

FABLAB微課程分享

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微課程主題：自動平交道

■ 情境：

小明是一個自動平交道程式設計師，他的工作是為無人看守的平交道編寫自動看守程式。小明的構想是當火車接近平交道時，LED燈由長亮的綠色轉成閃爍的紅色，警告用路人火車即將到來，同時警報聲響起、8X8矩陣出現警告的號誌，柵欄自動放下，大車輪順時鐘旋轉讓火車駕駛知道可以安全通過。

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■ 想一想：

1. 超音波的功能是.....？
2. 火車還沒來時，LED燈、蜂鳴器、8X8矩陣、柵欄、大車輪的狀態是.....？
3. 火車來了，LED燈、蜂鳴器、8X8矩陣、柵欄、大車輪的狀態是.....？

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狀態一、火車還沒來

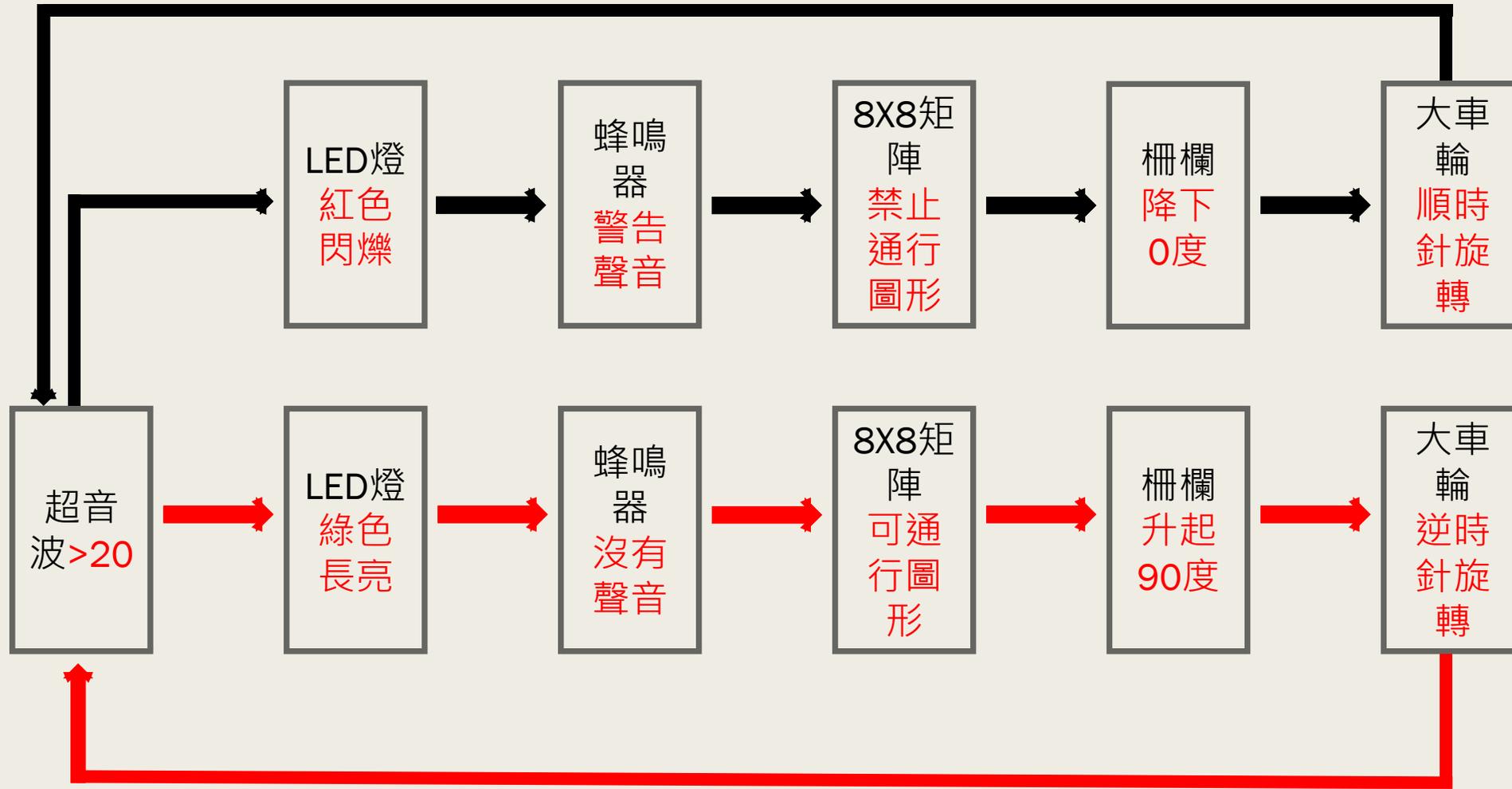
1. 超音波的數字 > 20
2. LED燈綠色長亮
3. 蜂鳴器沒有聲音
4. 8X8矩陣可通行圖形
5. 柵欄升起90度
6. 大車輪逆時鐘旋轉

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狀態二、火車來了

1. 超音波的數字 ≤ 20
2. LED燈紅色閃爍
3. 蜂鳴器發出警告聲音
4. 8X8矩陣禁止通行圖形
5. 柵欄向下0度
6. 大車輪順時鐘旋轉

微課程主題：自動平交道(時間差)



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超音波

The image shows a Scratch script for an automatic level crossing using an ultrasonic sensor. The script is as follows:

- 當 被點擊** (When clicked)
- 變數 距離 設為 0** (Set distance variable to 0)
- 重複無限次** (Repeat forever loop)
 - 變數 距離 設為 超音波 腳位 Trig腳位A2, Echo腳位A3 註** (Set distance variable to Ultrasonic sensor port Trig pin A2, Echo pin A3)
 - 等待 0.5 秒** (Wait 0.5 seconds)
 - 如果 距離 < 20 那麼** (If distance < 20 then)
 - 廣播訊息 火車來了** (Broadcast message: Train is coming)
 - 否則** (Otherwise)
 - 廣播訊息 火車還沒來** (Broadcast message: Train hasn't come)

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RGB LED



```
當收到訊息 火車還沒來  
重複直到 距離 < 20  
 設定數位腳位 9 輸出為 低電位(0)  
 設定數位腳位 10 輸出為 高電位(1)
```

This code block is triggered by the message 'Train hasn't come'. It enters a loop that continues as long as the distance is less than 20. Inside the loop, it sets digital pin 9 to low (0) and digital pin 10 to high (1).



```
當收到訊息 火車來了  
重複直到 距離 > 20  
 設定數位腳位 10 輸出為 低電位(0)  
 設定數位腳位 9 輸出為 低電位(0)  
 等待 0.3 秒  
 設定數位腳位 9 輸出為 高電位(1)
```

This code block is triggered by the message 'Train has come'. It enters a loop that continues as long as the distance is greater than 20. Inside the loop, it sets digital pin 10 to low (0), digital pin 9 to low (0), waits for 0.3 seconds, and then sets digital pin 9 to high (1).

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8X8矩陣

The image displays two Scratch code blocks designed to control an 8x8 LED matrix for an automatic level crossing system. Each block starts with a '當收到訊息' (When I receive a message) trigger.

The first block is triggered by the message '火車還沒來' (Train hasn't come). It contains a '重複直到' (Repeat until) loop with the condition '距離 < 20' (Distance < 20). Inside the loop, there are two '設MAX7219 8*8LED矩陣' (Set MAX7219 8*8 LED matrix) blocks. The first block is set to display a red light icon, and the second block is set to display a green light icon. Both blocks have the same pin configuration: ,DIN 12, CS A4, CLK A5.

The second block is triggered by the message '火車來了' (Train has come). It contains a '重複直到' (Repeat until) loop with the condition '距離 > 20' (Distance > 20). Inside the loop, there are two '設MAX7219 8*8LED矩陣' (Set MAX7219 8*8 LED matrix) blocks. The first block is set to display a green light icon, and the second block is set to display a red light icon. Both blocks have the same pin configuration: ,DIN 12, CS A4, CLK A5.

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蜂鳴器

The image shows two code blocks for a microcontroller program. The first block is triggered by the message "火車還沒來" (Train hasn't come) and contains a "重複直到" (Repeat until) loop with the condition "距離 < 20". Inside the loop, there is a "設定數位腳位" (Set digital pin) block for pin 8, set to "高電位(1)" (High level) with a checked "註" (Note) option. The second block is triggered by the message "火車來了" (Train is coming) and contains a "重複直到" (Repeat until) loop with the condition "距離 > 20". Inside this loop, there are two "蜂鳴器在腳位" (Buzzer on pin) blocks for pin 8. The first block plays a "Do,262" tone for 500ms, followed by a "等待 0.1 秒" (Wait 0.1 seconds) block. The second block plays a "Me,330" tone for 500ms, followed by another "等待 0.1 秒" (Wait 0.1 seconds) block.

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柵欄-伺服馬達



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大車輪

The image displays two Scratch code blocks on a grid background. The first block is a yellow 'When I receive a message' block with the message '火車還沒來' (Train hasn't come). It is followed by an orange 'Repeat until' loop block with the condition '距離 < 20' (Distance < 20). Inside the loop is a black 'Set DC motor speed' block for '腳位 2、3' (Port 2, 3) with a speed of 200. The second block is a yellow 'When I receive a message' block with the message '火車來了' (Train is coming). It is followed by an orange 'Repeat until' loop block with the condition '距離 > 20' (Distance > 20). Inside the loop is a black 'Set DC motor speed' block for '腳位 2、3' (Port 2, 3) with a speed of -200.