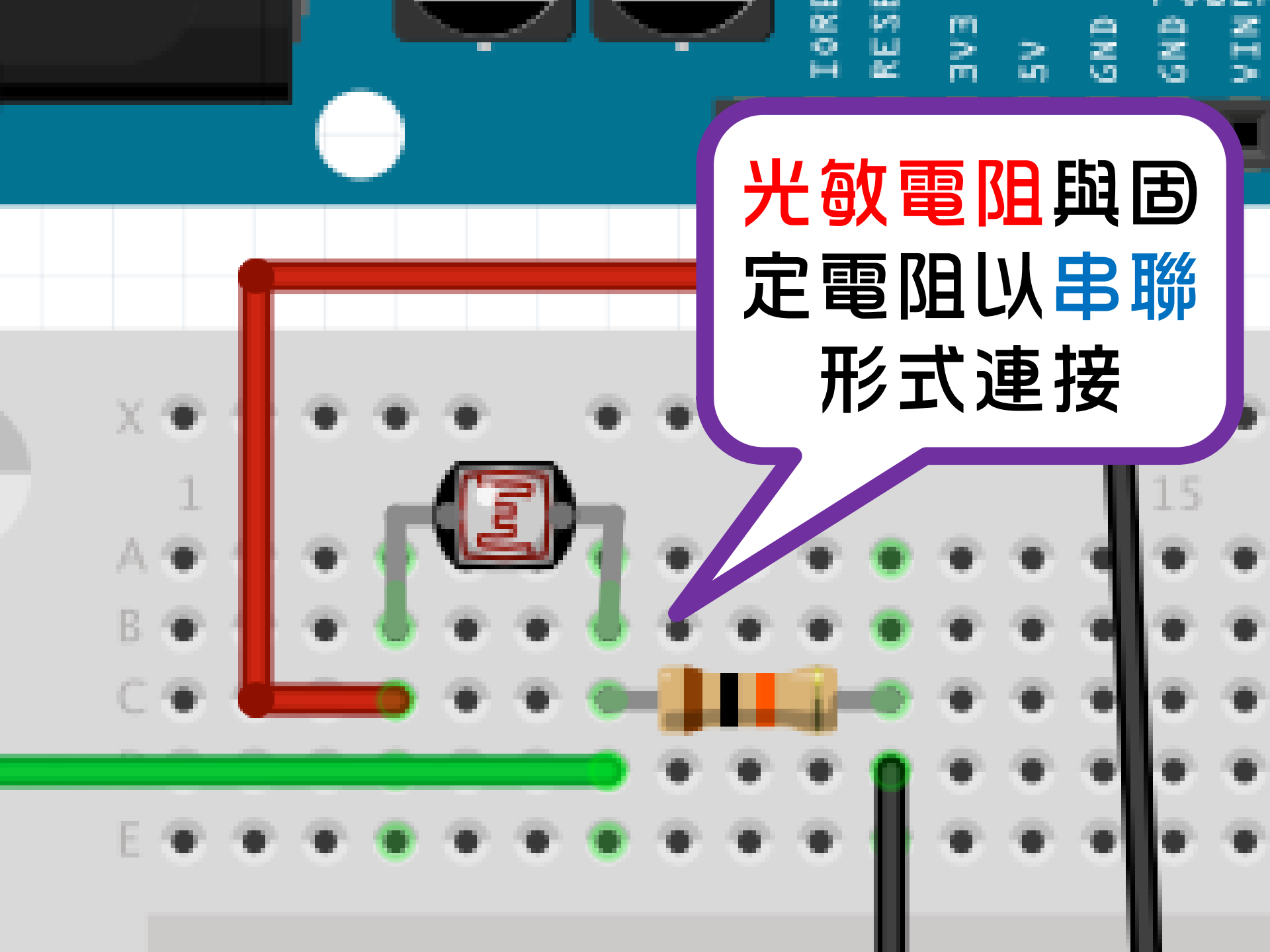
220 Ω



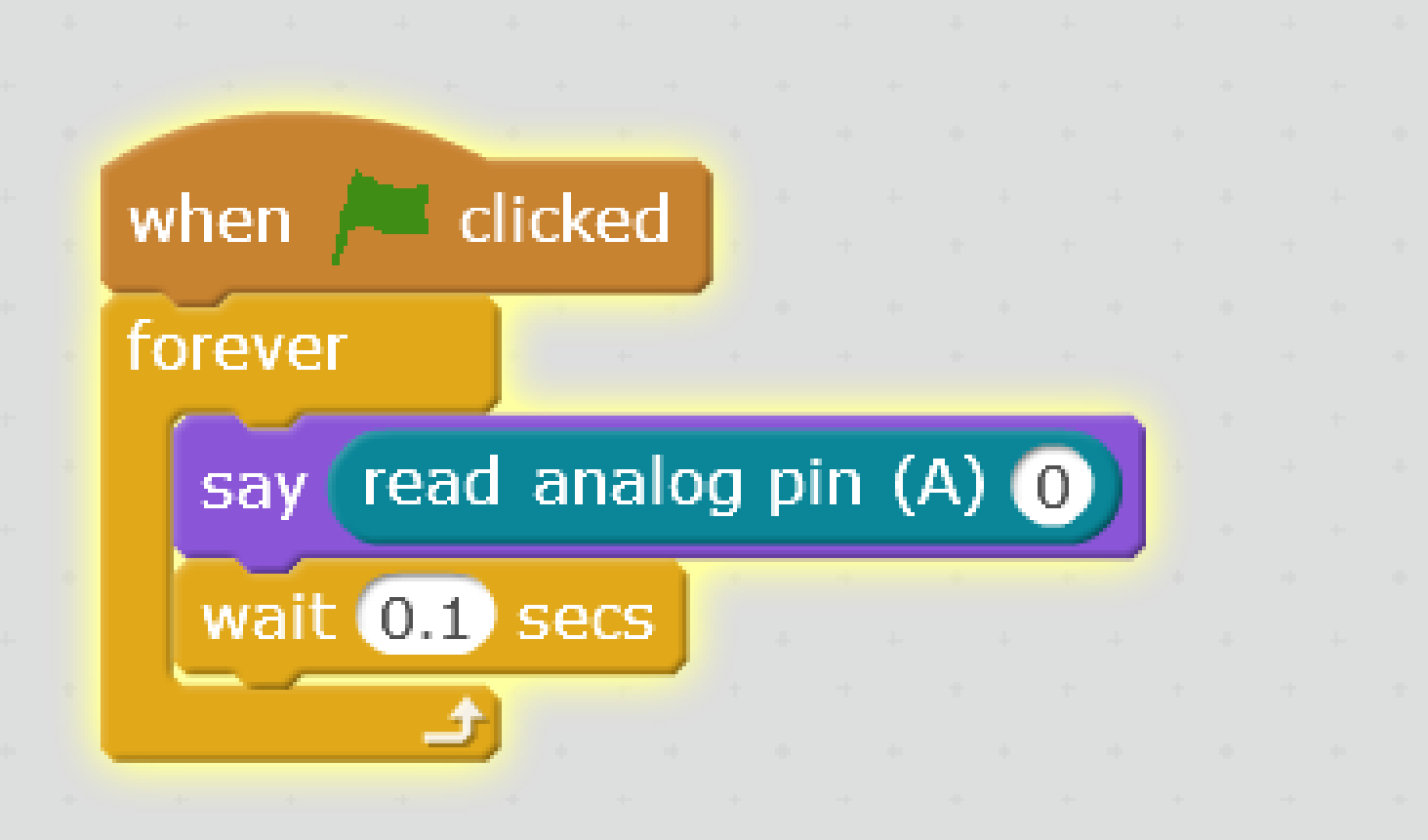
10K Ω

測試光度值


RESET
ICSP2
AREF
GND
13
12
~11
~10
~9
8
7
~6
~5
4
~3
2
TX→1
RX←0
DIGITAL (PWM=~)
L
TX
RX
Arduino™
UNO
ON
ICSP
IOREF
RESET
3V3
5V
GND
GND
VIN
POWER
A0
A1
A2
A3
A4
A5
ANALOG IN
X
A
B
C
E
F
G
H
I
J
Y
1
5
10
15

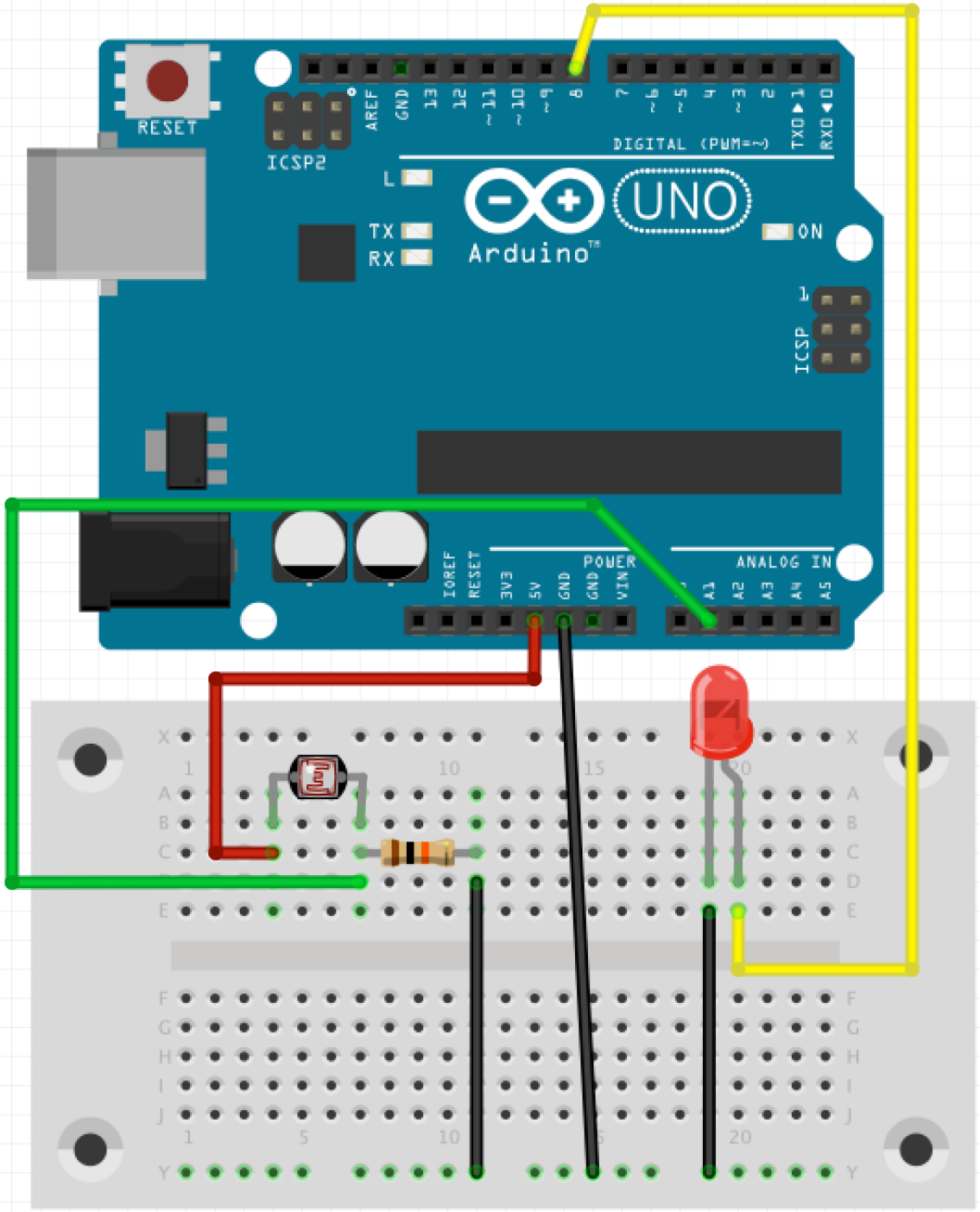

光敏電阻與固
定電阻以串聯
形式連接

M-Panda 說出光度值



M-Panda 說出光度值

活動6:
光敏燈


RESET
ICSP2
AREF
GND
13
12
~11
~10
~9
8
7
~6
~5
4
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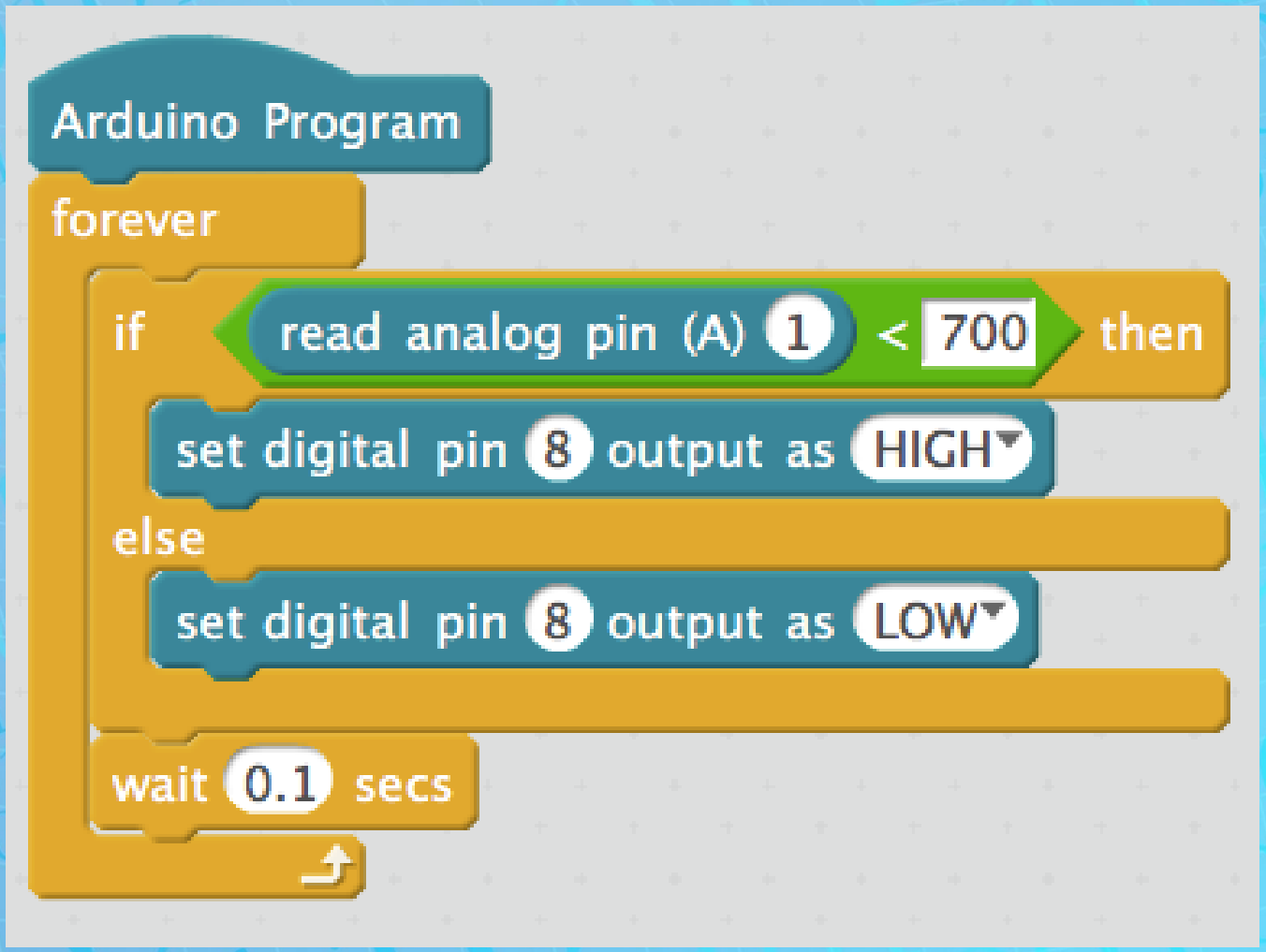
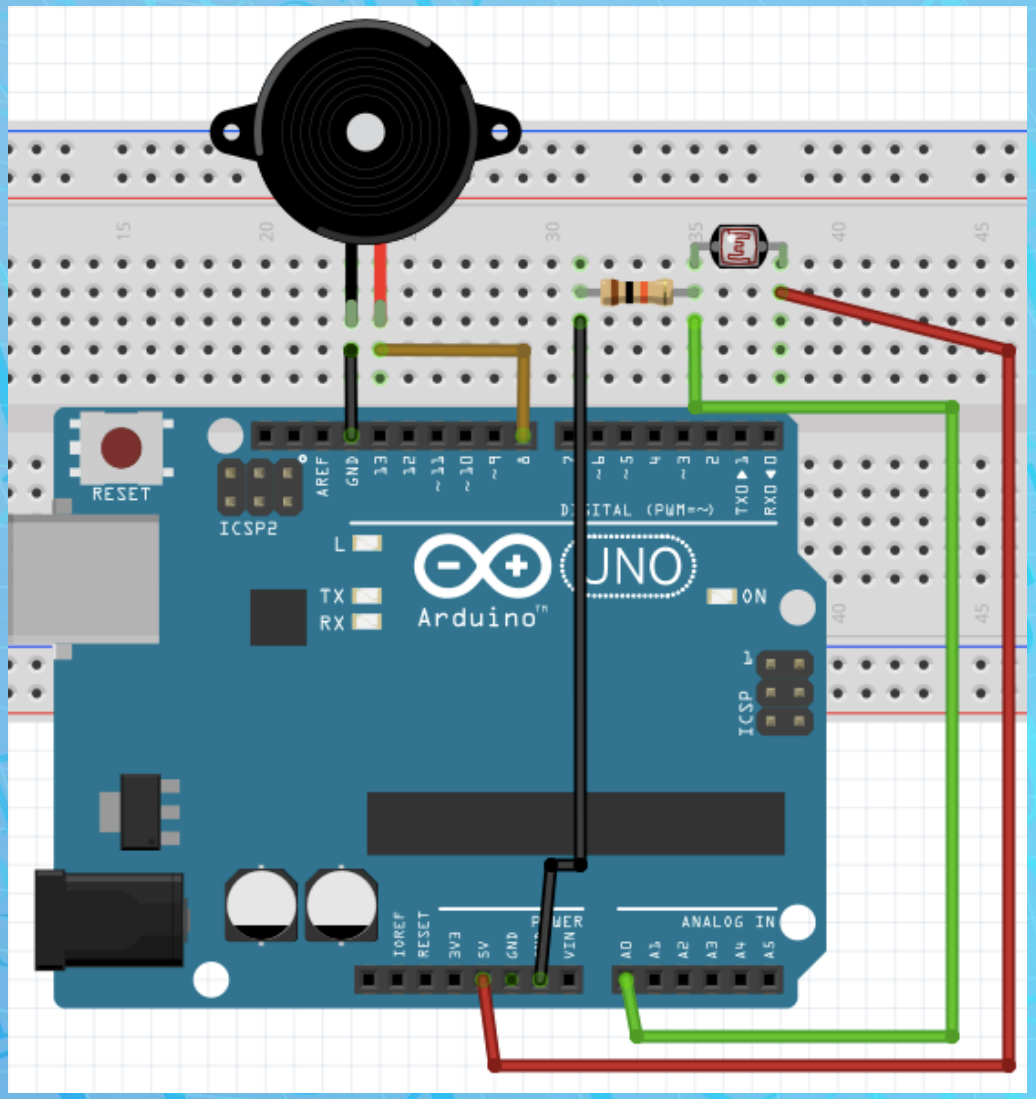
TX→1
RX←0
DIGITAL (PWM=~)
L
TX
RX
Arduino™
UNO
ON
ICSP
IOREF
RESET
3V3
5V
GND
GND
VIN
POWER
A1
A2
A3
A4
A5
ANALOG IN

活動6：光敏燈

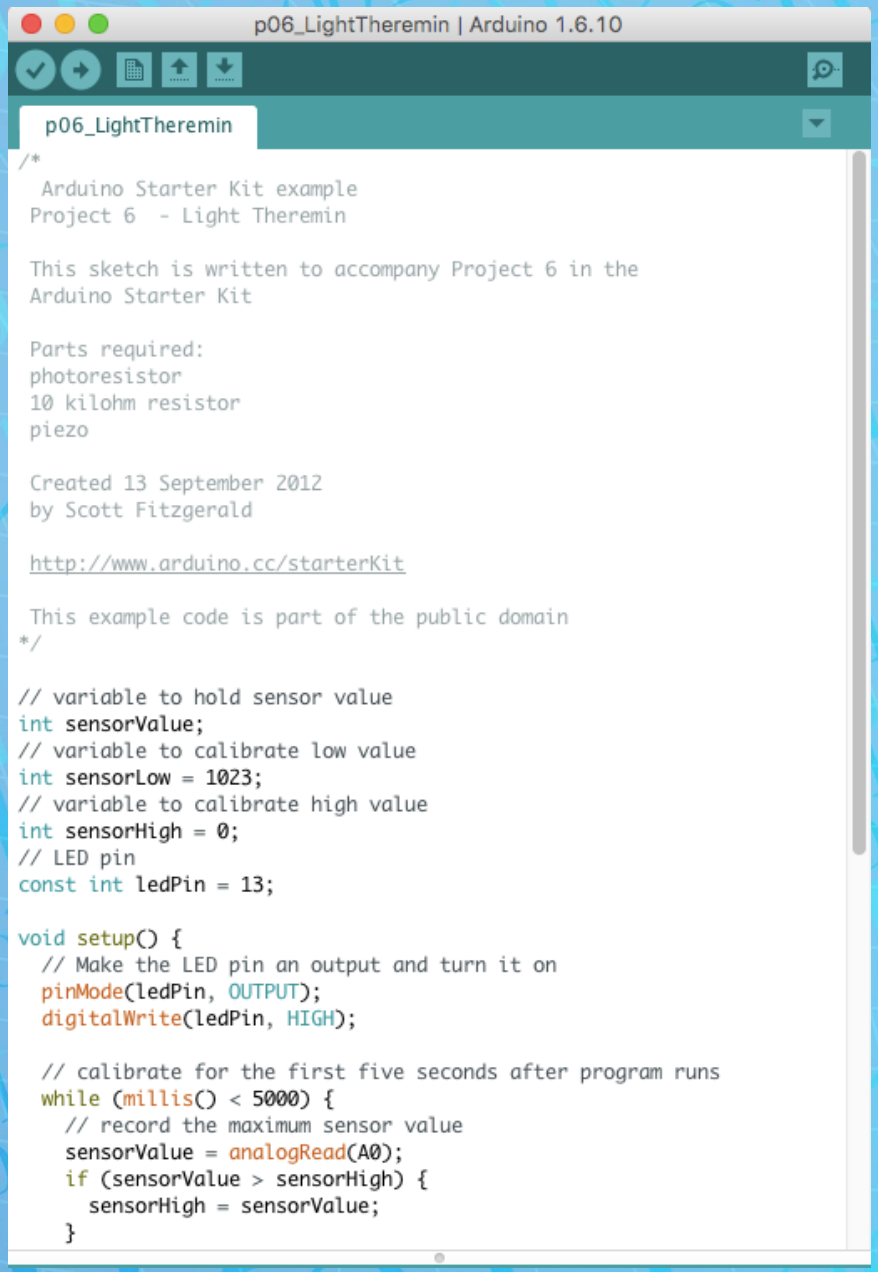

Arduino Program
forever
if
read analog pin (A) 1
< 700
then
set digital pin 8 output as HIGH
else
set digital pin 8 output as LOW
wait 0.1 secs

活動1：**光度特雷門
因光度變化而改變蜂鳴器的音調



留意：如有裝置與Arduino example一樣，相關部分將不會計算分數

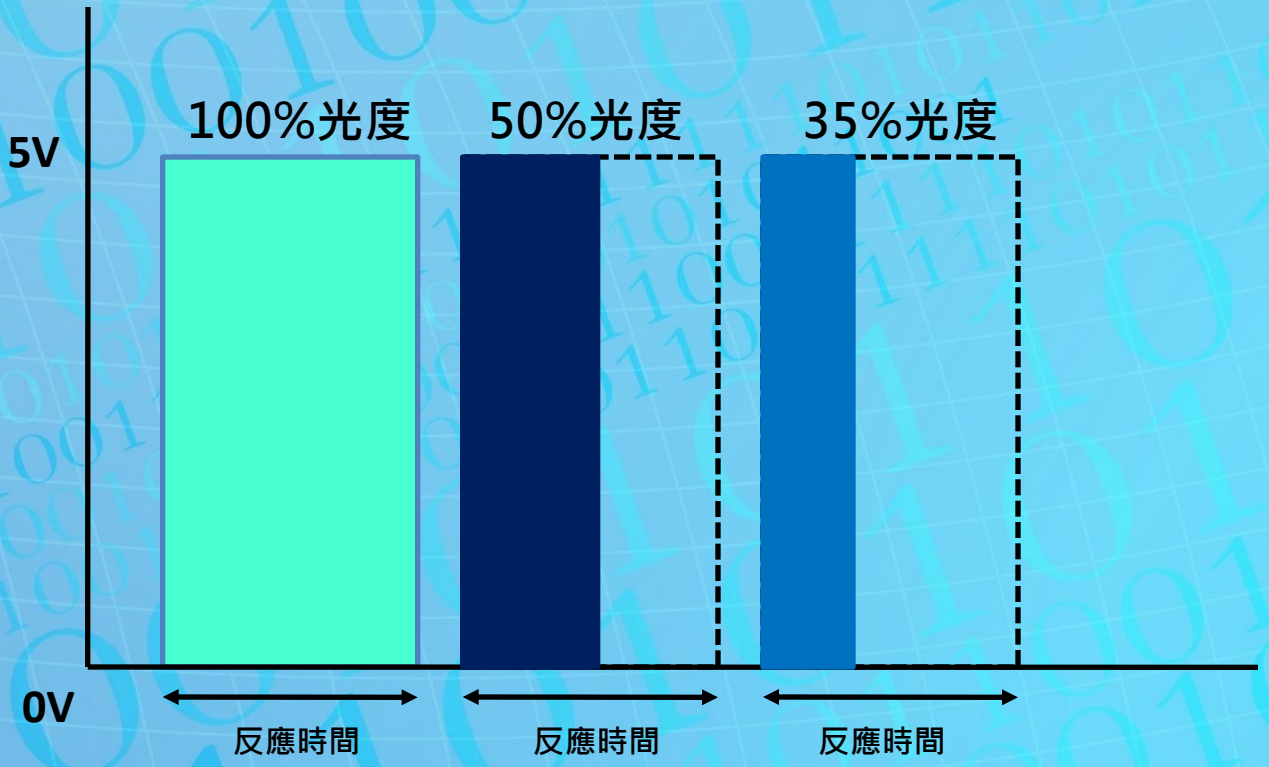
活動1：**光度特雷門



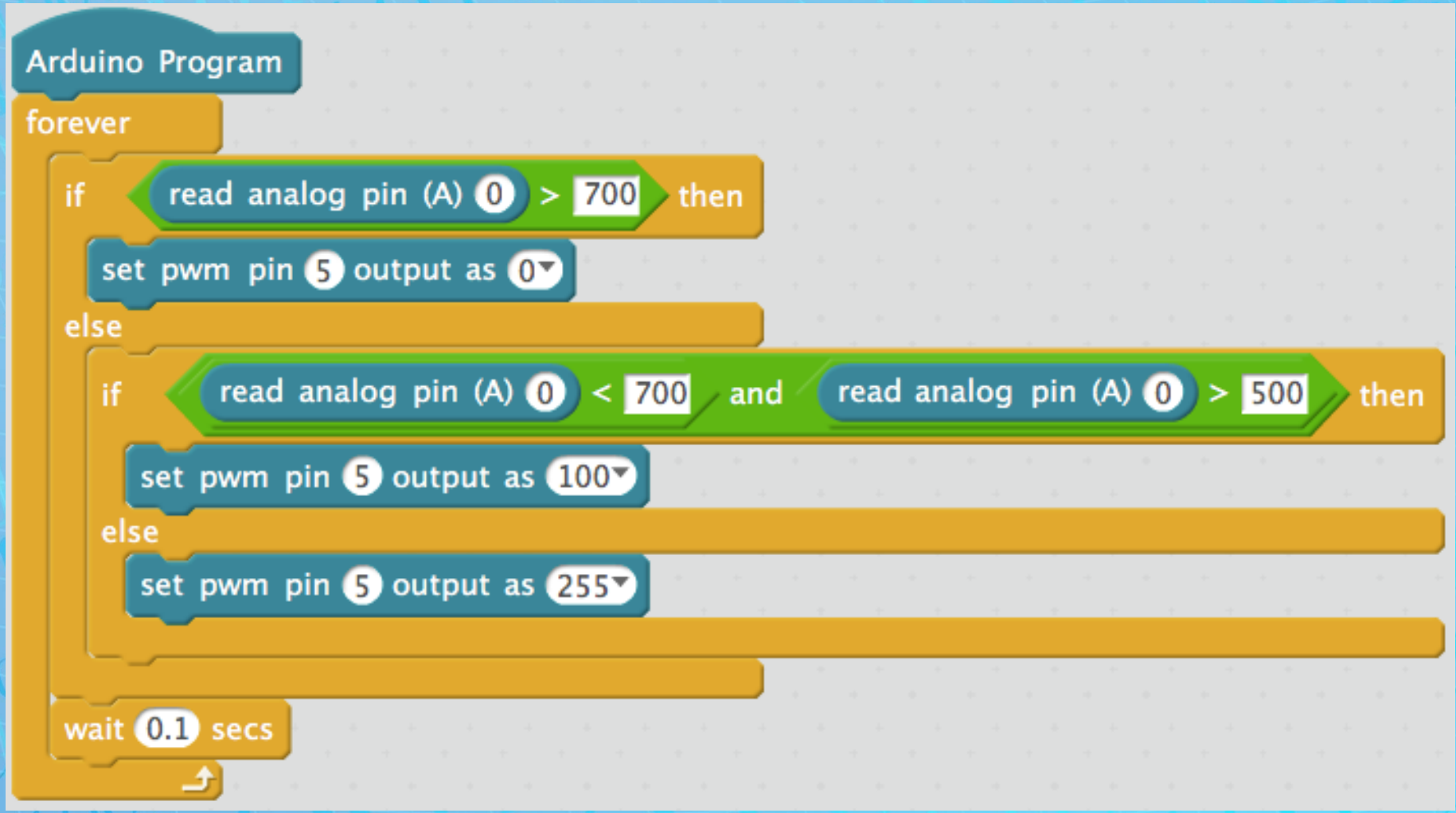
“File” -> “Examples”->
10.StarterKit_BasicKit->
p06_LightTheremin

類比輸出 Analog Out

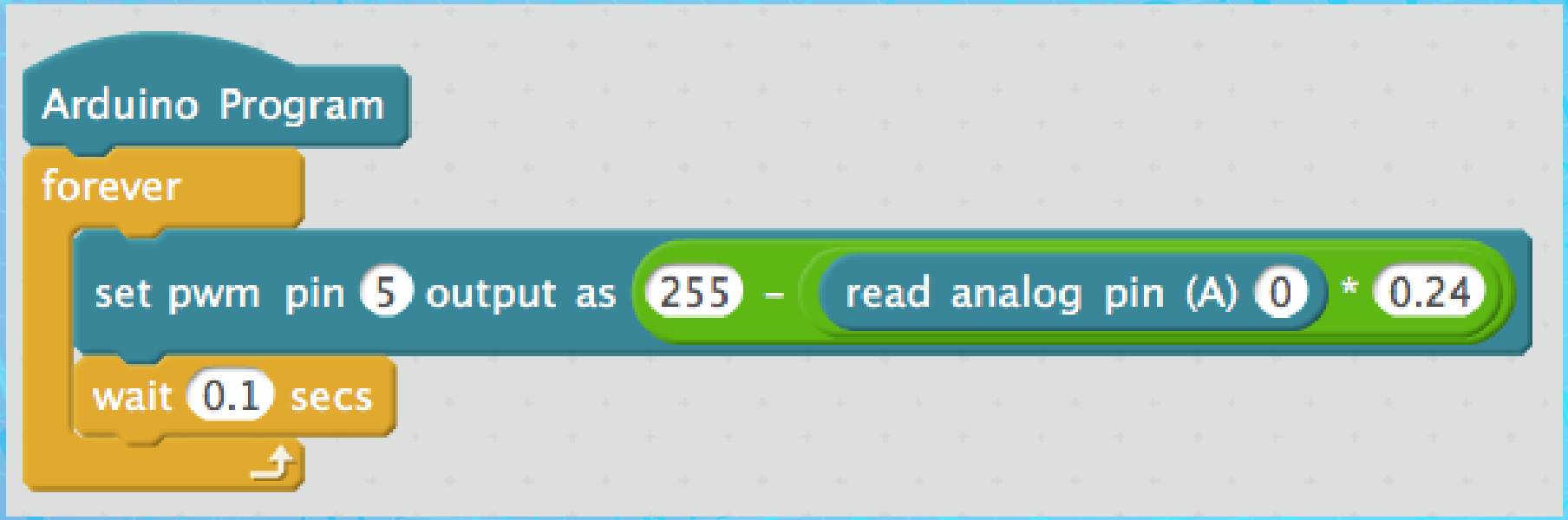
- Arduino預設訊號輸出：5V
- 使用脈衝寬度調變 (Pulse Width Modulation, PWM)技術轉變為模擬輸出
- 腳位含“ ~ ”可進行類比輸出 (Arduino UNO腳位 3, 5, 6, 9, 10, 11)
- Arduino數值設定：0 - 255



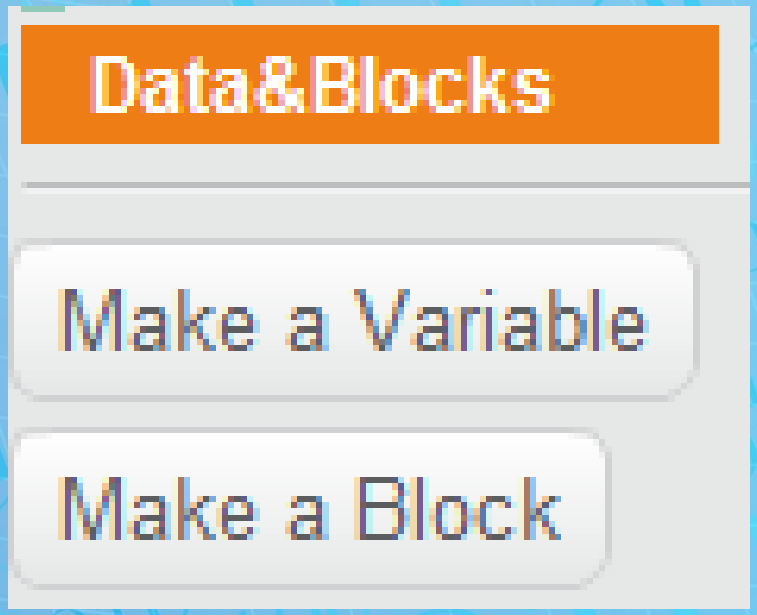
活動2.1：光敏燈（進階版）

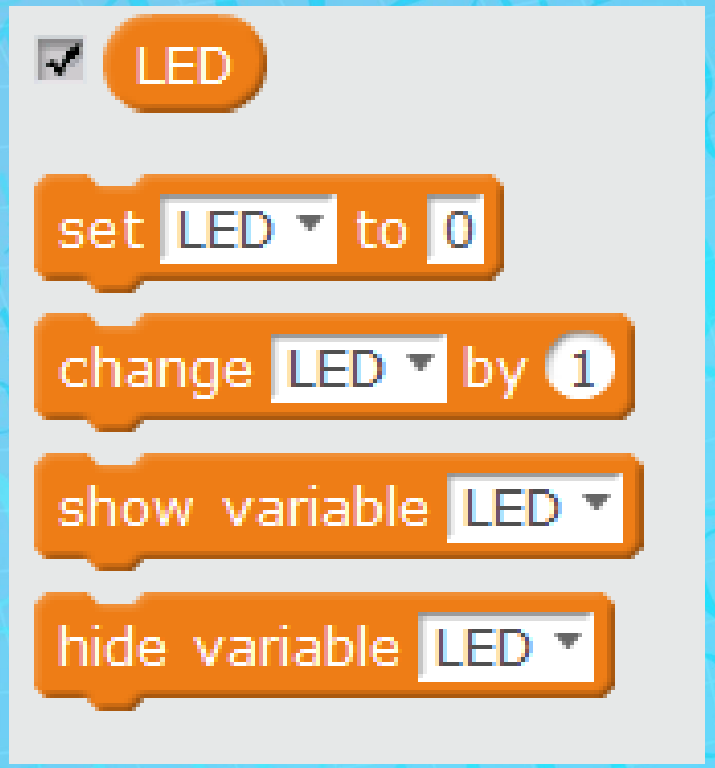

Arduino Program
forever
if read analog pin (A) 0 > 700 then
set pwm pin 5 output as 0
else
if read analog pin (A) 0 < 700 and read analog pin (A) 0 > 500 then
set pwm pin 5 output as 100
else
set pwm pin 5 output as 255
wait 0.1 secs

活動2.2：光敏燈（進階版）


Arduino Program
forever
set pwm pin 5 output as 255 - read analog pin (A) 0 * 0.24
wait 0.1 secs

用mBlock設定
變數(Variables)及指令積木(Block)

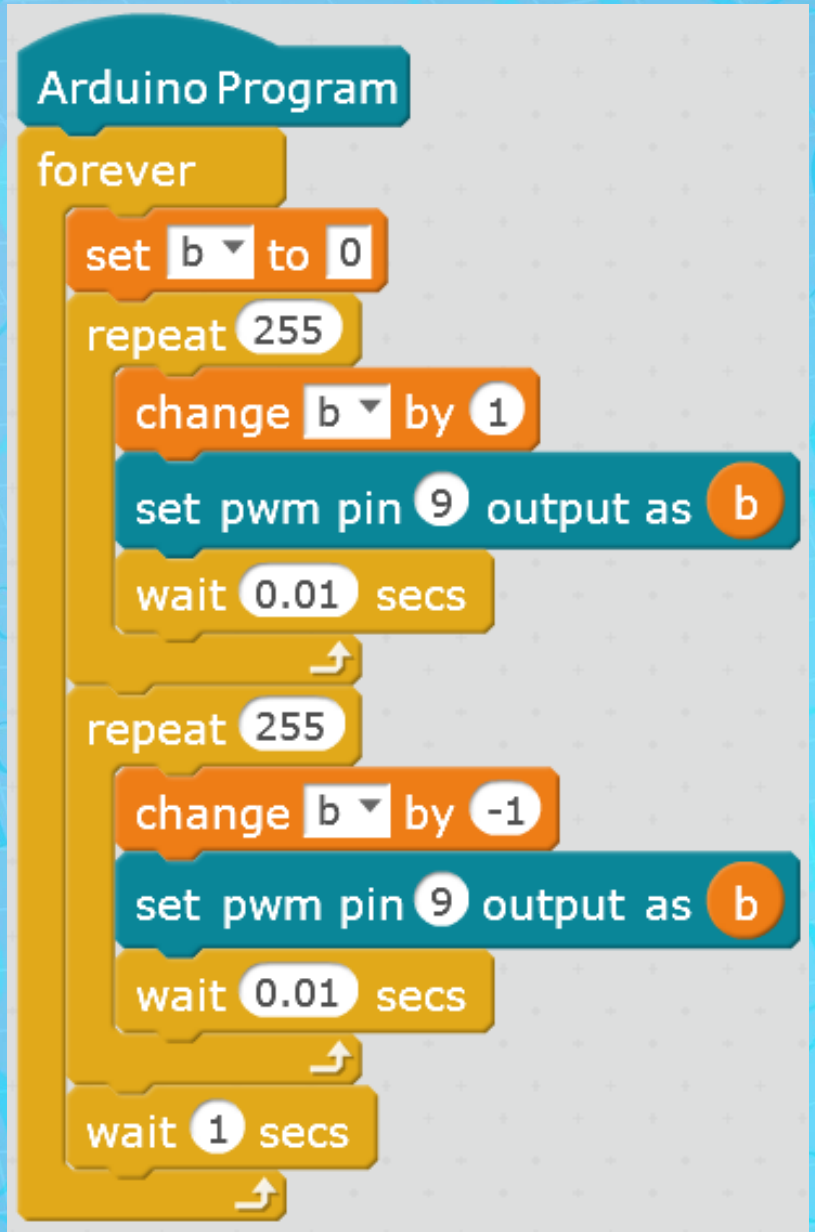




**活動3：呼吸燈

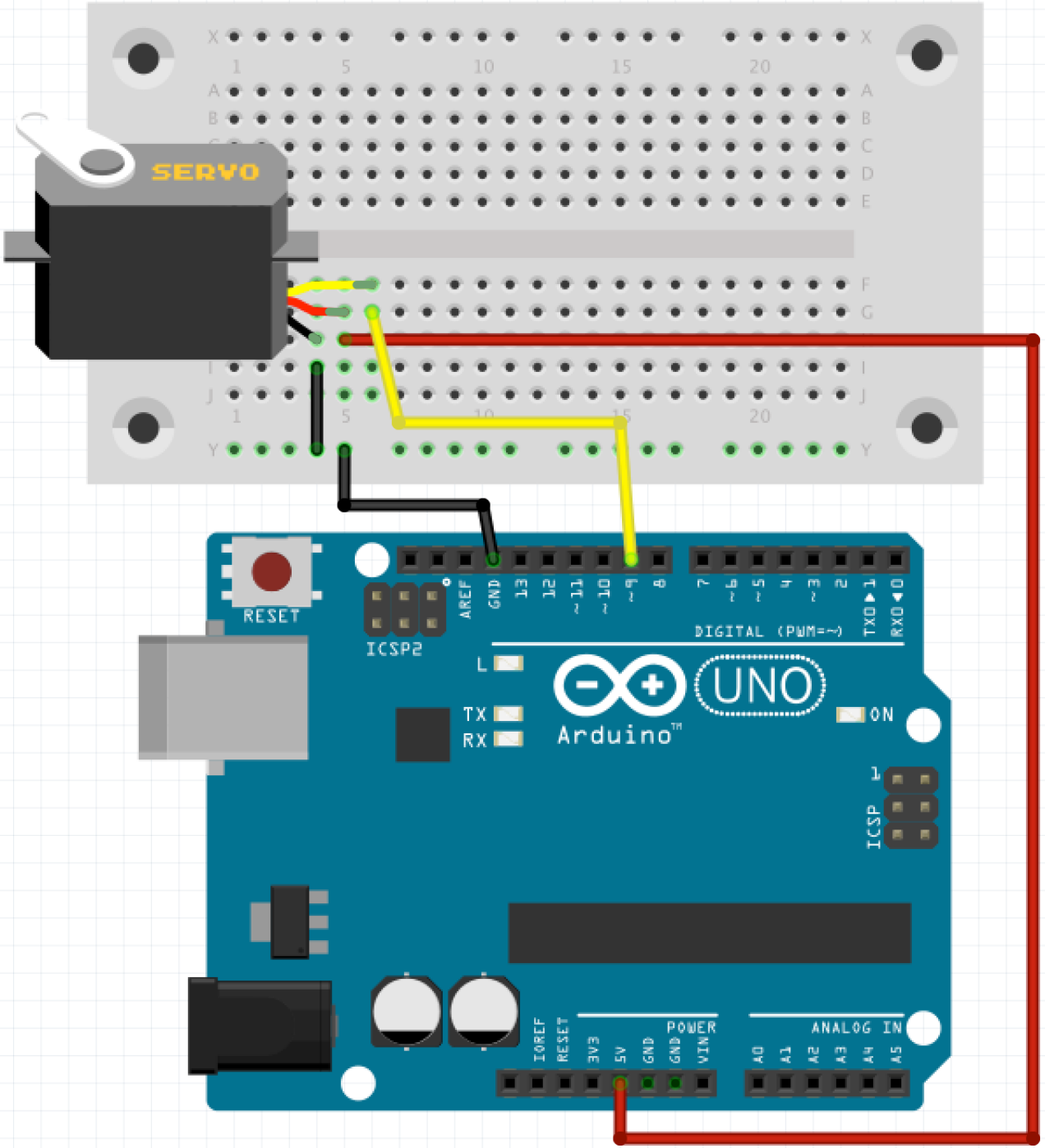
所使用的編程：

1. 變數
2. 重複
3. 遞增/遞減 - 改變

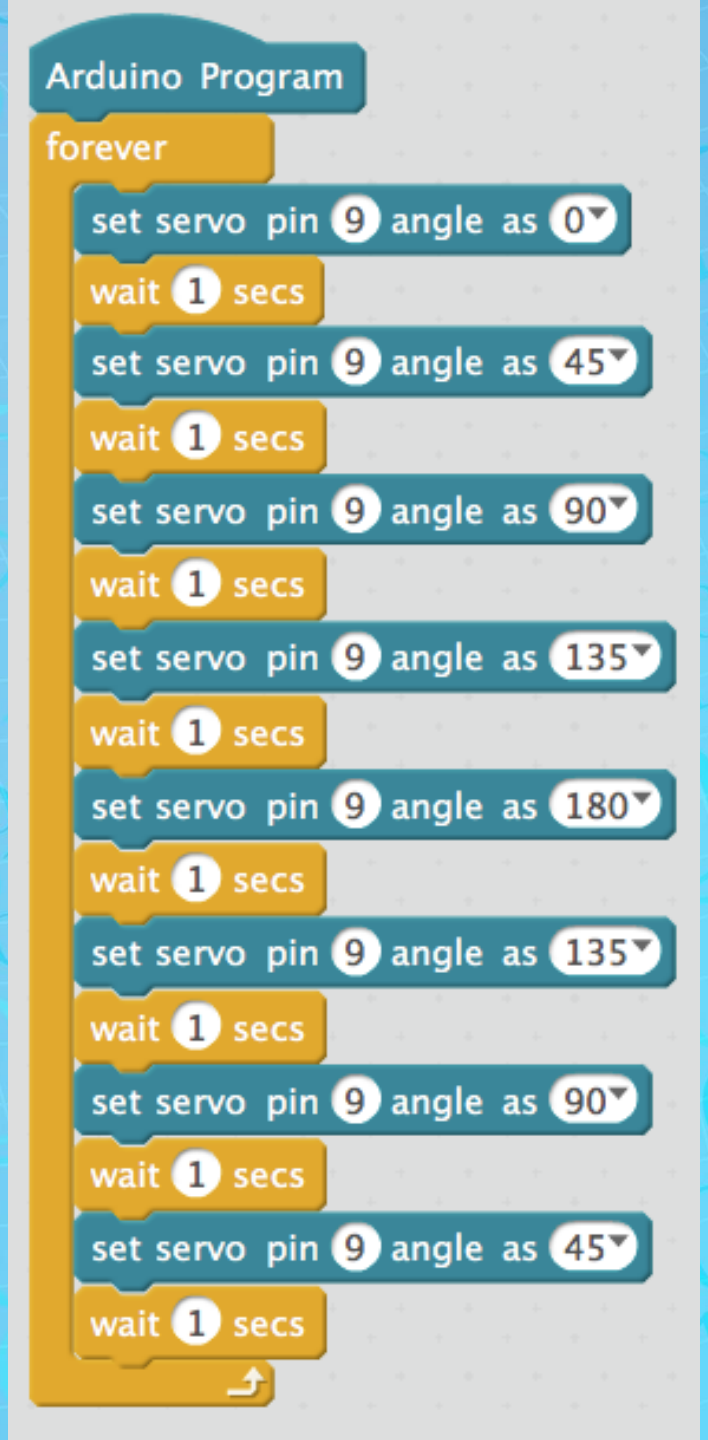


伺服摩打
(舵機)
Servo Motor

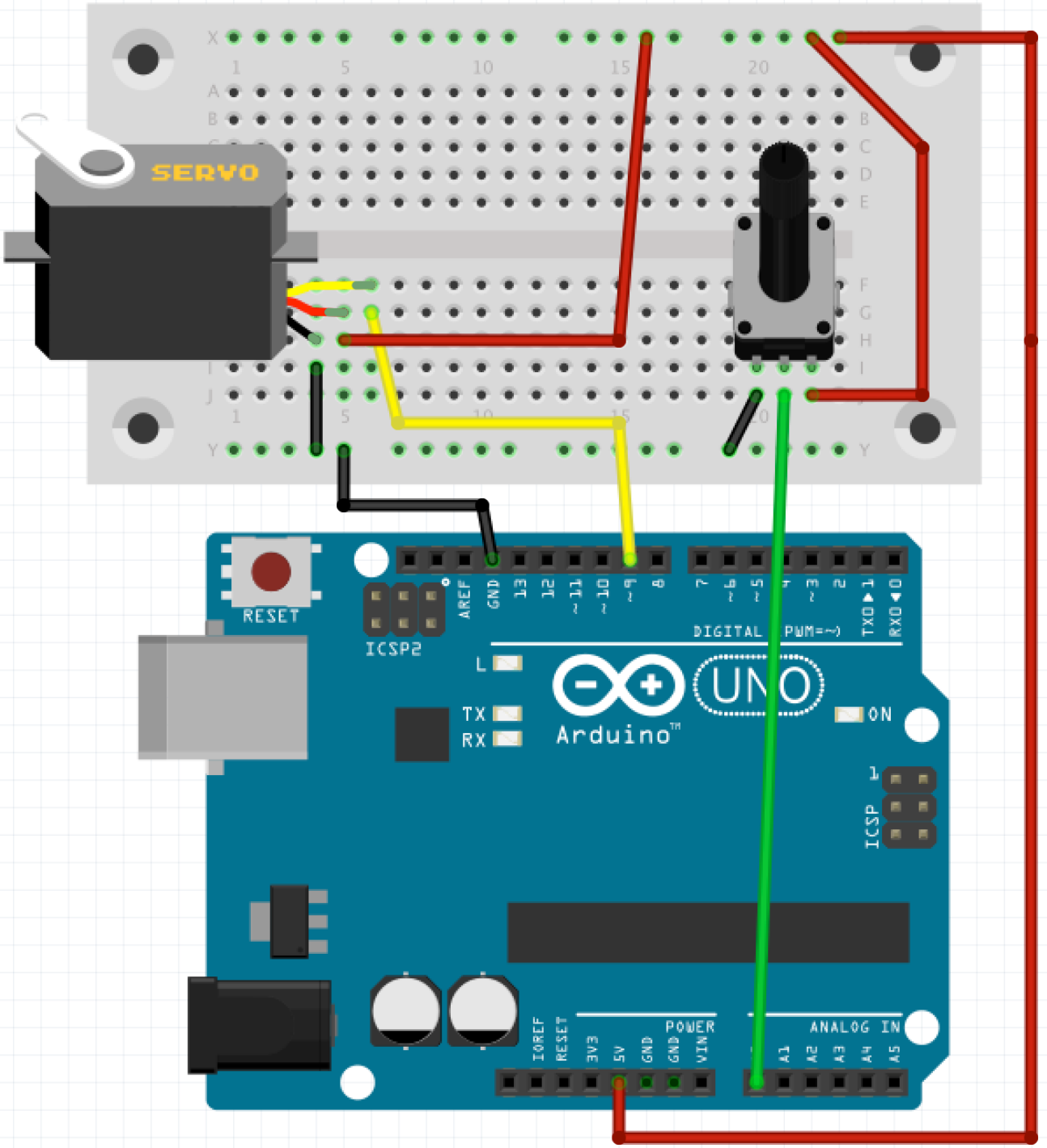
橙色線：訊號線
紅色線：電源
啡色線：接地



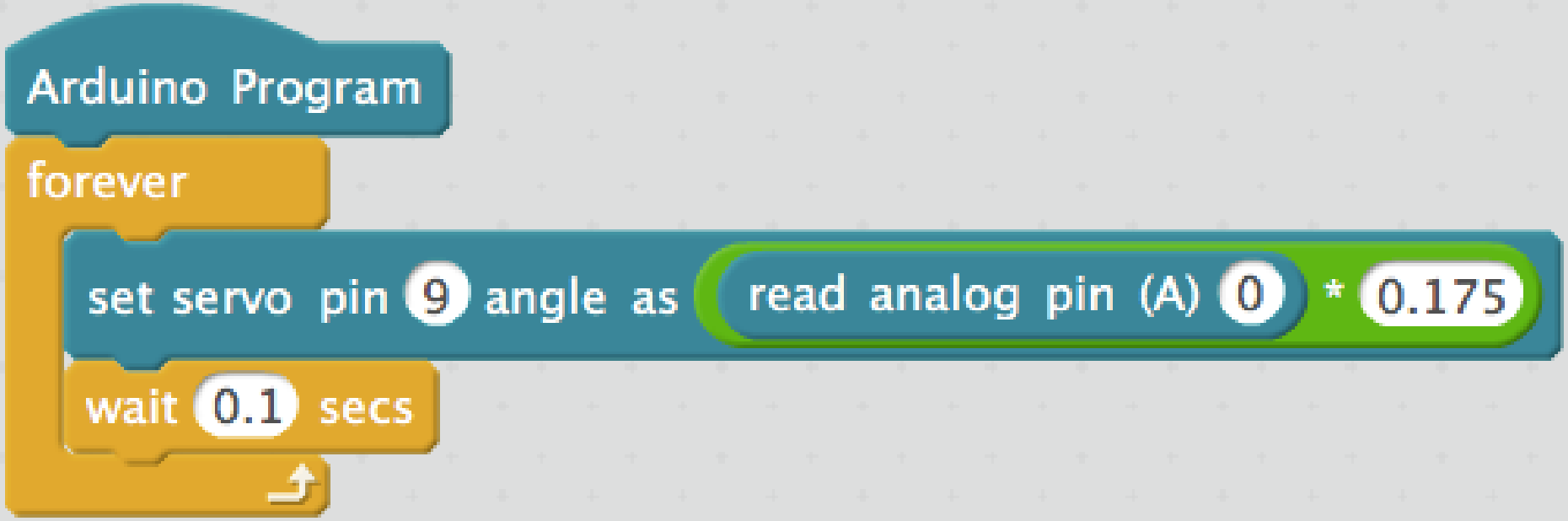
活動4：伺服摩打(舵機)
Servo Motor



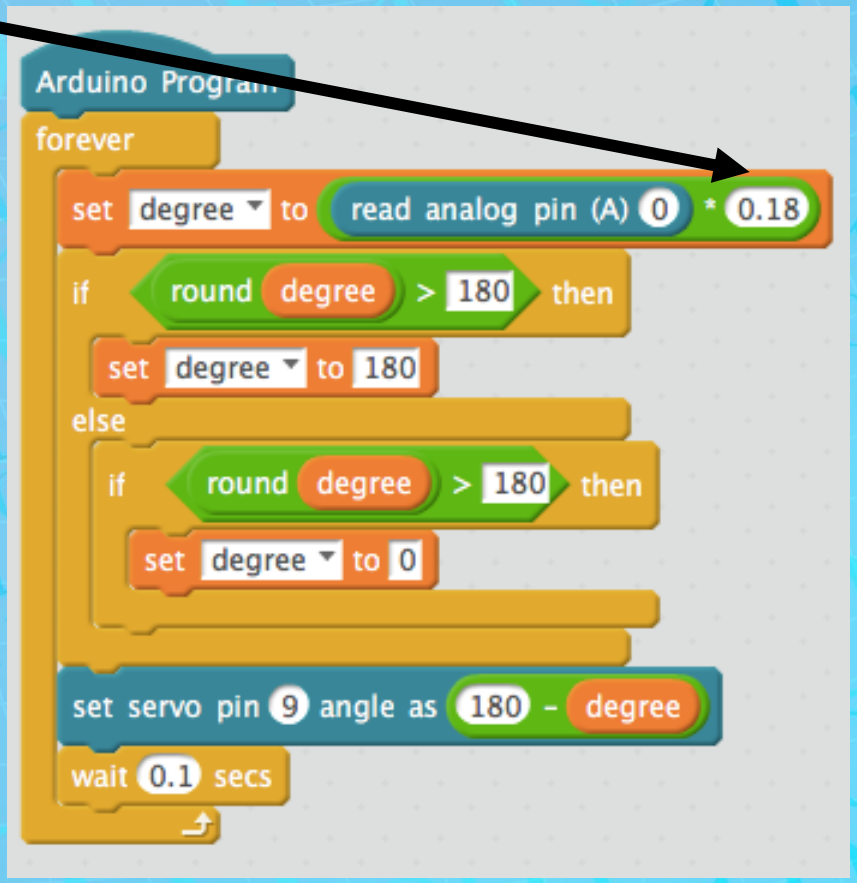
活動5：
可變電阻控制
伺服摩打



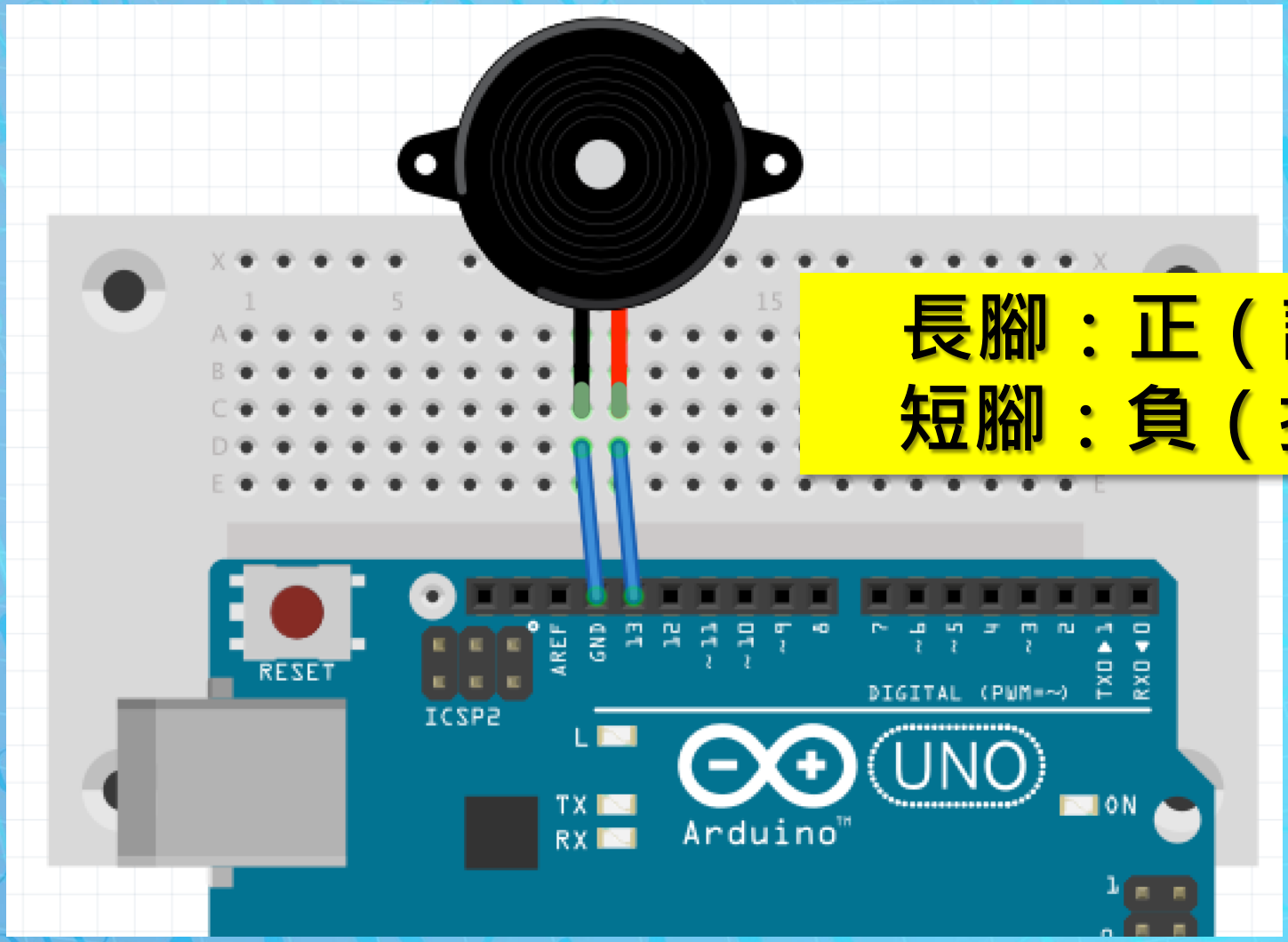
活動5：可變電阻控制伺服摩打

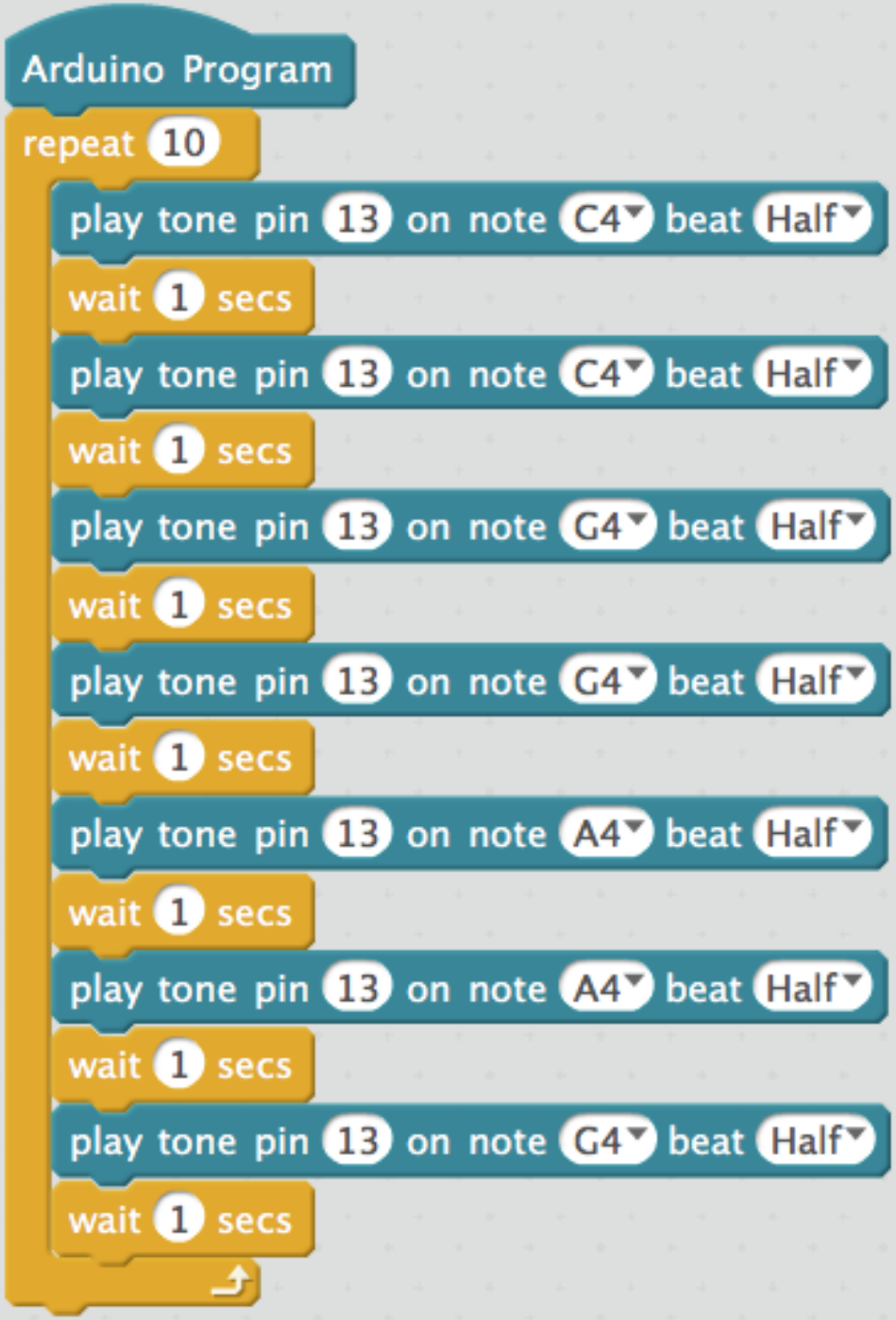


180 / 1023 = 0.175



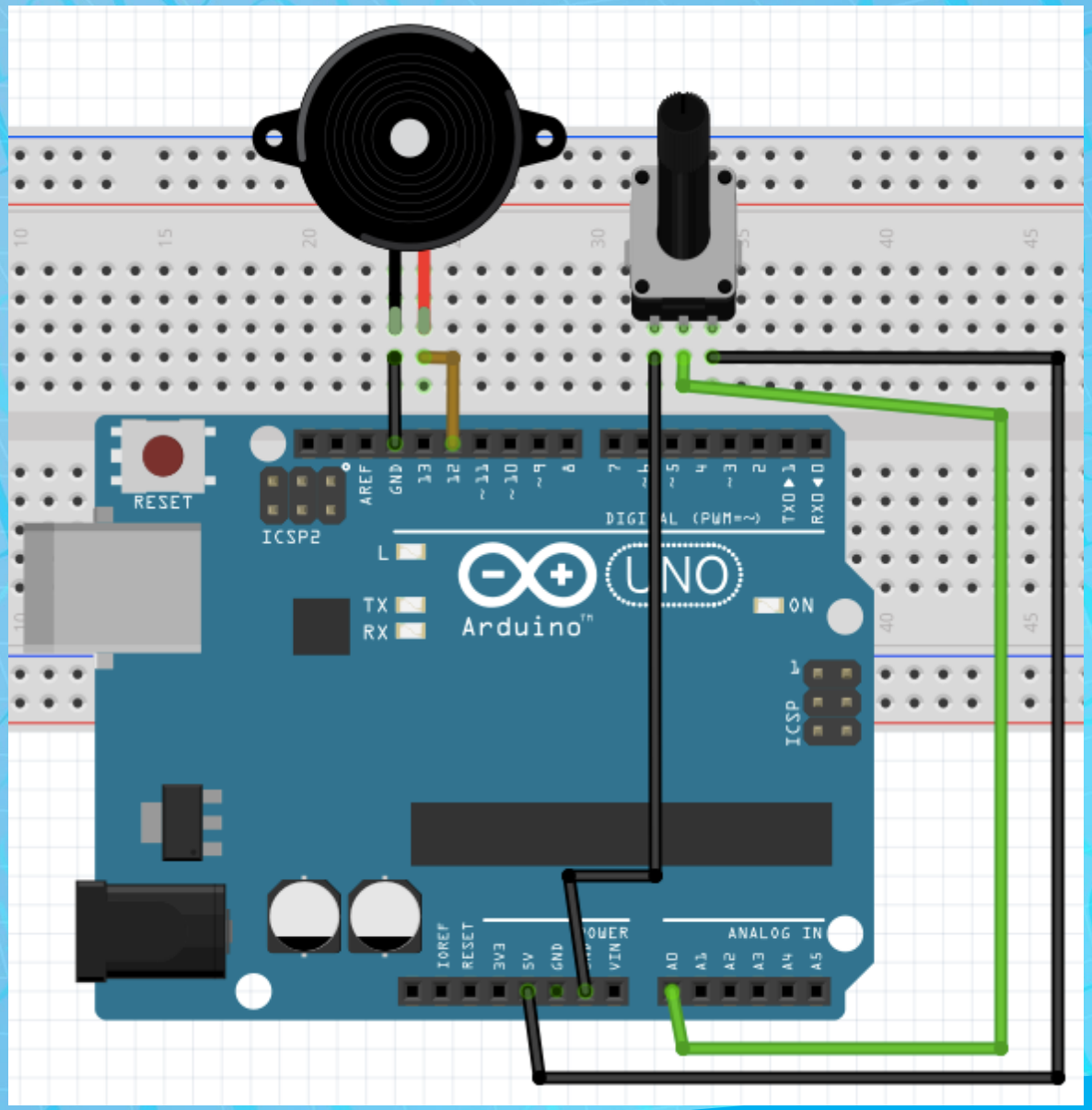
無源蜂鳴器


長腳：正（訊號線）
短腳：負（接地）
RESET
ICSP2
AREF
GND
13
12
~11
~10
~9
8
7
~6
~5
4
~3
2
TX→1
RX←0
DIGITAL (PWM=~)
L
TX
RX
Arduino™
UNO
ON


Arduino Program
repeat 10
play tone pin 13 on note C4 beat Half
wait 1 secs
play tone pin 13 on note C4 beat Half
wait 1 secs
play tone pin 13 on note G4 beat Half
wait 1 secs
play tone pin 13 on note G4 beat Half
wait 1 secs
play tone pin 13 on note A4 beat Half
wait 1 secs
play tone pin 13 on note A4 beat Half
wait 1 secs
play tone pin 13 on note G4 beat Half
wait 1 secs

活動6：使用蜂鳴器

**活動7：製作節拍器


RESET
ICSP2
L
TX
RX
Arduino
UNO
ON
ICSP
DIGITAL (PWM=~)
ANALOG IN
IOREF
RESET
3V3
5V
GND
VIN
A0
A1
A2
A3
A4
A5

節拍 Beats per Minute (BPM):
由 40(1.5秒/拍)至208(0.3秒/拍)

**活動7：
製作節拍器

168/1023

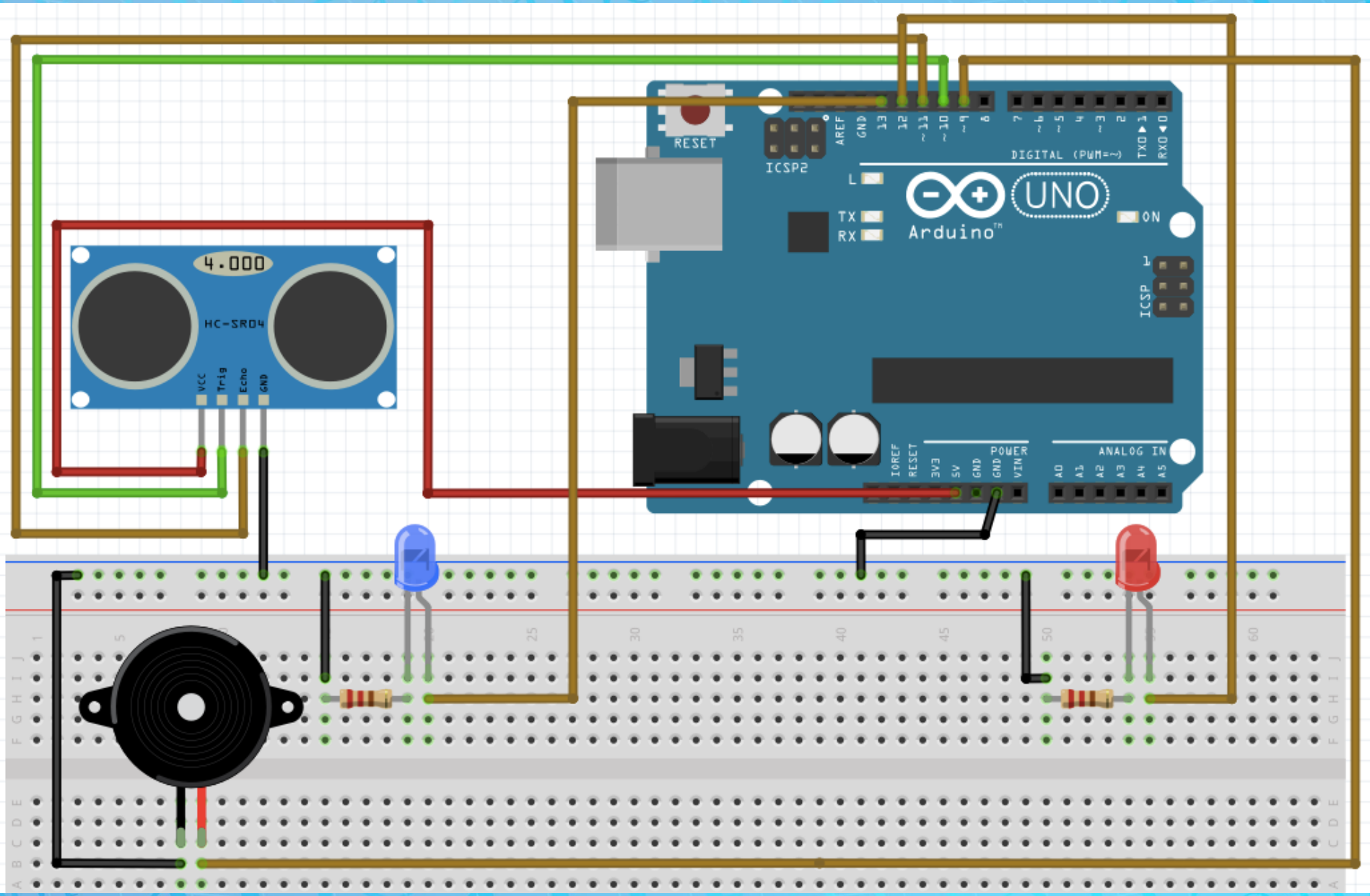
Arduino IDE程式

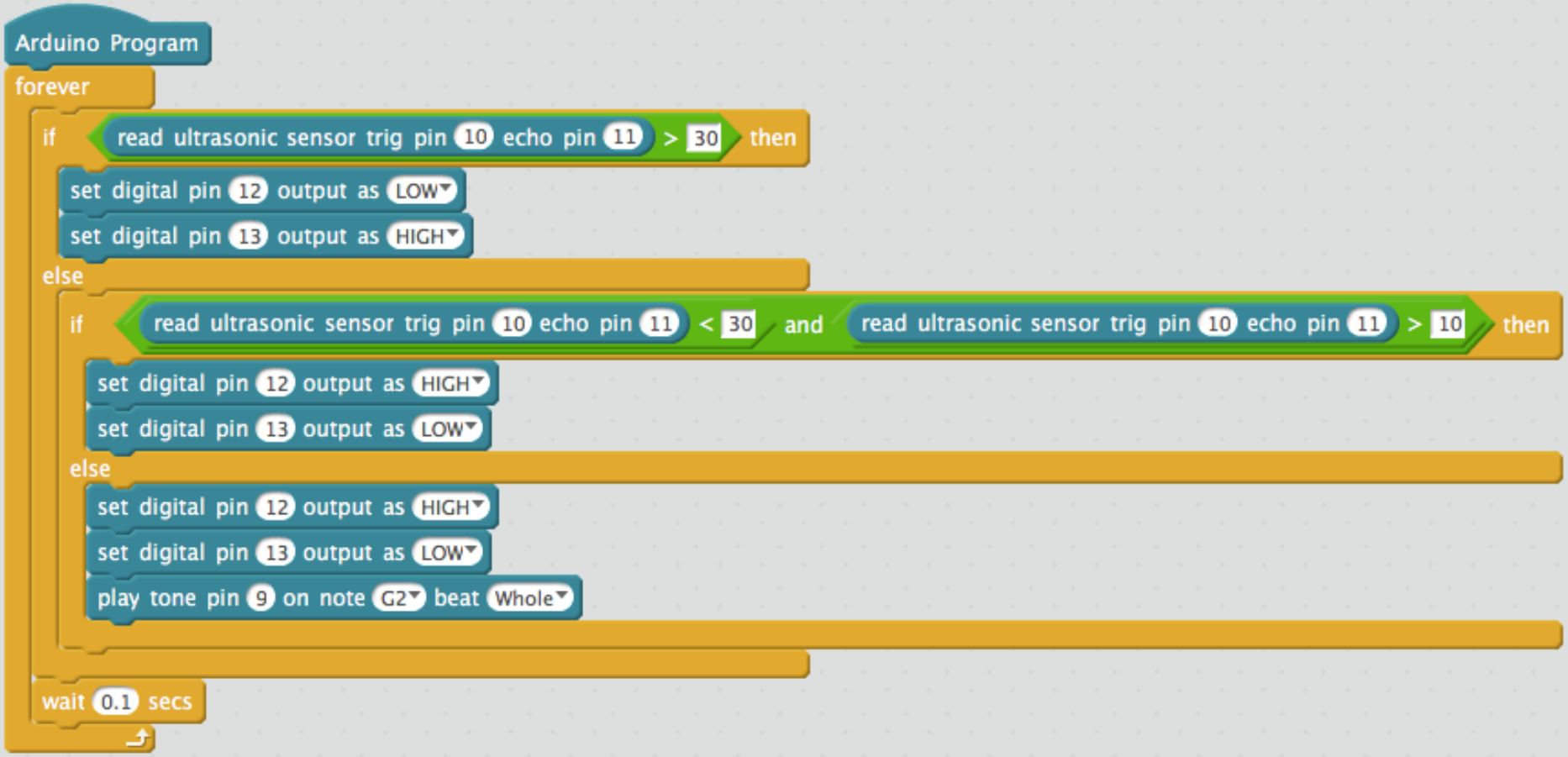
```
double bpm (int pin) {
return round (analogRead(pin) * 0.16422 + 40);
}

void setup(){
pinMode(A0, INPUT);
pinMode (13, OUTPUT);
}

void loop(){
tone(13, 262, 125);
double seconds = 60 / bpm(A0);
delay(1000 * seconds);
noTone(13);
}
```

超聲波感應器 Ultrasonic Sensor

HC-SR04型號：

VCC：供電
Trig：發射超音波
Echo：接收超音波
GND：接地


4.000
HC-SR04
VCC
Trig
Echo
GND
RESET
ICSP2
AREF
GND
13
12
~11
~10
~9
8
7
~6
~5
4
~3
2
TX→1
RX←0
DIGITAL (PWM=~)
L
TX
RX
UNO
Arduino™
ON
ICSP
IOREF
RESET
3V3
5V
GND
GND
VIN
POWER
A0
A1
A2
A3
A4
A5
ANALOG IN

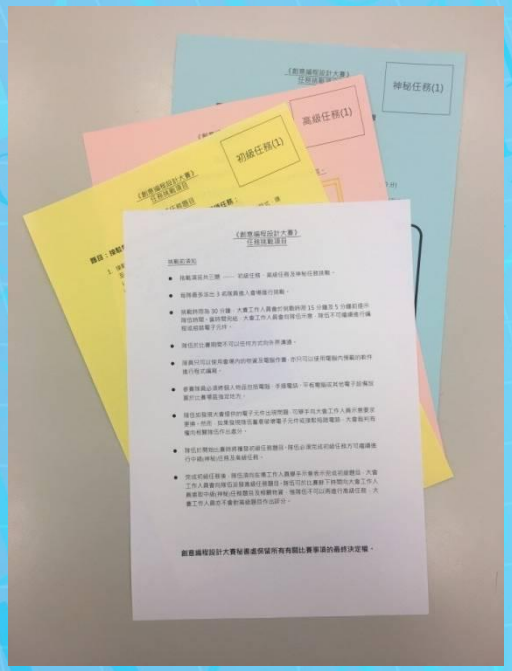

Arduino Program
forever
if read ultrasonic sensor trig pin 10 echo pin 11 > 30 then
set digital pin 12 output as LOW
set digital pin 13 output as HIGH
else
if read ultrasonic sensor trig pin 10 echo pin 11 < 30 and read ultrasonic sensor trig pin 10 echo pin 11 > 10 then
set digital pin 12 output as HIGH
set digital pin 13 output as LOW
else
set digital pin 12 output as HIGH
set digital pin 13 output as LOW
play tone pin 9 on note G2 beat Whole
wait 0.1 secs

```
int TONEPIN = 11;
int ECHOPIN = 12;
int TRIGPIN = 13;

double distance(){
  digitalWrite(TRIGPIN, LOW);
  delayMicroseconds(2);
  digitalWrite(TRIGPIN, HIGH);
  delayMicroseconds(10);
  digitalWrite(TRIGPIN, LOW);
  return pulseIn(ECHOPIN, HIGH)/58.2;
}

void setup() {
  pinMode(TONEPIN, OUTPUT);
  pinMode(ECHOPIN, INPUT);
  pinMode(TRIGPIN, OUTPUT);
}

void loop() {
  tone(TONEPIN, 262, 125);
  double cm=distance();
  if(cm<1){
    delay(50);
  }
  else{
    if(cm>20){
      delay(1000);
    }
    else{
      delay(50*cm);
    }
  }
}
```

Arduino IDE

任務挑戰項目(ME)題目類別

- 初級任務(黃)：簡單電路接駁及編程
- 中級任務(藍)：考驗不同編程指令的使用方式
- 高級任務(紅)：修改程式/改變電路設計



Coding Day！

- 進一步了解不同電子元件的使用方法
- 自學以下電子元件：
  1) 溫度模組
  2) 超聲波感應器
  3) 步進摩打（Step Motor）
  4) 紅外線動作感測器（PIR Motion Sensor）

2018年3月3日（六）下午（Arduino）

http://ccst.hkfyg.org.hk/

科學比賽 >
創意編程設計大賽

聯絡方法

香港青年協會 創新科學中心

電話：(852) 2561 6149

傳真：(852) 2565 8345

電郵：creativecoder@hkfyg.org.hk

網頁：http://ccst.hkfyg.org.hk/