

Arduino- 無線傳輸

nrf24L01篇

童羸毅、陳美如


Category

簡介無線通訊

介紹Arduino、腳位、功用

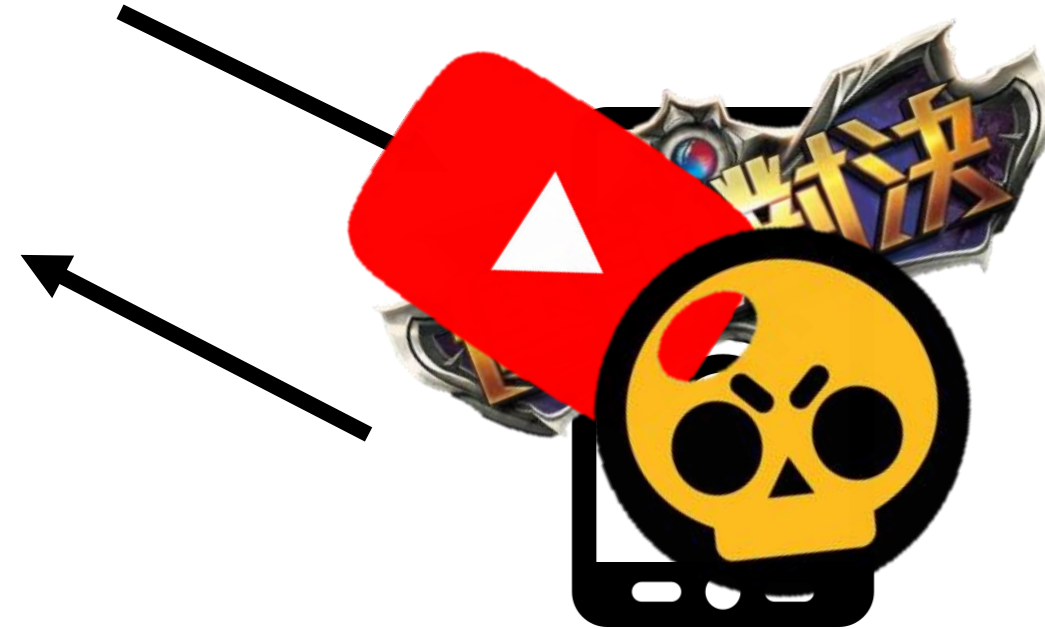
按鍵學習

nrf24L01無線模組



訊息傳遞
摩斯密碼

無線傳輸是什麼？



主要分為三種：



WIFI



BT

RF

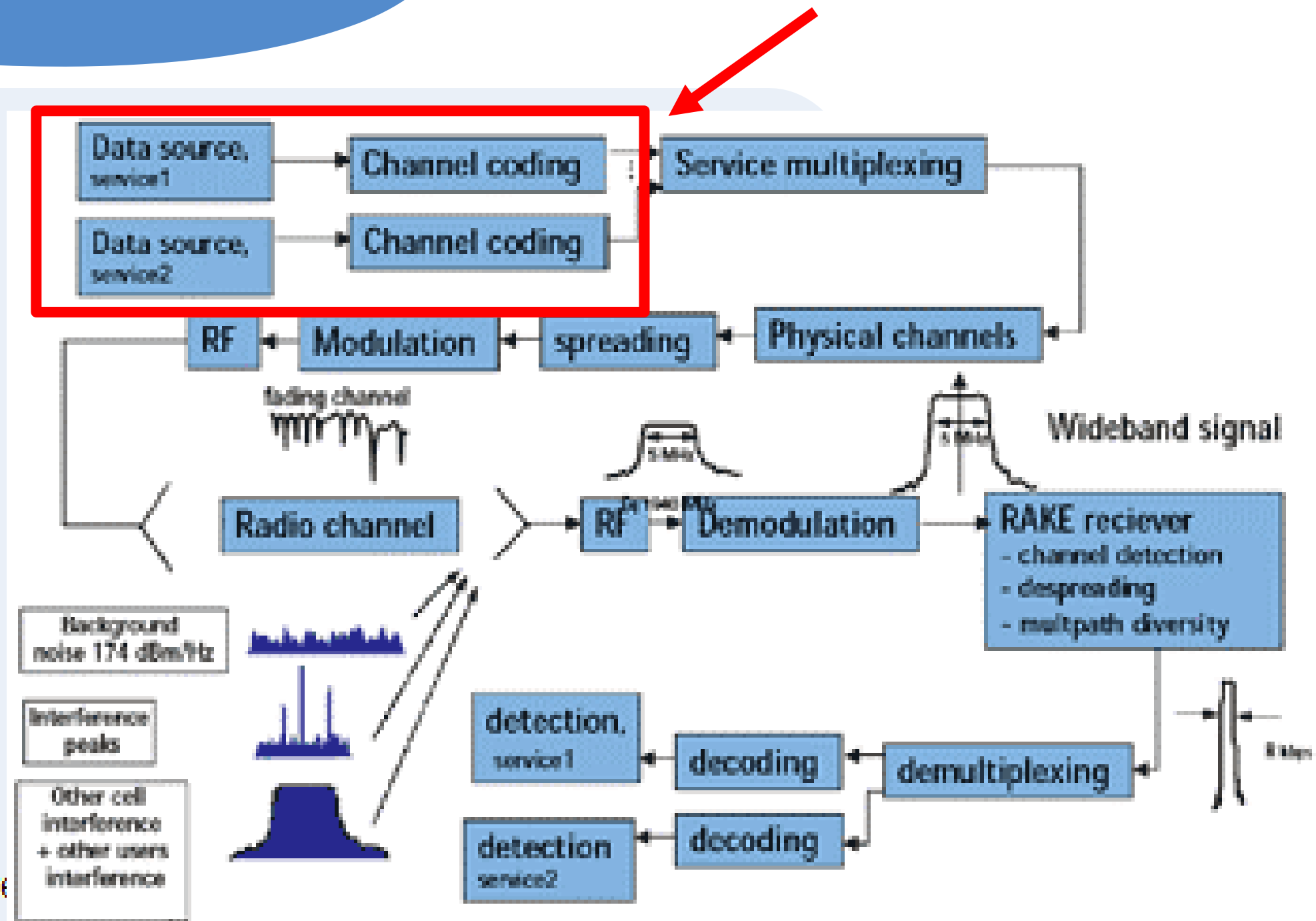
RF還有什麼應用？

NFC

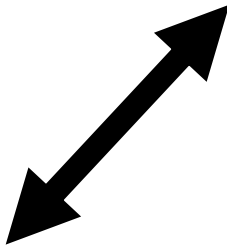
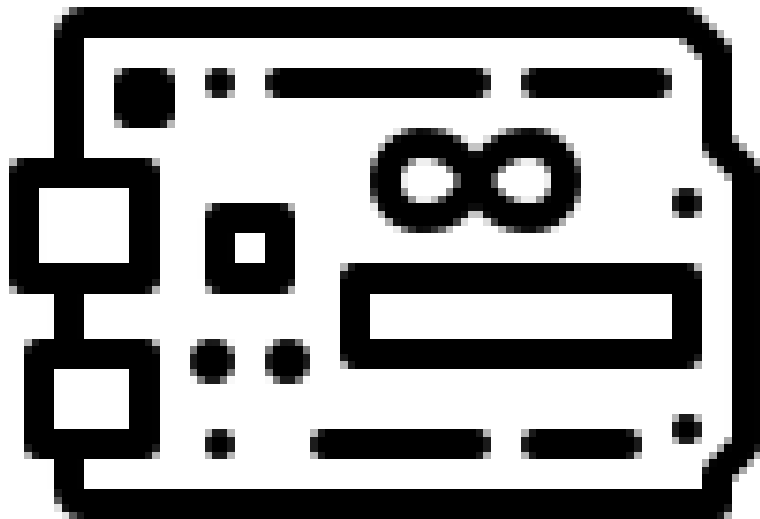
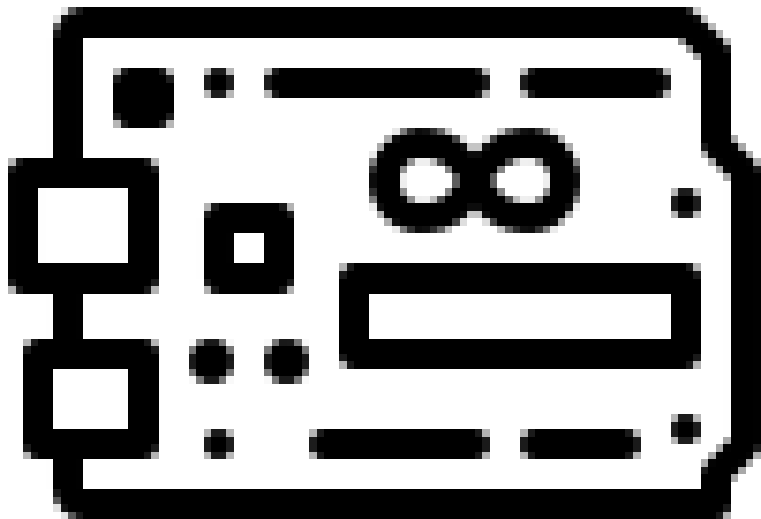
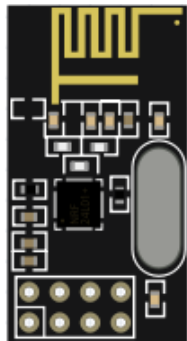
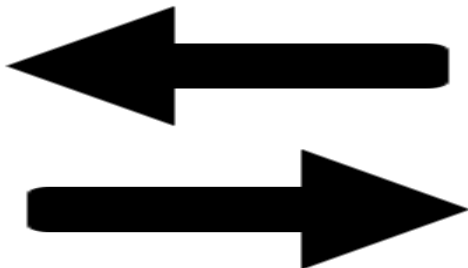
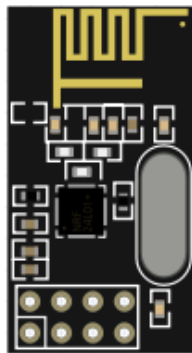
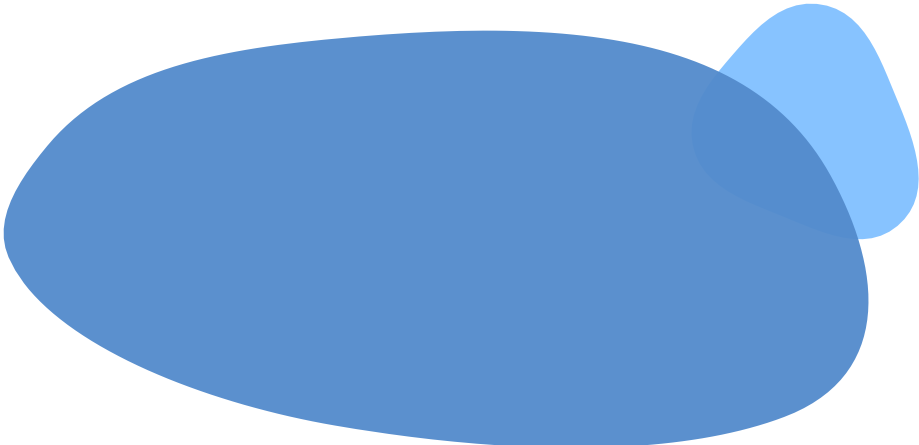
Zigbee



無線傳輸架構

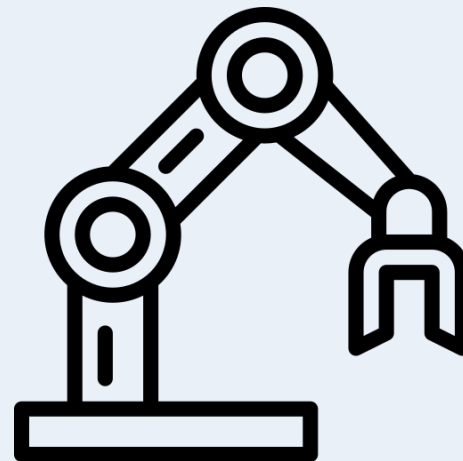


那如何實現無線傳輸呢？



Arduino可以幹嘛？

可以吃嗎？



Robot arm

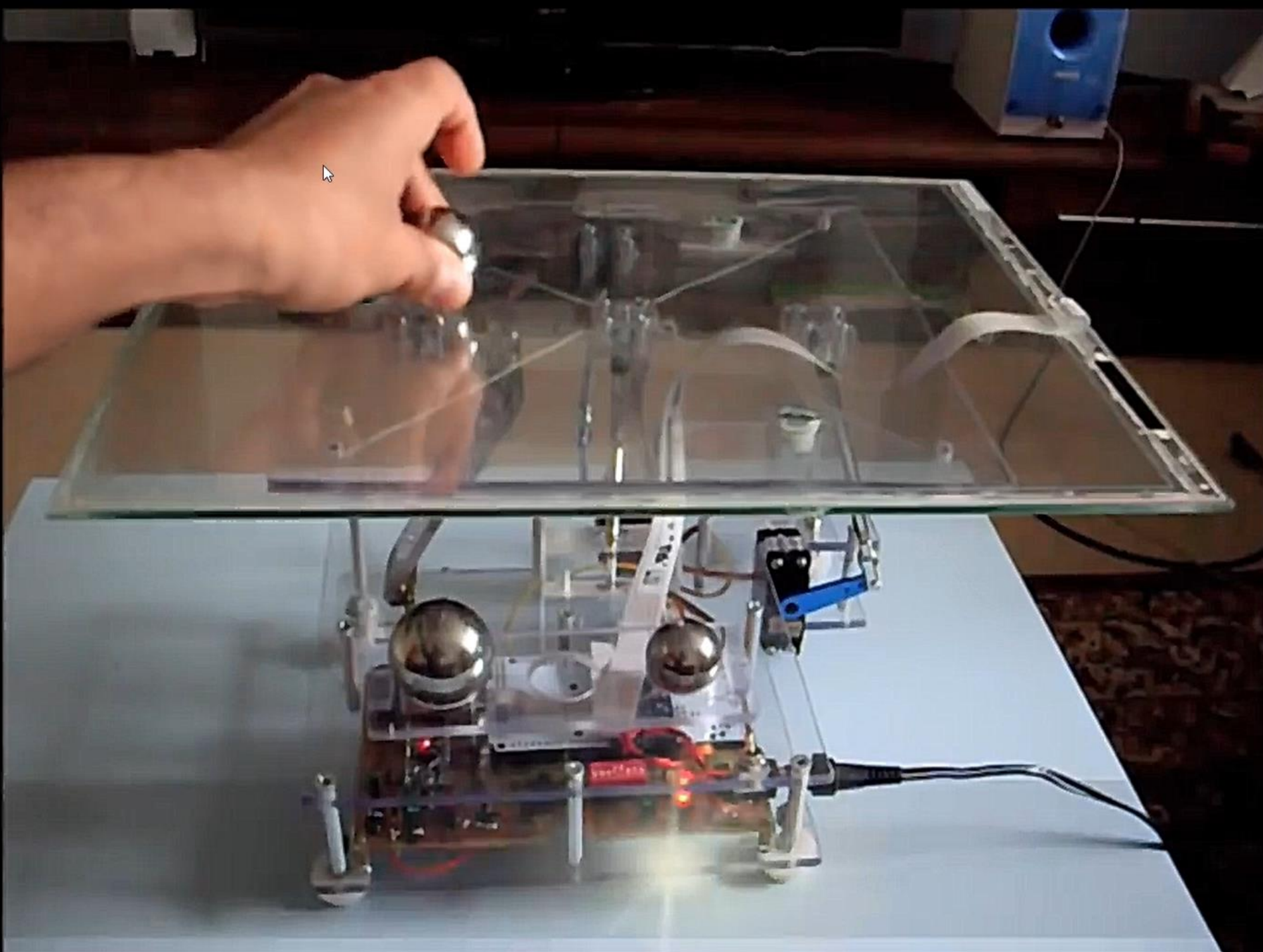


Quadcopter



Game controller

Arduino Project



Arduino Project



Arduino 簡介

認識 Arduino

Q1.Arduino源自於哪裡？

ANS:義大利

Q2.Arduino 多少錢就能買到？

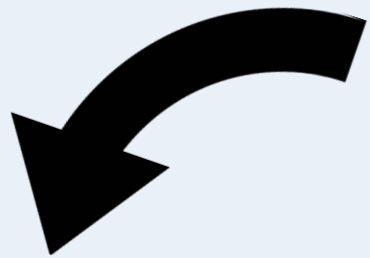
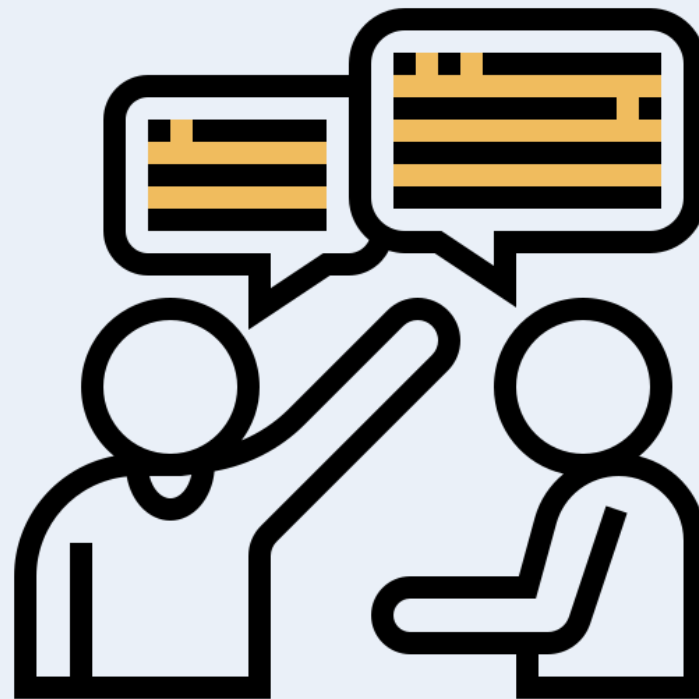
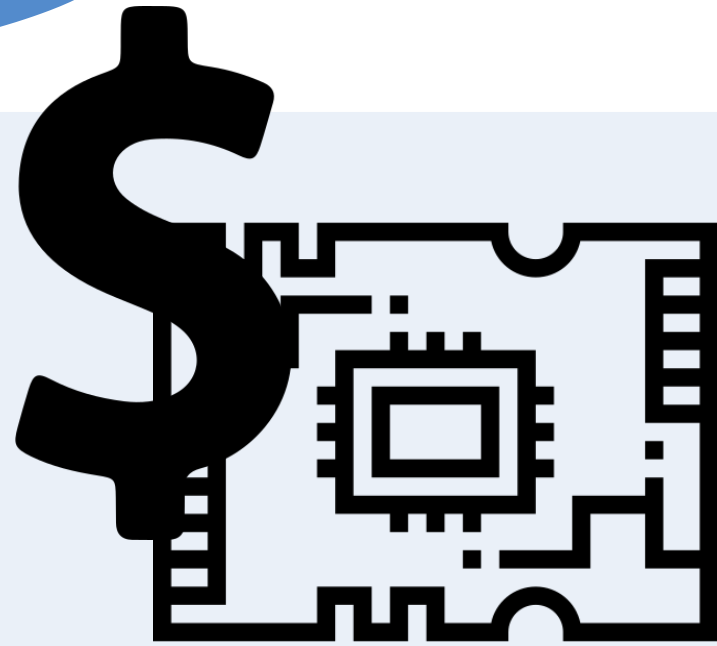
ANS:120元



Q3.除了arduino 外你還知道有那些開發版？

ANS: nodeMCU 、 stm32 、 樹莓派 、 香橙派 、 橘子派 、 香蕉派

Arduino 由來



下載安裝 Arduino IDE

按download

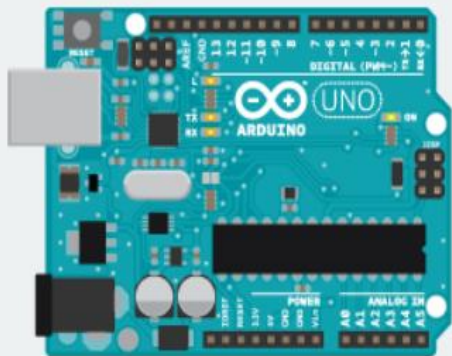


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SIGN IN

WHAT IS ARDUINO?



BUY AN ARDUINO



LEARN ARDUINO



DONATE



BLOG



ANNOUNCING THE NEW
ARDUINO CREATE MAKER
PLAN!

NEW NANO FAMILY
LET'S MAKE BIG
IDEAS REAL.
PRE-ORDER NOW!



下載安裝 Arduino IDE



ARDUINO 1.8.9

The open-source Arduino Software (IDE) makes it easy to write code and upload it to the board. It runs on Windows, Mac OS X, and Linux. The environment is written in Java and based on Processing and other open-source software.

This software can be used with any Arduino board. Refer to the [Getting Started](#) page for Installation instructions.

Windows Installer, for Windows XP and up
Windows ZIP file for non admin install

Windows app Requires Win 8.1 or 10



Mac OS X 10.8 Mountain Lion or newer

Linux 32 bits

Linux 64 bits

Linux ARM 32 bits

Linux ARM 64 bits

[Release Notes](#)

[Source Code](#)

[Checksums \(sha512\)](#)



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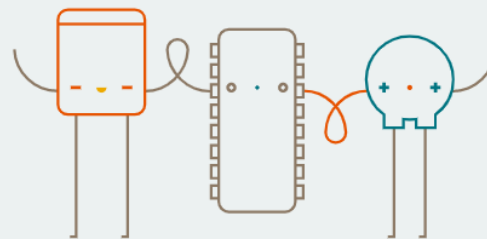
[RESOURCES](#)

[COMMUNITY](#)

[HELP](#)

Contribute to the Arduino Software

Consider supporting the Arduino Software by contributing to its development. (US tax payers, please note this contribution is not tax deductible). [Learn more on how your contribution will be used.](#)



SINCE MARCH 2015, THE ARDUINO IDE HAS BEEN DOWNLOADED **33,982,283** TIMES. (IMPRESSIVE!) NO LONGER JUST FOR ARDUINO AND GENUINO BOARDS, HUNDREDS OF COMPANIES AROUND THE WORLD ARE USING THE IDE TO PROGRAM THEIR DEVICES, INCLUDING COMPATIBLES, CLONES, AND EVEN COUNTERFEITS. HELP ACCELERATE ITS DEVELOPMENT WITH A SMALL CONTRIBUTION! REMEMBER: OPEN SOURCE IS LOVE!

\$3

\$5

\$10

\$25

\$50

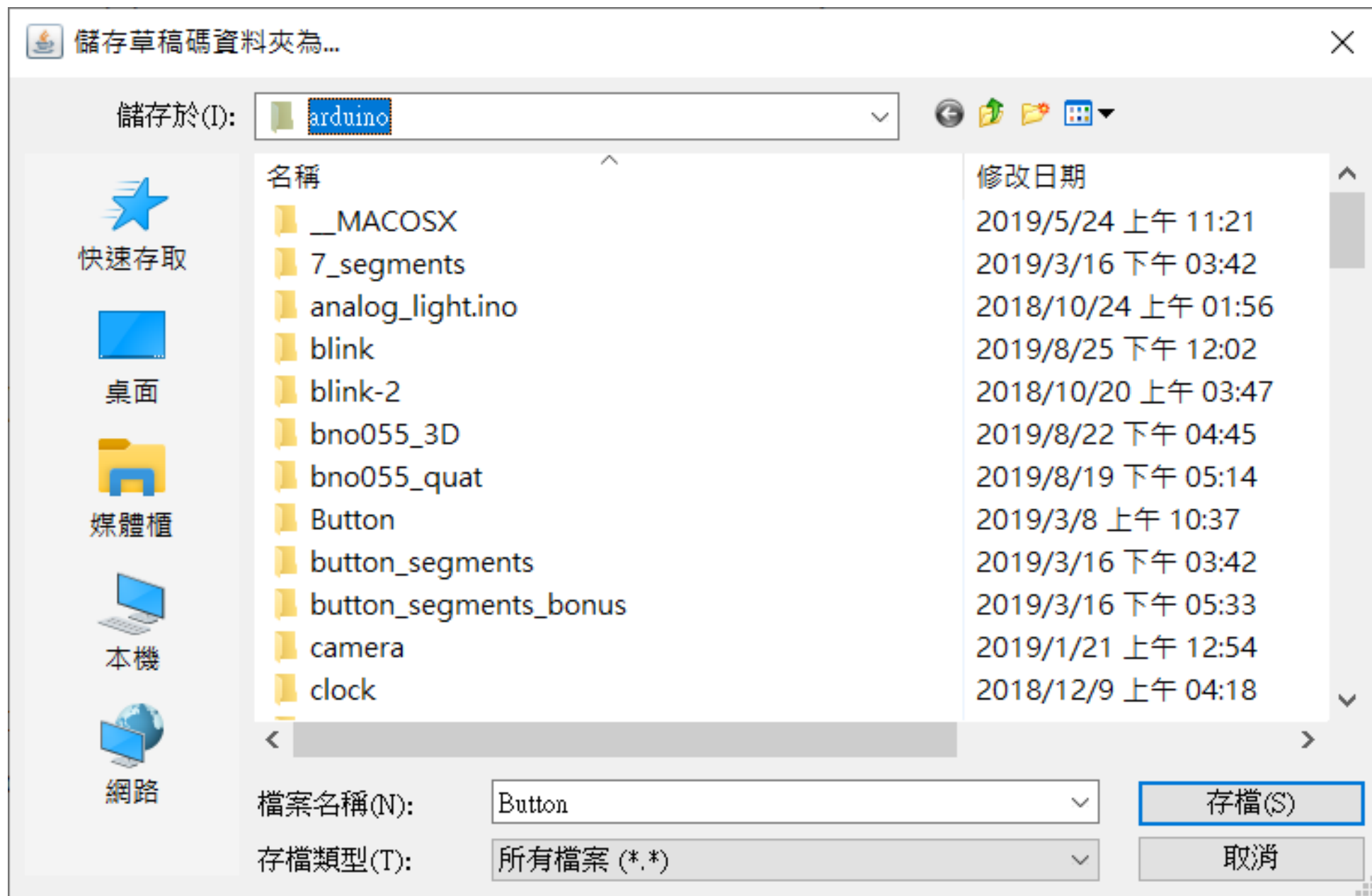
OTHER

JUST DOWNLOAD

CONTRIBUTE & DOWNLOAD

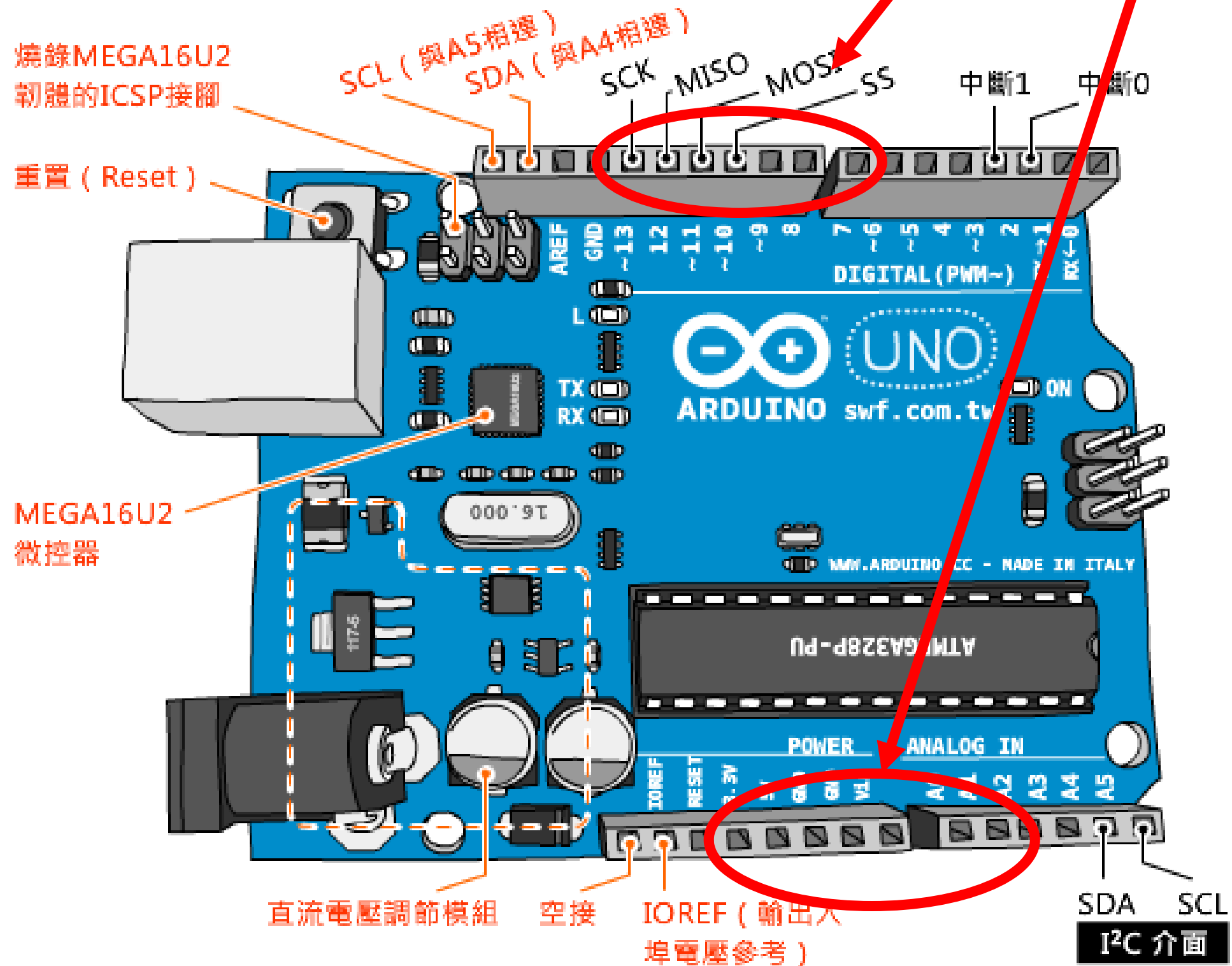
檔案存取

自製資料夾各別打名字存

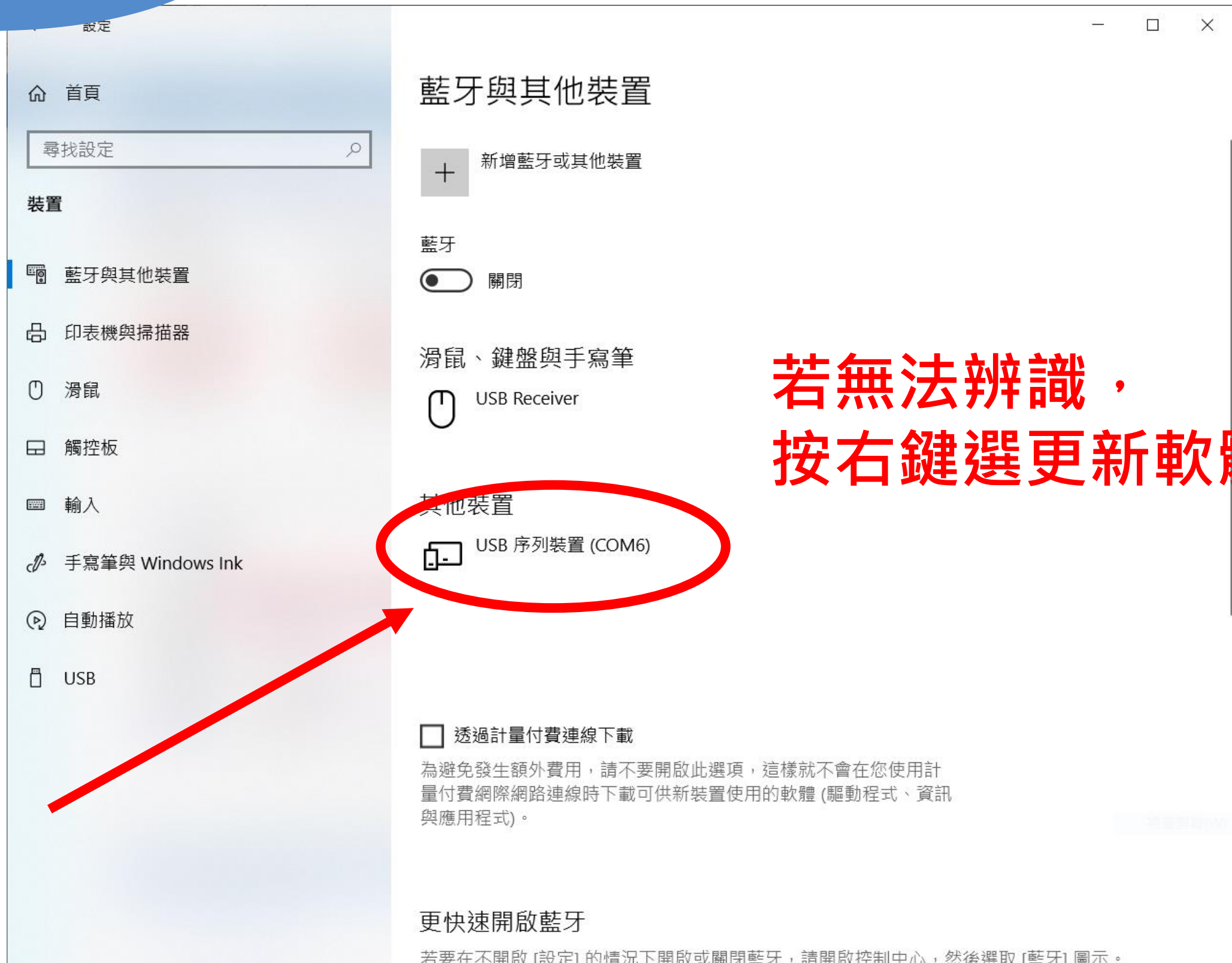


Arduino 腳位介紹

主要用這些腳位



下載安裝 Arduino IDE



若無法辨識，
按右鍵選更新軟體

選擇板子

按工具 選擇開發板

選擇 arduino/ Genuino Uno

BNO055_skeleton_BT_master | Arduino 1.8.9 (Windows Store 1.8.21.0)

檔案 編輯 草稿碼 工具 說明

The screenshot shows the Arduino IDE interface. The 'Tools' menu is open, and '開發板: "Arduino/Genuino Uno"' is selected and highlighted with a red oval. The background code is for a BNO055 sensor project. The right sidebar shows the '開發板管理員...' (Board Manager) window, which lists various Arduino boards. 'Arduino/Genuino Uno' is selected in this list, also highlighted with a red oval.

```
1 //#incl
2 #includ
3 #includ
4 #includ
5
6 /* Set
7 #define
8 #define
9 #define
10
11 Adafruit_BNO055 bno = Adafruit_BNO055(55,
12 Adafruit_BNO055 bno2 = Adafruit_BNO055(56,
13
14 int sent_times = 1;
15 int start = 0;
16 short fix;
17 short fix2;
18
19 //SPI
20 char buf [50];
21 byte c;
22 byte a;
23
24 //BT
25 SoftwareSerial BT(8, 9); // 接收腳, 傳送腳
26
```

開發板管理員...

- Arduino AVR 板
- Arduino Yún
- Arduino/Genuino Uno
- Arduino Duemilanove or Diecimila
- Arduino Nano
- Arduino/Genuino Mega or Mega 2560
- Arduino Mega ADK
- Arduino Leonardo
- Arduino Leonardo ETH
- Arduino/Genuino Micro
- Arduino Esplora
- Arduino Mini
- Arduino Ethernet
- Arduino Fio
- Arduino BT
- LilyPad Arduino USB
- LilyPad Arduino
- Arduino Pro or Pro Mini
- Arduino NG or older
- Arduino Robot Control
- Arduino Robot Motor
- Arduino Gemma
- Adafruit Circuit Playground
- Arduino Yún Mini
- Arduino Industrial 101
- Linino One
- Arduino Uno WiFi
- Ameba ARM (32-bits) Boards
- Ameba RTL8195A
- Ameba RTL8710

選擇序列埠

按工具
選擇序列埠

選擇COM?

工具 說明

自動格式化	Ctrl+T
封存草稿碼	
修正編碼並重新載入	
管理程式庫...	Ctrl+Shift+I
序列埠監控視窗	Ctrl+Shift+M
序列繪圖家	Ctrl+Shift+L
WiFi101 / Wi-Fi NINA Firmware Updater	
開發板: "Arduino/Genuino Uno"	>
序列埠: "COM14 (Arduino/Genuino Uno)"	>
取得開發板資訊	
燒錄器: "AVR ISP"	>
燒錄Bootloader	

序列埠

☒ COM14 (Arduino/Genuino Uno)

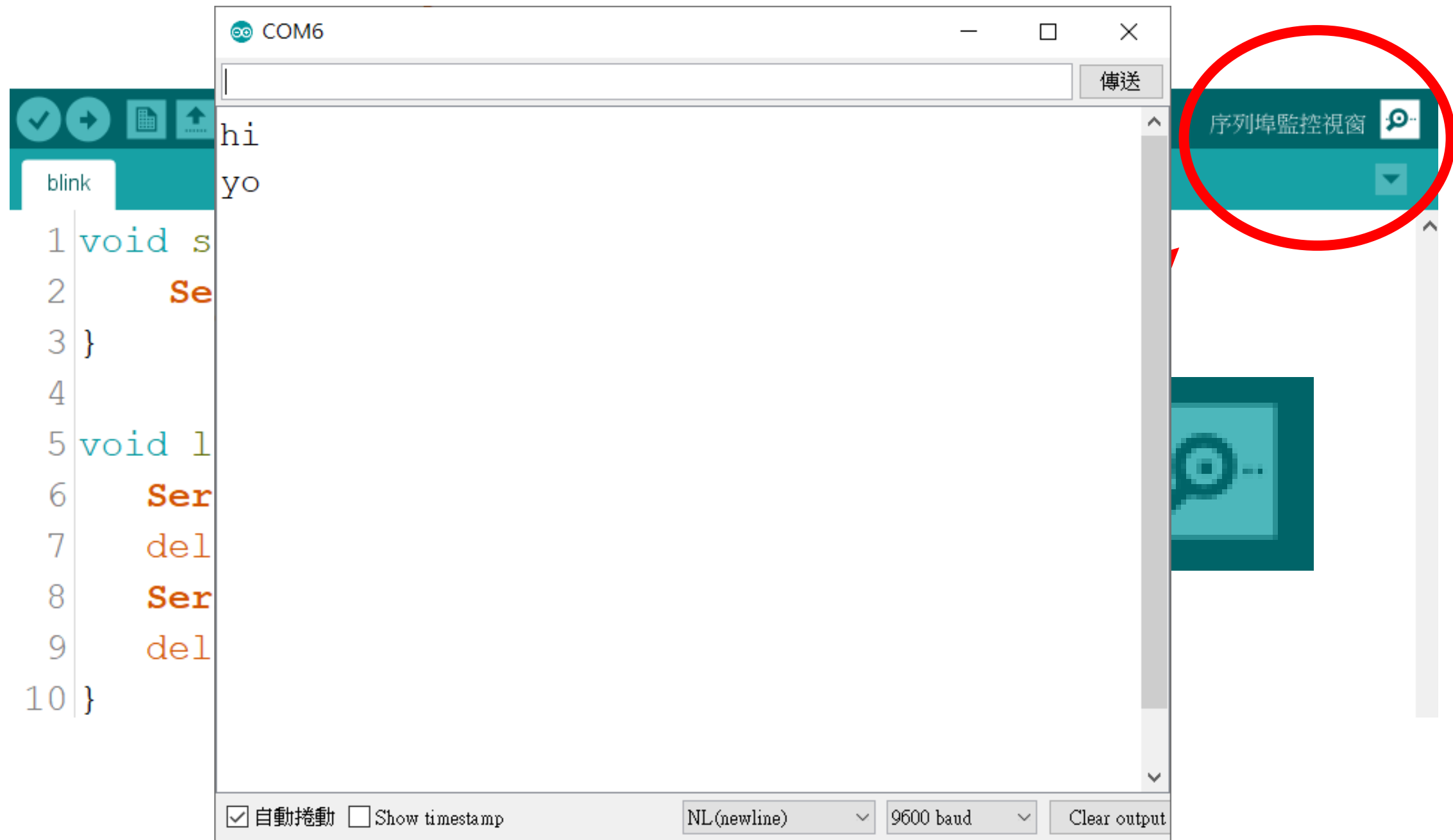
編譯 燒錄 Arduino

編譯

燒錄



序列埠視窗



基本語法介紹

```
Void setup(){  
}
```

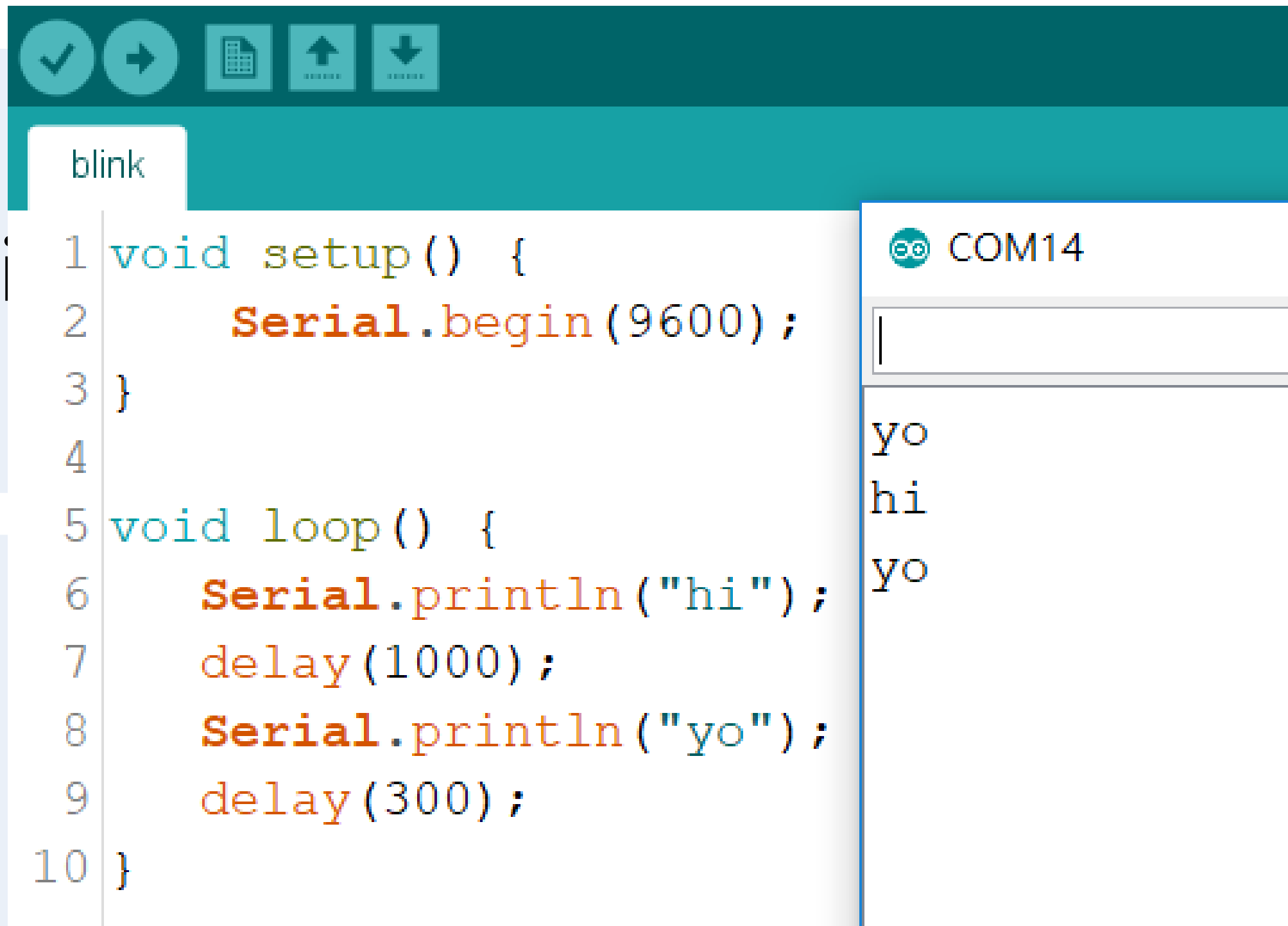
```
Void loop(){  
}
```



基本語法介紹

Serial

Serial
Serial



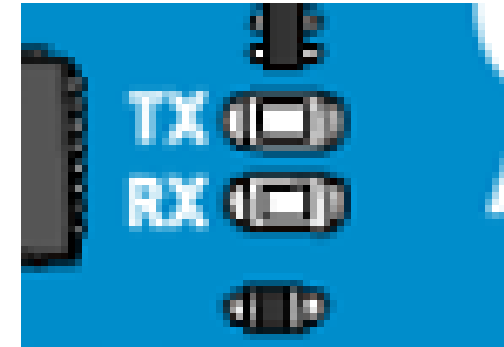
```
1 void setup() {  
2     Serial.begin(9600);  
3 }  
4  
5 void loop() {  
6     Serial.println("hi");  
7     delay(1000);  
8     Serial.println("yo");  
9     delay(300);  
10 }
```

COM14

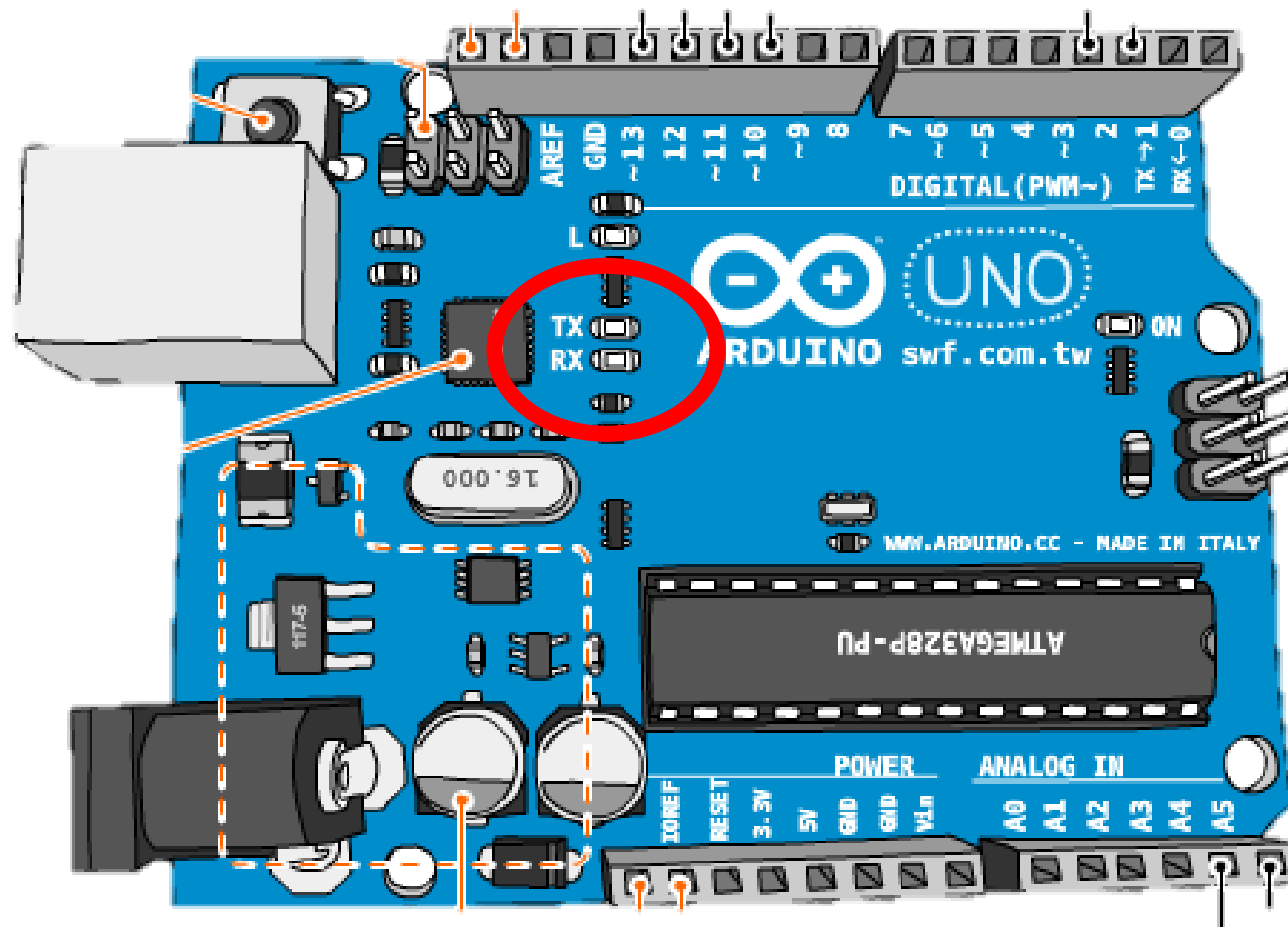
yo
hi
yo

里面

補充小站



TX 寫入
RX 讀取



基本語法介紹

```
pinMode(腳位, INPUT/OUTPUT);
```

放在void setup()裡面

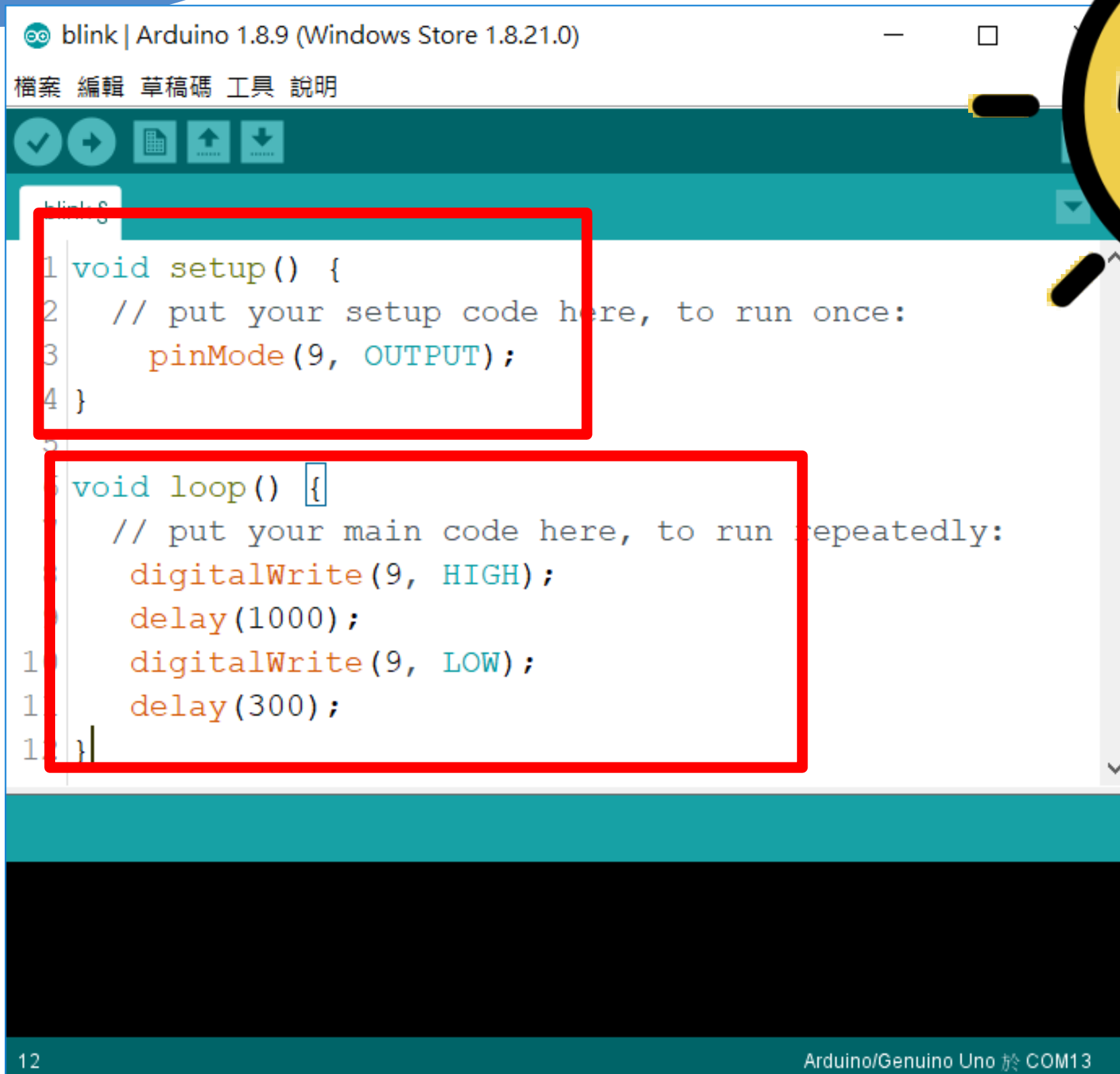
```
digitalWrite(腳位, HIGH/LOW);
```

放在void loop()裡面

```
delay(ms);
```

都可放

練習led 開關燈

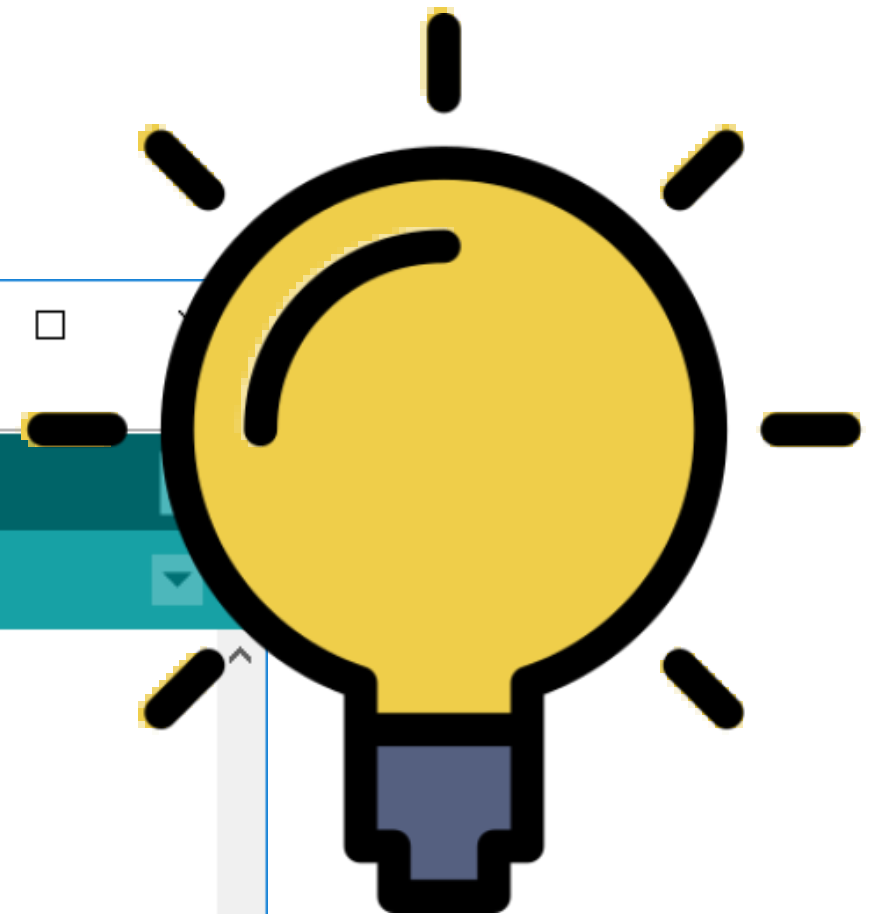


```
blink | Arduino 1.8.9 (Windows Store 1.8.21.0)
檔案 編輯 草稿碼 工具 說明

1 void setup() {
2   // put your setup code here, to run once:
3   pinMode(9, OUTPUT);
4 }
5
6 void loop() {
7   // put your main code here, to run repeatedly:
8   digitalWrite(9, HIGH);
9   delay(1000);
10  digitalWrite(9, LOW);
11  delay(300);
12 }
```

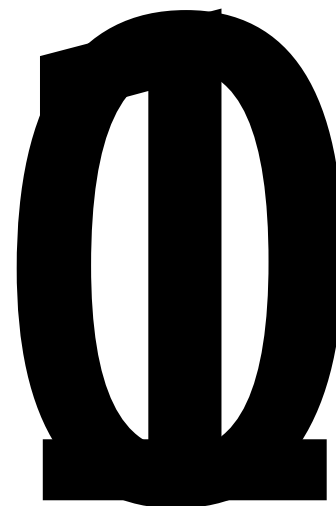
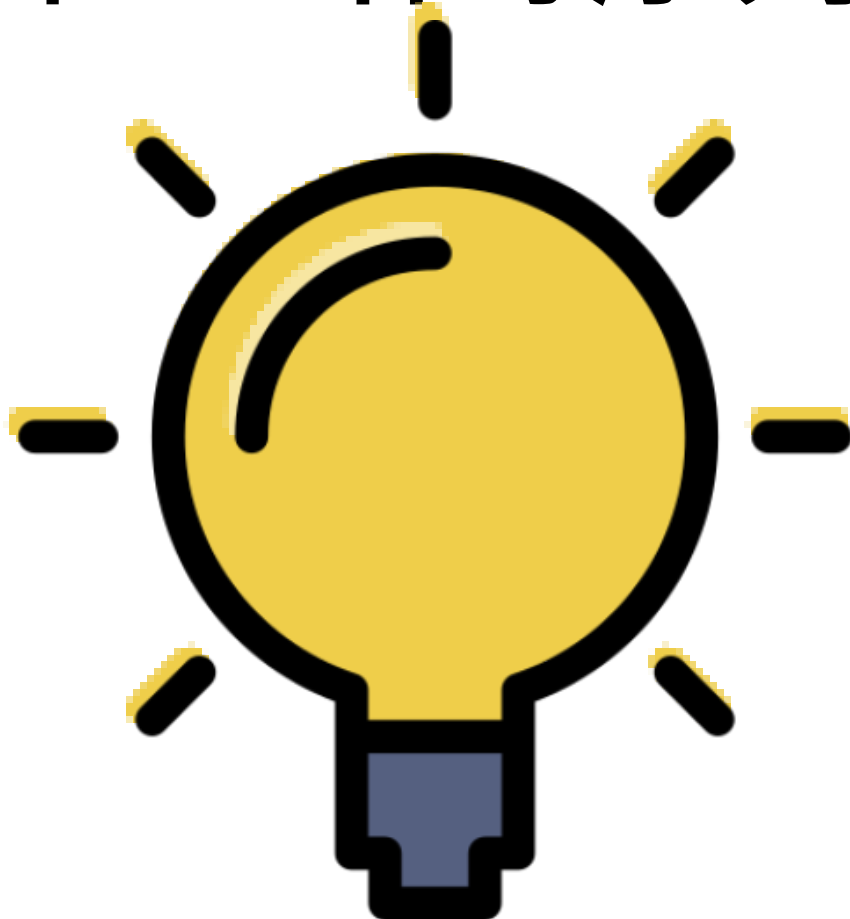
12

Arduino/Genuino Uno 於 COM13



extra

請將led用序列埠顯示
當led亮時序列埠顯示的值為1或High
當led暗時序列埠顯示的值為0或Low



輸入序列埠

Serial.available()

Arduino板看序列埠
有沒有傳值過來

Serial.read();

Arduino 讀取我們在
序列埠打的值

輸入序列埠

serial_read §

```
1 void setup() {  
2     Serial.begin(9600);  
3 }  
4 char r='\0';  
5 void loop() {  
6     if(Serial.available()) {  
7         while((r=Serial.read()) != -1) {  
8             if(r != '\n') {  
9                 Serial.print(r);  
10            }  
11            else if(r == '\n') {  
12                Serial.println();  
13            }  
14        }  
15    }  
16 }
```

COM4

lalalalala.....|

hello everyone

how are you today?

按鈕教學

練習

Serial read+nrf ! !

How are you?

I am fine. Thank you.

練習

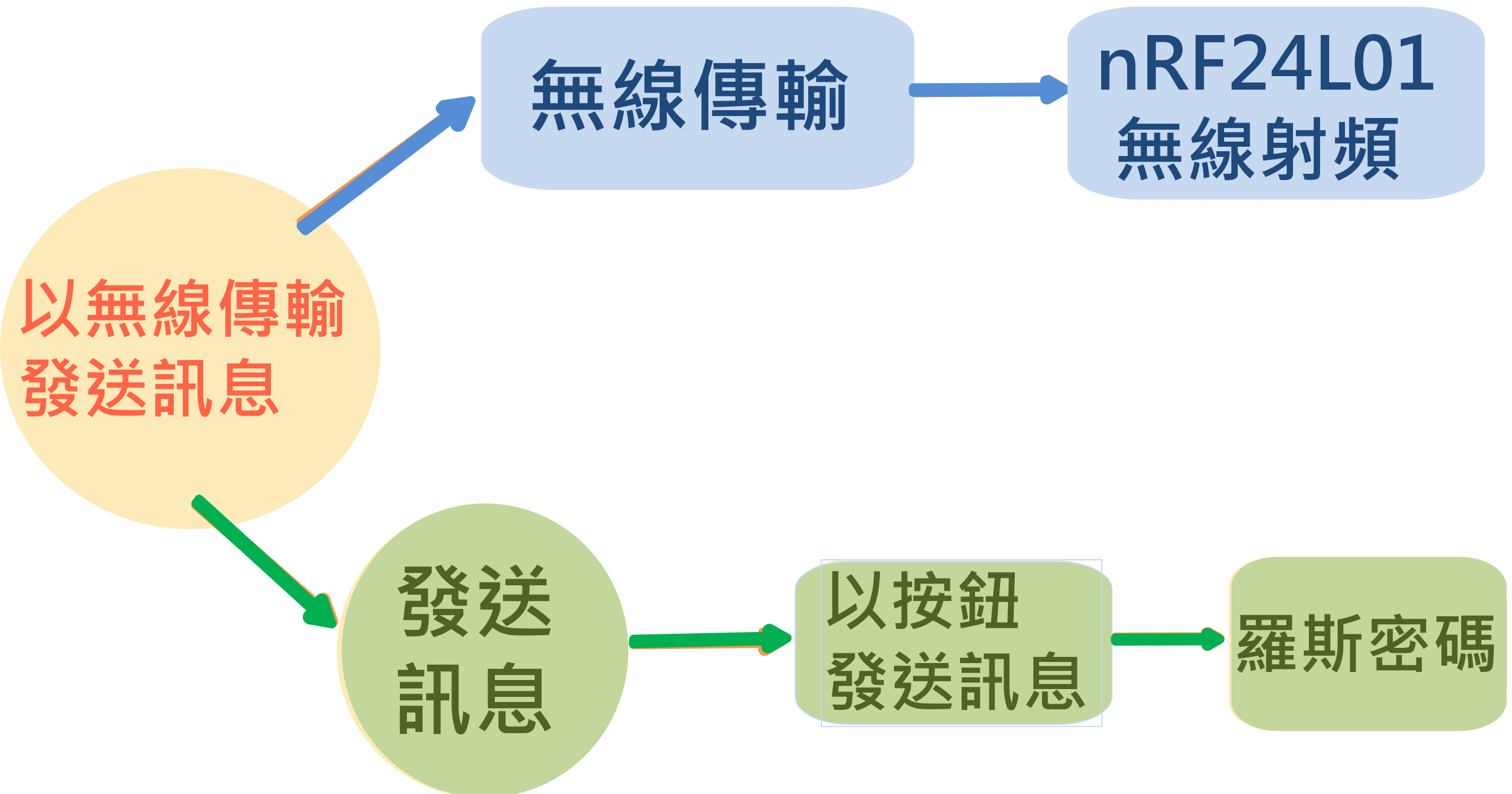
button+nrf ! !

10110010

0101001101101

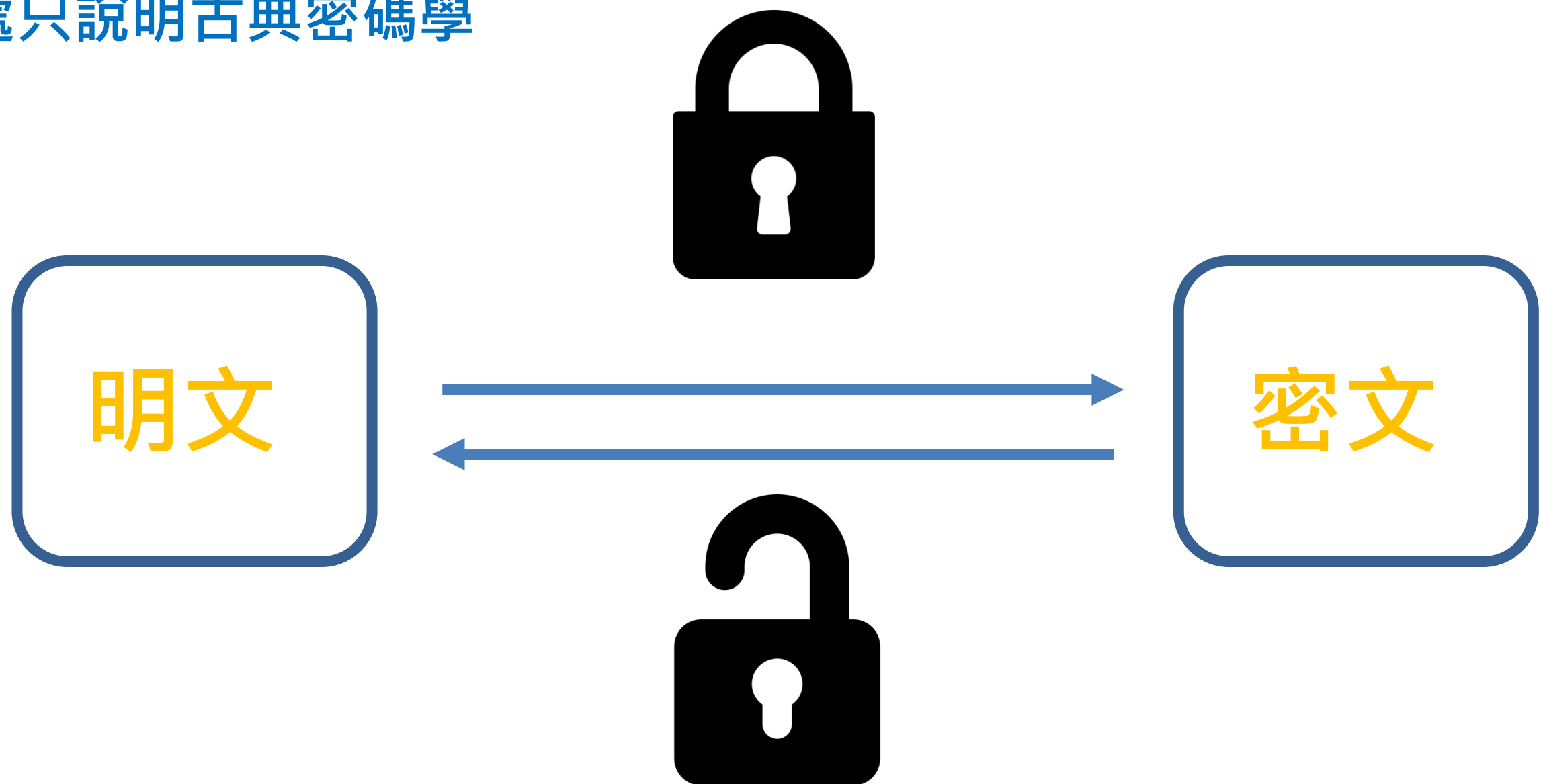
羅斯密碼教學

課程地圖



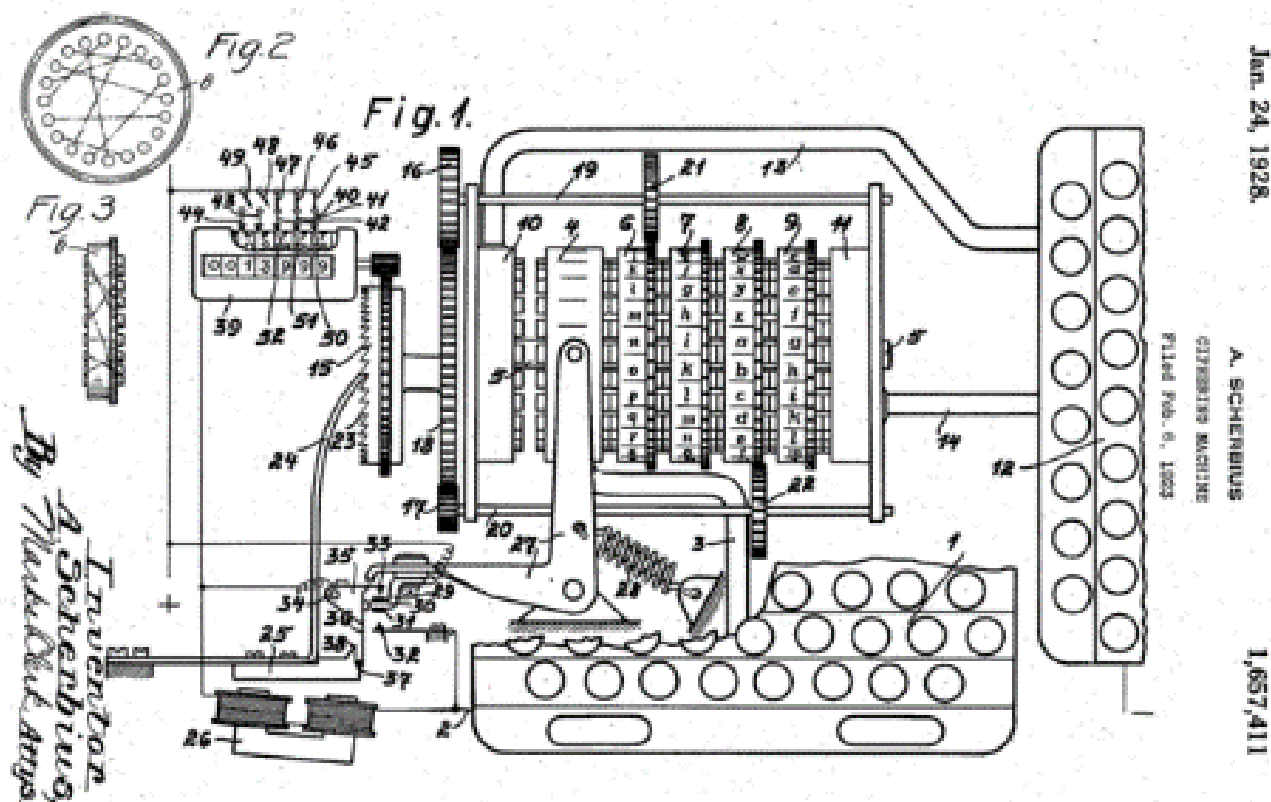
何謂密碼學？

此處只說明古典密碼學



何謂密碼學？

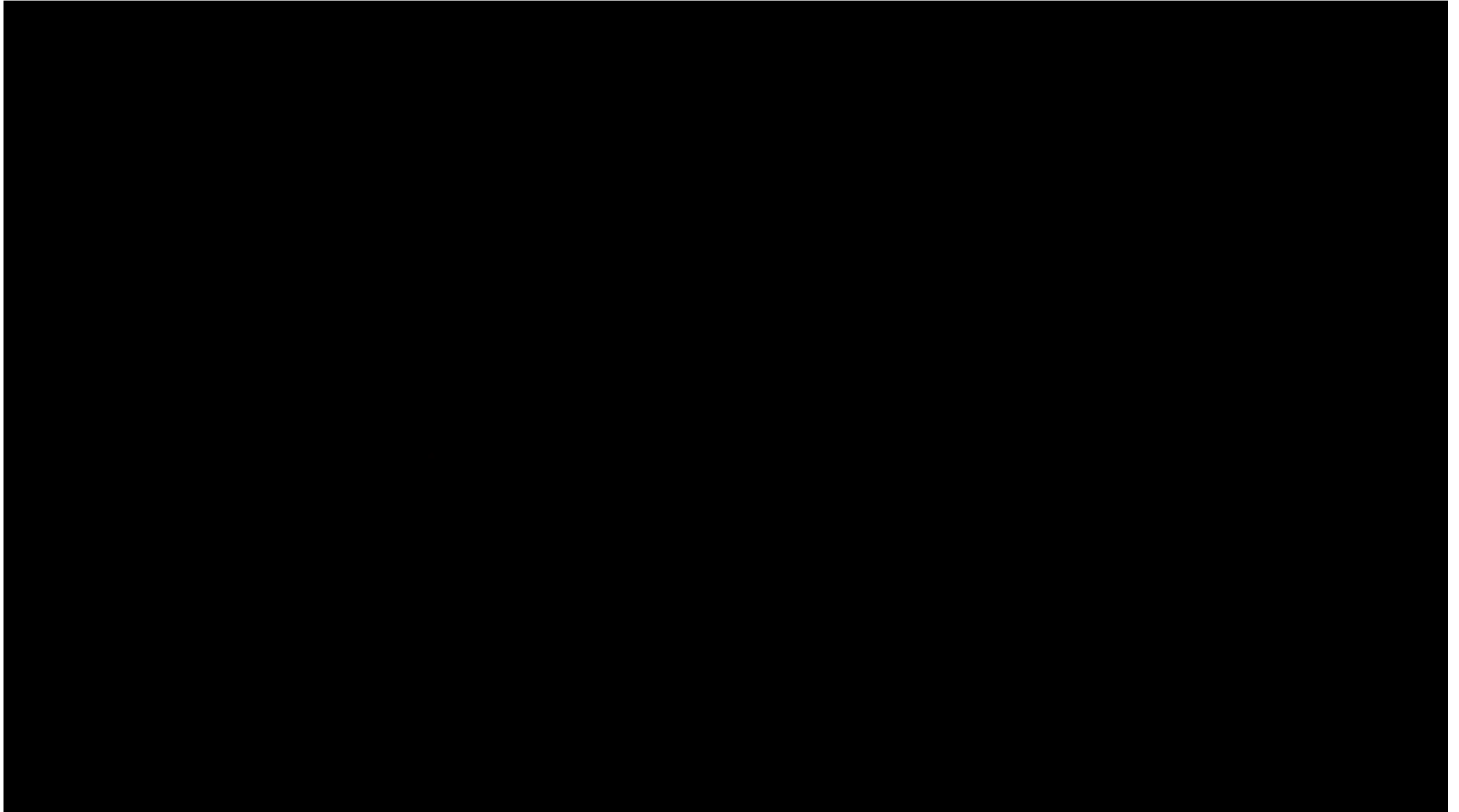
159,000,000,000,000,000,000種加密方式！



Ans: Enigma



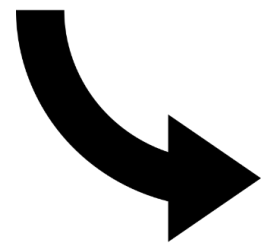
模仿遊戲



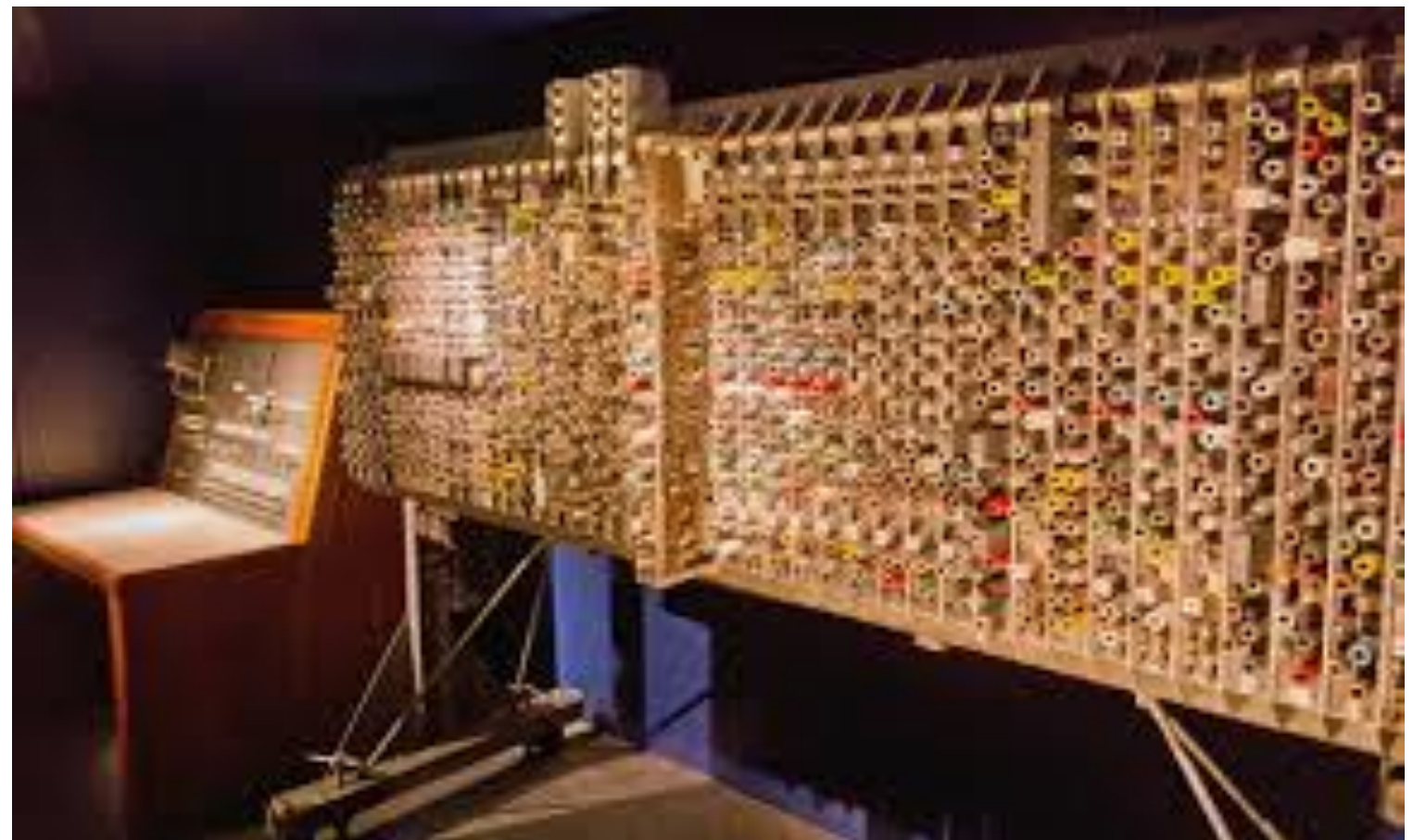
發展



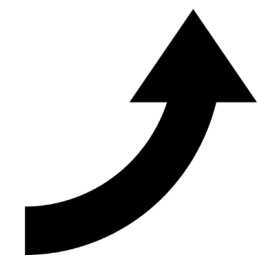
Bombe



Colossus computer



Automatic Computing Engine



發展

自己試試看
如何做加密訊息



摩斯密碼架構

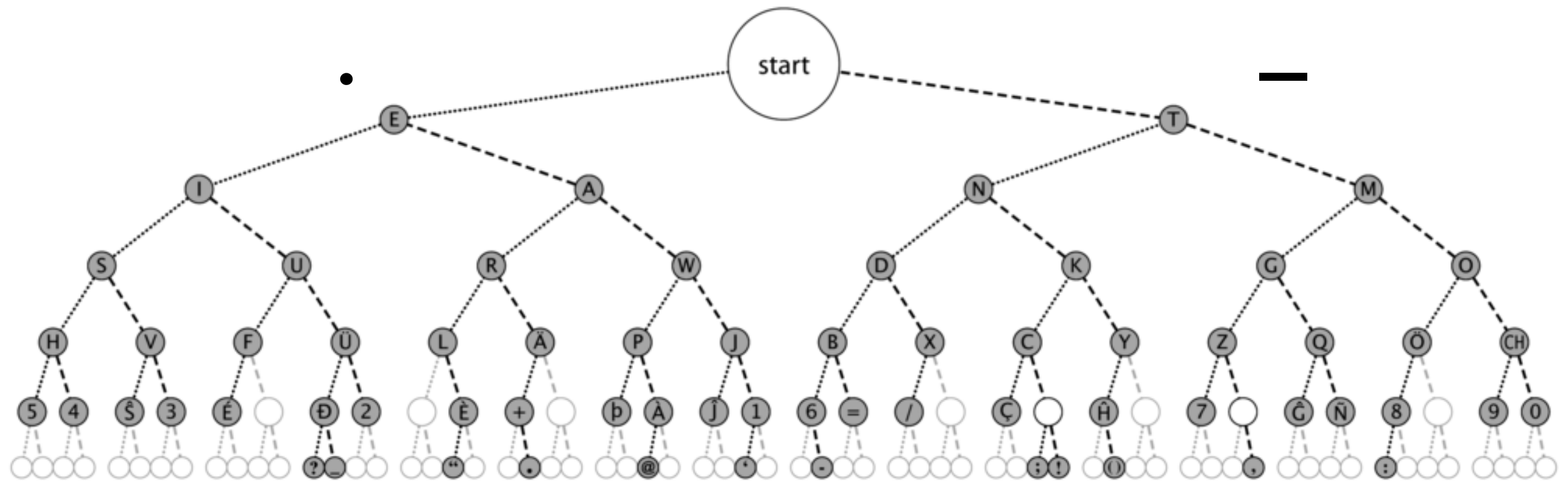
A ● ■
B ■ ● ● ●
C ■ ● ■ ●
D ■ ● ●
E ●
F ● ● ■ ●
G ■ ■ ●
H ● ● ● ●
I ● ●
J ● ■ ■ ■
K ■ ● ■
L ● ■ ● ●
M ■ ■
N ■ ●
O ■ ■ ■
P ● ■ ■ ●
Q ■ ■ ● ■
R ● ■ ●
S ● ● ●
T ■

U ● ● ■
V ● ● ● ■
W ● ■ ■
X ■ ● ● ■
Y ■ ● ■ ■
Z ■ ■ ● ●

1 ● ■ ■ ■ ■
2 ● ● ■ ■ ■
3 ● ● ● ■ ■
4 ● ● ● ● ■
5 ● ● ● ● ●
6 ■ ● ● ● ●
7 ■ ■ ● ● ●
8 ■ ■ ■ ● ●
9 ■ ■ ■ ■ ●
0 ■ ■ ■ ■ ■

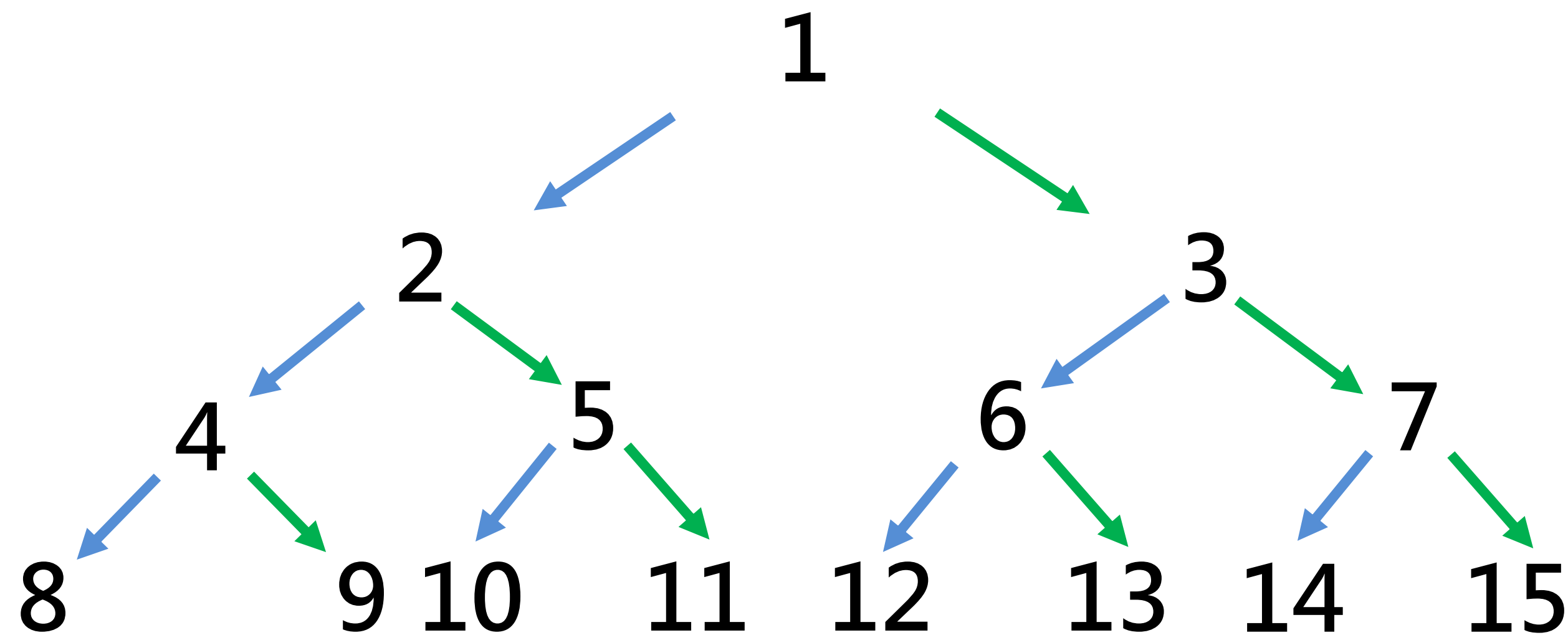
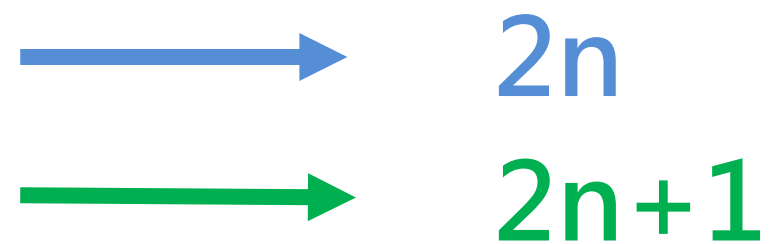
摩斯密碼架構

tree(二元樹)



· 放左子樹，-放右子樹

摩斯密碼架構



摩斯密碼架構

用陣列方式打樹

```
1 char alphabet[29]={'e','t','i','a','n','m','s','u','r','w','d','k','g','o','h','v','f',';','l',':',',','p','j','b','x','c','y','z','q','\n'};
2 char morse[31][5]={{'\n','\n','\n','\n','\n'},
3                     {'\n','\n','\n','\n','\n'},
4                     {'0',' ',' ',' ',' ',' '},//e 2
5                     {'1',' ',' ',' ',' ',' '},//t 3
6                     {'0','0',' ',' ',' ',' '},//i 4
7                     {'0','1',' ',' ',' ',' '},//a 5
8                     {'1','0',' ',' ',' ',' '},//n 6
9                     {'1','1',' ',' ',' ',' '},//m 7
10                    {'0','0','0',' ',' ',' '},//s 8
11                    {'0','0','1',' ',' ',' '},//u 9
12                    {'0','1','0',' ',' ',' '},//r 10
13                    {'0','1','1',' ',' ',' '},//w 11
14                    {'1','0','0',' ',' ',' '},//d 12
15                    {'1','0','1',' ',' ',' '},//k 13
16                    {'1','1','0',' ',' ',' '},//g 14
17                    {'1','1','1',' ',' ',' '},//o 15
18                    {'0','0','0','0',' ',' '},//h 16
19                    {'0','0','0','1',' ',' '},//v 17
20                    {'0','0','1','0',' ',' '},//f 18
21                    {'0','0','1','1',' ',' '},//none 19
22                    {'0','1','0','0',' ',' '},//l 20
23                    {'0','1','0','1',' ',' '},//none 21
24                    {'0','1','1','0',' ',' '},//p 22
25                    {'0','1','1','1',' ',' '},//j 23
26                    {'1','0','0','0',' ',' '},//b 24
27                    {'1','0','0','1',' ',' '},//x 25
28                    {'1','0','1','0',' ',' '},//c 26
29                    {'1','0','1','1',' ',' '},//y 27
30                    {'1','1','0','0',' ',' '},//z 28
31                    {'1','1','0','1',' ',' '},//q 29
32                    {'\n','\n','\n','\n','\n'}};
```

二維陣列

char (name) [5] [5]

row

column

摩斯密碼架構

加密程式流程



摩斯密碼架構

字母→摩斯密碼



Alphabet[i] == ' the alphabet you want ';//ex. a,b,c...

```
for loop(int j=0;j<5;j++)
```

```
buf[b]=morse[i][j]; //store the morse data into the buf  
b++;
```

摩斯密碼架構

`Serial.read();`



`rf24.write();`

字母轉成摩斯密碼

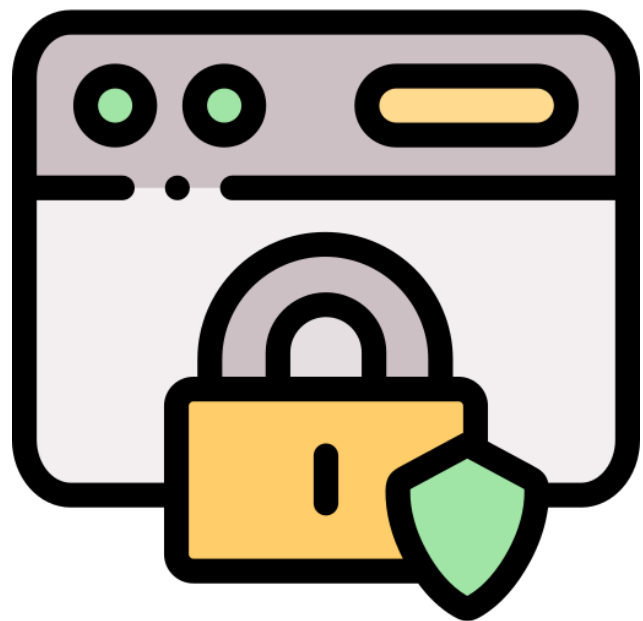
每轉摩斯密碼後
一定要空格

Why?

那空格如何處理？

摩斯密碼架構

試試看如何加密吧！



+



摩斯密碼架構

解密程式流程

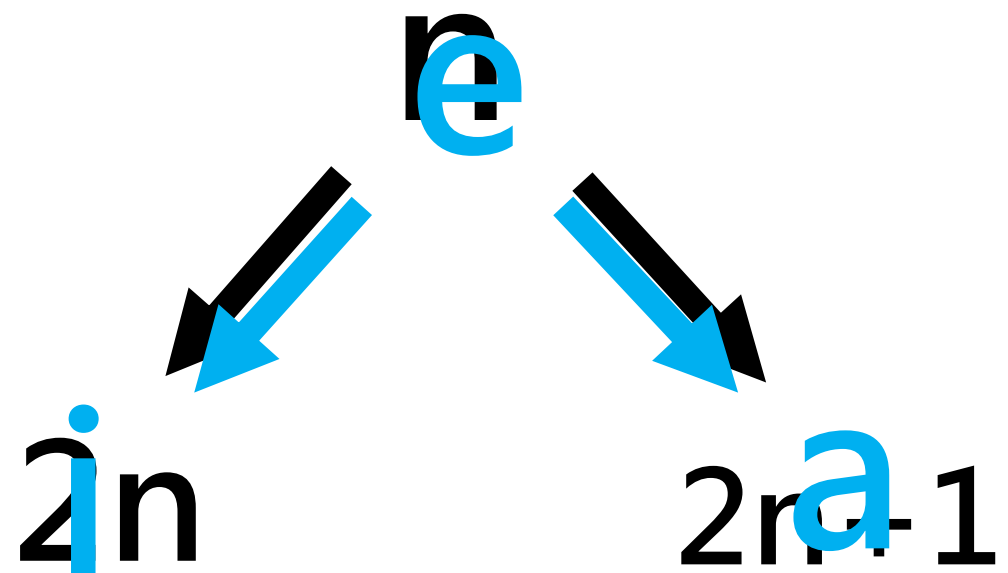


摩斯密碼架構

摩斯密碼→字母

當 · 和 – 傳入時，用類似樹的陣列去做偵測

morse[n][]
↓
alphabet[n]



摩斯密碼架構

```
rf24.read();
```

摩斯密碼轉回字母

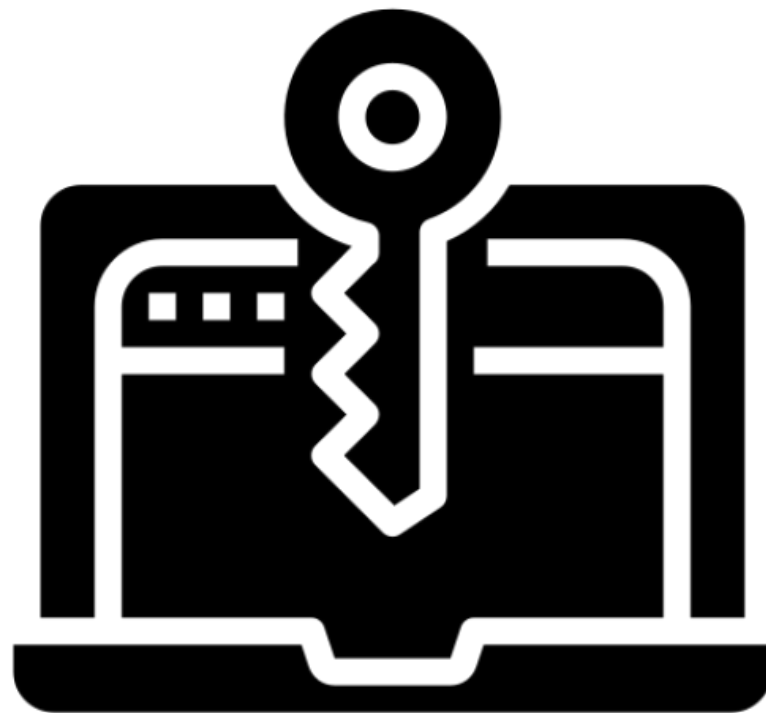
讀到空格後把前
面的值轉回來

那真正的空格如何處理？

```
Serial.print();
```

摩斯密碼架構

試試看如何解密吧！



摩斯密碼架構

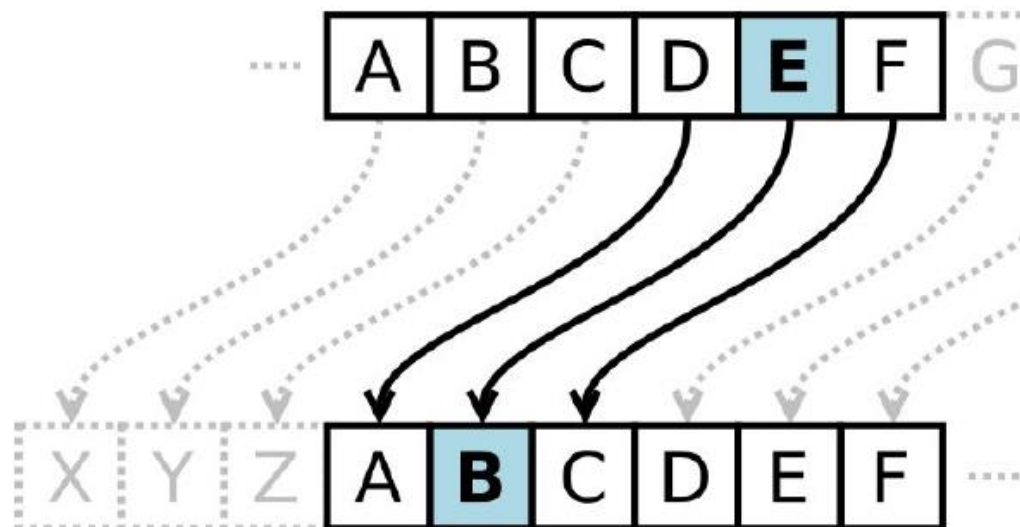
體驗按鈕傳電報！！



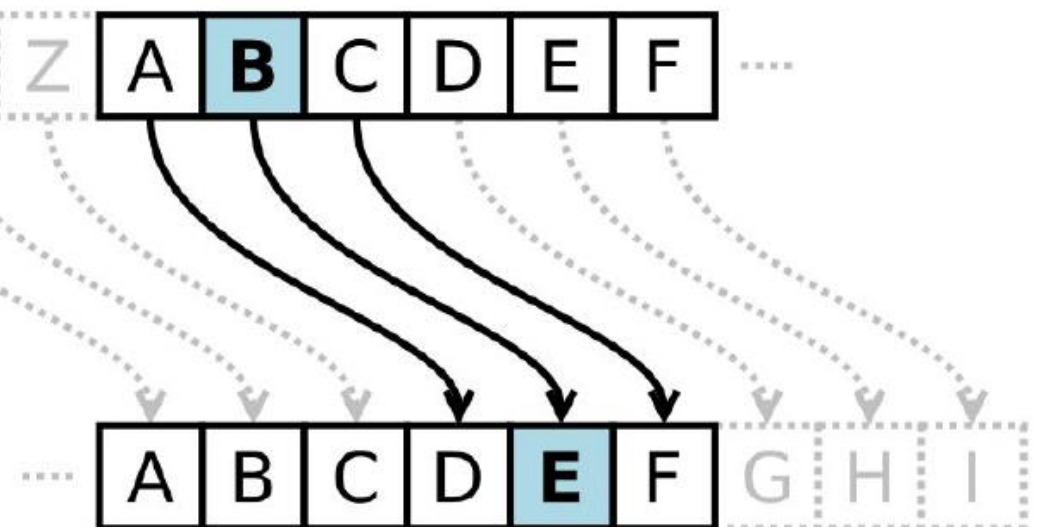
extra

Caesar cipher

加密(以向左偏三位為例)



解密



extra

將傳的字數能無限制！！

!@#\$!@*#&!#^!%~....



實作才能發現問題！！