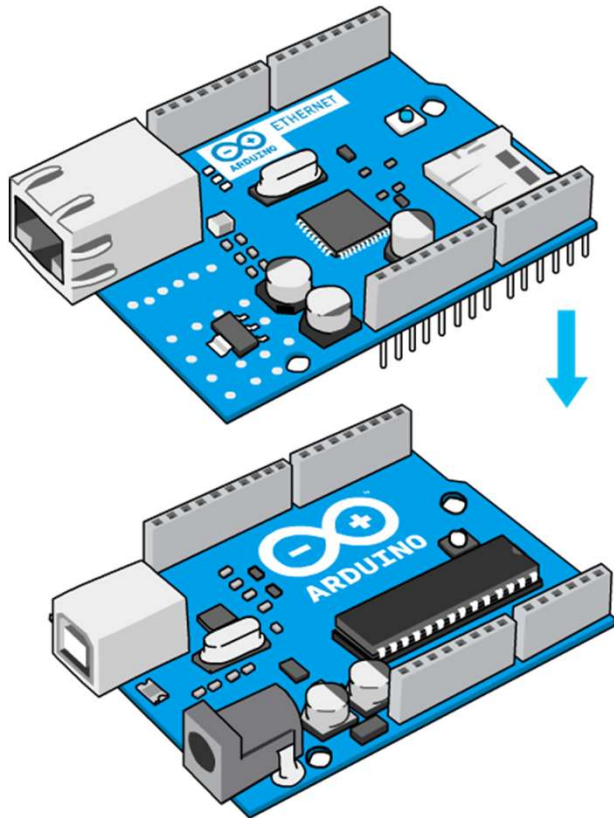
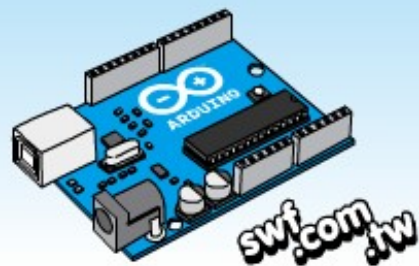


# 第六章 類比信號處理

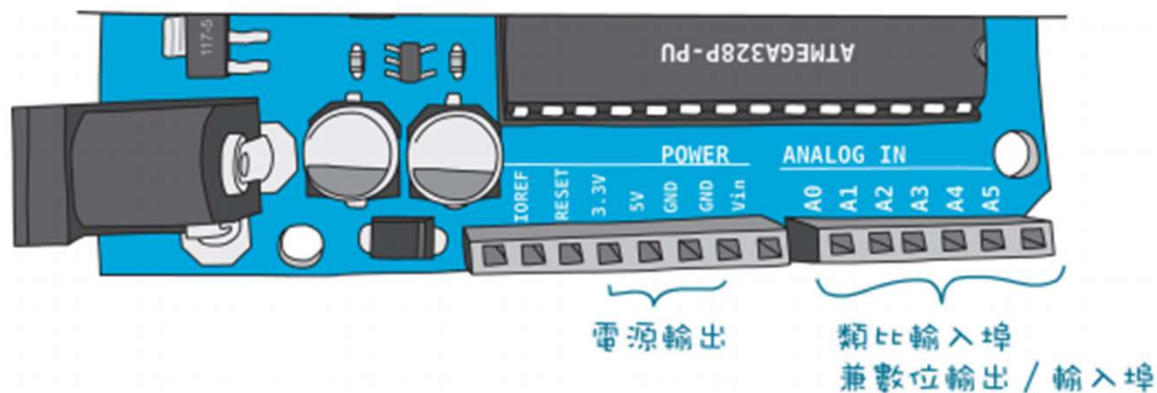
- 讀取類比值
- 從序列埠讀取類比輸入值
- 使用光敏電阻製作小夜燈
- 認識運算放大器
- 拍手控制開關



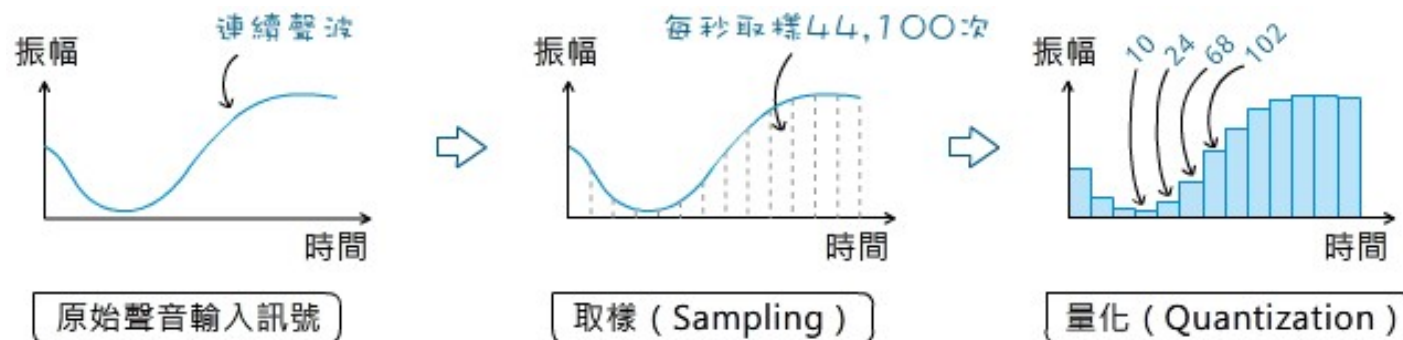


# 讀取類比值

對Arduino而言，類比資料就是0V到5V之間的電壓變化值，例如：0.8V, 2.7V, 3.6V, ...。



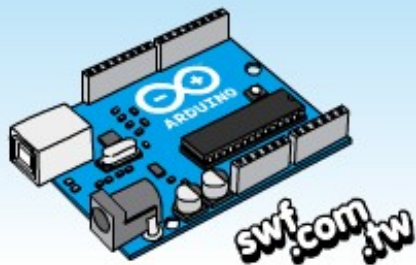
類比轉成數位的過程



讀取類比的語法

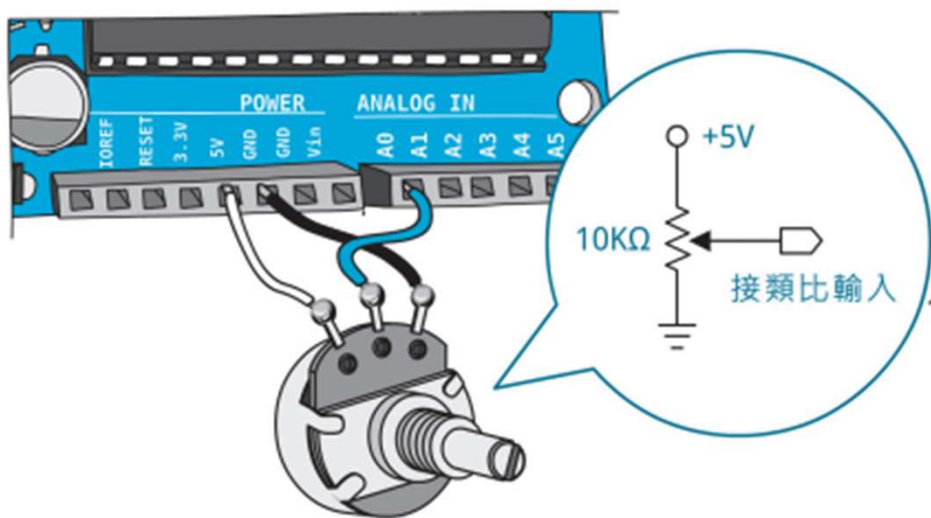
```
int val = analogRead(類比腳位);
```

可能值為0~1023      可能值為A0~A5 (Leonardo板則是A0~A11)



# 從序列埠讀取類比輸入值

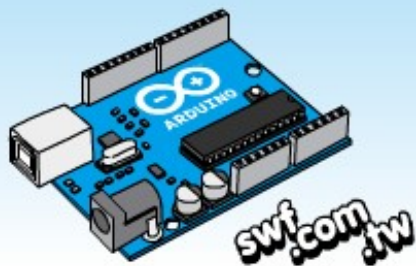
用可變電阻建立一個「電壓調節器」，讓輸出電壓隨著電阻值的變化而改變，藉以模擬類比資料。



```
const byte potPin = A0;
int val;

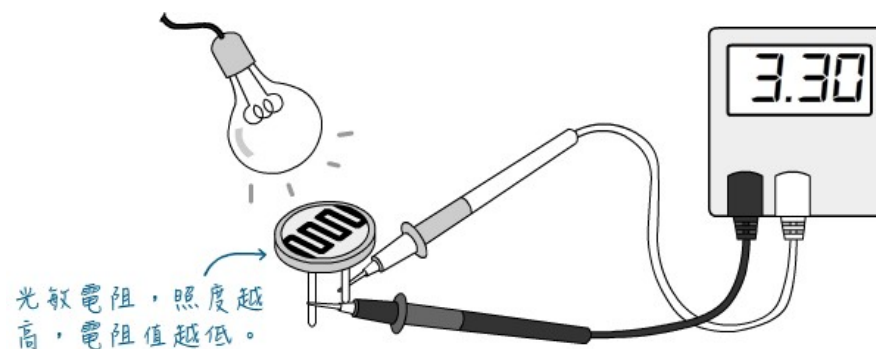
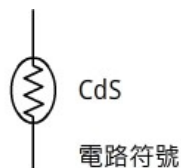
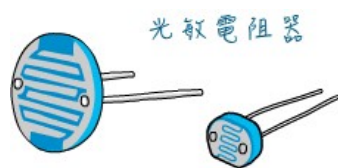
void setup() {
  Serial.begin(9600);
}

void loop() {
  val = analogRead(potPin);
  Serial.println(val);
  delay(500);
}
```

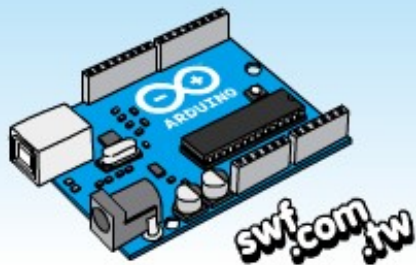


# 光敏電阻

光敏電阻的阻值會隨著照度（亦即，光的亮度）變化。照度越高，阻值越低。光敏電阻的受光面，有鋸齒狀的感光材料。

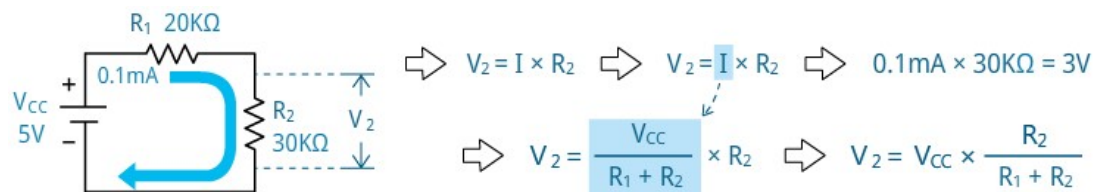
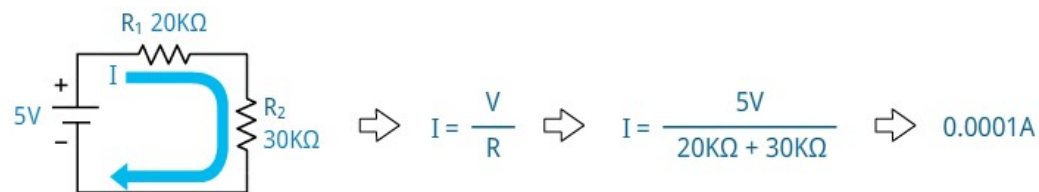


測試條件	CdS電阻值	10KΩ分壓值	4.7KΩ分壓值	1KΩ分壓值
用高亮度LED照射	165Ω	0.08v	0.16v	0.7v
緊急出口指示燈	1KΩ	0.45v	0.87v	2.5v
客廳日光燈	3.3KΩ	1.24v	2.06v	3.83v
室內暗處	18KΩ	3.21v	3.96v	4.73v
用黑色膠布遮蓋	>2MΩ	4.95v	4.98v	4.99v

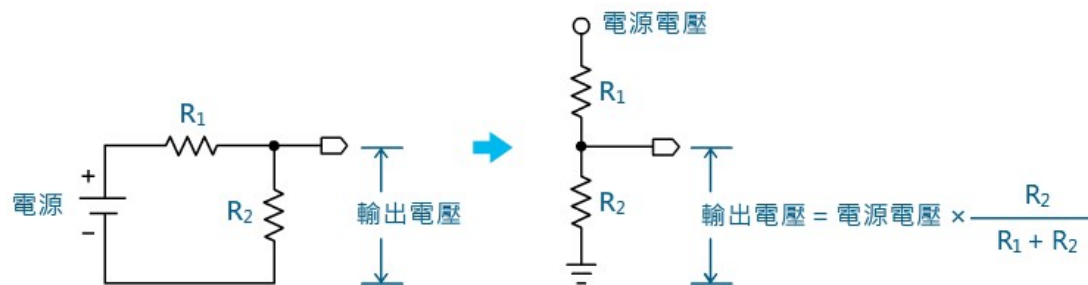


# 電阻分壓電路

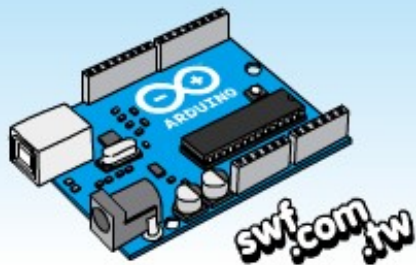
在電子迴路中，流出的電流等於流入的電流。計算電流時，需要把所有電阻值加總。



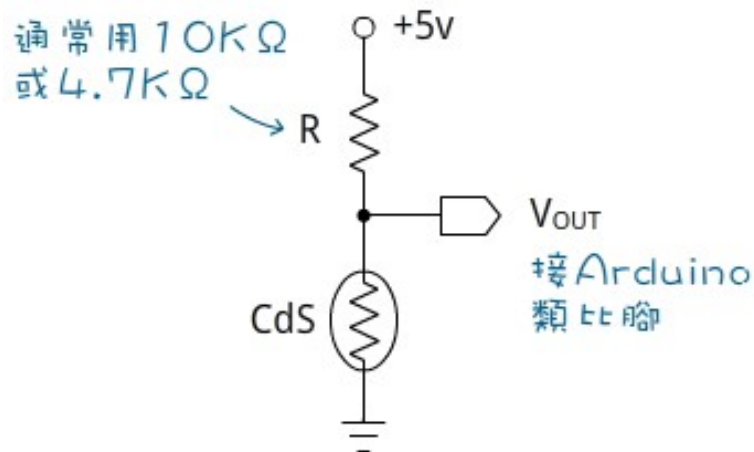
電阻分壓代表分配電壓，使用兩個電阻構成的分壓電路與電壓計算公式：



$$\text{輸出電壓} = 5V \times \frac{1000}{1000 + 1000} \Rightarrow \text{輸出電壓} = 5V \times \frac{1}{2} \Rightarrow \text{輸出電壓} = 2.5V$$



# 使用光敏電阻製作小夜燈

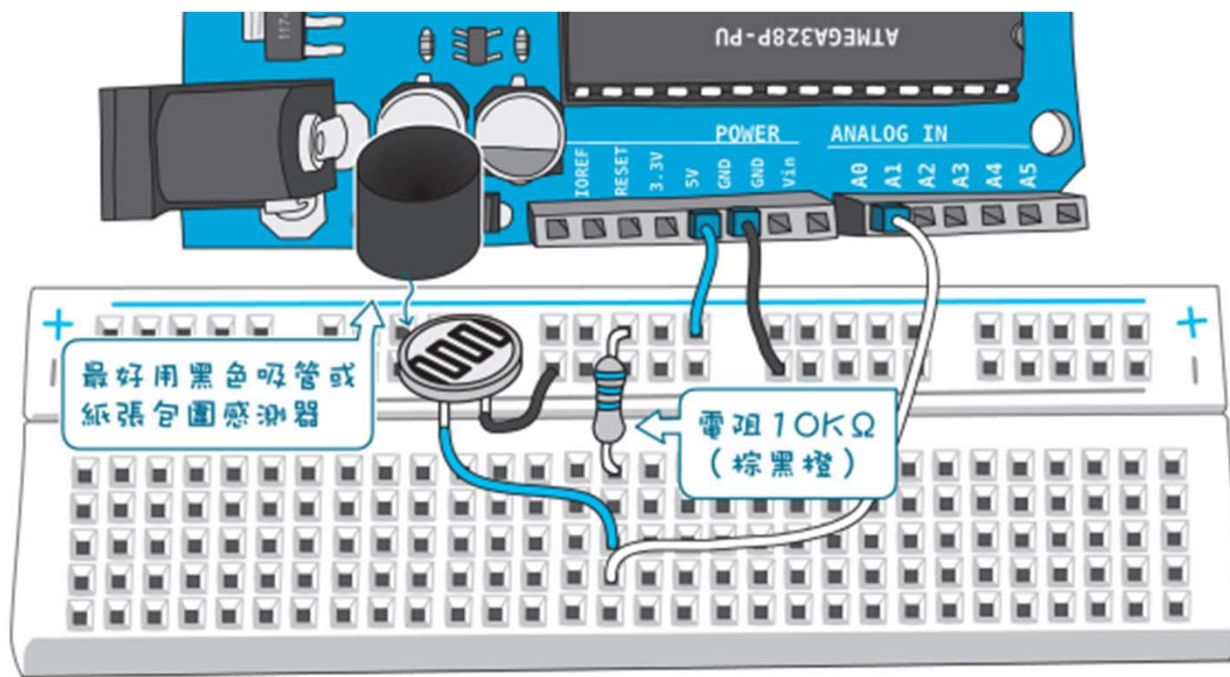


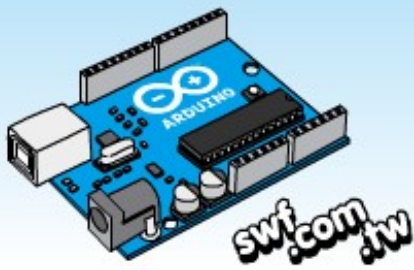
$$V_{OUT} = 5V \times \frac{CdS}{R + CdS} \quad \leftarrow \text{電阻分壓的計算式}$$

$$V_{OUT} = 5V \times \frac{3300\Omega}{10000\Omega + 3300\Omega} \approx 1.24V$$

在室內光源測得的阻值約  $3.3k\Omega$

使用光敏電阻和另一個電阻構成分壓電路；光敏電阻會隨著光線變化改變阻值。

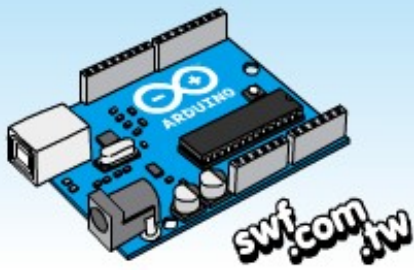




# 使用光敏電阻開關燈

```
void setup() {  
  // put your setup code here, to run once:  
  Serial.begin(9600);  
}
```

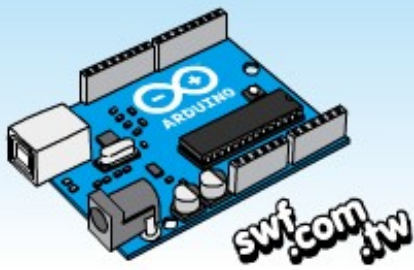
```
void loop() {  
  // put your main code here, to run  
  repeatedly:  
  float val = analogRead(A1);  
  Serial.println(val);  
  if (val>322) {  
    digitalWrite(13, HIGH); }  
  else {  
    digitalWrite(13, LOW);  
  }  
  delay(500);  
}
```



# 使用光敏電阻計數

```
int count=0;
int s=0;
void setup() {
  // put your setup code here, to run once:
  Serial.begin(9600); }
void loop() {
  // put your main code here, to run repeatedly:
  float val=analogRead(A0);
  Serial.print(val);
  Serial.print("  counter : ");
  if (val>350) {
    s=1;
    delay(100); }
  if (val<300) {
    count =count+s;
    s=0; }
  Serial.println(count);
  if (Serial.available()) {
    char reset = Serial.read();
    if(reset="0") {
      count = 0; } }
  delay(1000); }
```





- 一分鐘回饋:
- <https://goo.gl/forms/0C6jWOW5MTX9paos1>

