

HW3. 機器人路考測驗

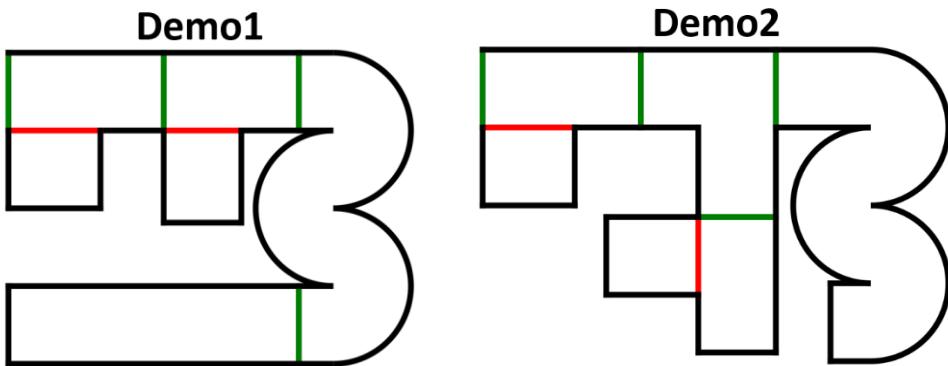
team8

•組員分工表

組員名稱	工作項目
周子揚	組裝機器人、測試員
張仲瑜	主要圖形化程式、測試員
許元瑞	副圖形化程式、組裝機器人
賴博允	組裝機器人、設計機器人
蔡耀靈	組裝機器人、測試員

•設計理念

這次的目標是要成功走完兩個場地



我們的車體想要盡量越小越好，不會像上次一樣考量重量或一些攻擊手段而加一些配件，為了能成功走完，而不要有太多複雜的變因，採用最簡單的設計，將車體組裝好。

- 圖形化程式說明：

1. 這次場地由五種地形組成，路邊停車、倒車入庫、S型彎道、直線及一

般轉彎，我們針對這些地形透過不斷試錯的方式找出我們需要的係數，

以下是我們各個地形測試出的程式碼。

2. 對於連續的轉彎我們很常加入暫停，縱使這會讓我們付出時間上的代

價，但這能使動作的慣性消失，使每條指令不受過去的運動狀態干擾確

實執行，對於結果比較穩定，也比較好試錯。

3. 我們的速度也不會調太高，速度越高，輪子和地面的摩擦力要將我們的

車子停下來就越不容易，滑動的距離也是我們想盡量在腳本中減小影響

的變數，對於直行和轉彎都是。

4. 我們試出的 0.4835 是我們測出的對我們那台車子進行一個 90 度的原地

轉彎需要的關鍵係數，往後若我們需要進行一個不到 90 度的彎就會以

除以一個大於 1 的數字來進行 90 度以下的轉彎。

Demo code 1.

The Scratch script starts with a "when program starts" hat block. It initializes variables: set wait to 0.1, set 90度回數 to 0.4835, and sets movement motors to D and A. The script then enters a loop for four cycles. Each cycle involves moving straight at 50% speed for 1.8 rotations, followed by a series of turns: a right turn of 90 degrees divided by 1.7 (approx. 52.9°) at -25% speed, a left turn of 90 degrees divided by 1.7 (approx. 52.9°) at 25% speed, another right turn of 90 degrees divided by 1.7 (approx. 52.9°) at 25% speed, and another left turn of 90 degrees divided by 1.7 (approx. 52.9°) at 25% speed. After each cycle, there is a wait of 0.3 seconds. The script concludes with a final move straight of 4.2 rotations at 100% speed.

```
when program starts
set [wait v] to [0.1]
set [90度回數 v] to [0.4835]
set [movement motors v] to [D and A]
move [straight: 0] by [1.8] rotations at [50 % speed]
wait [seconds]
move for [90度回數 / 1.7] rotations at [-25 25 % speed]
wait [seconds]
move [straight: 0] by [1.2] rotations at [-30 % speed]
wait [seconds]
move for [90度回數 / 1.7] rotations at [25 -25 % speed]
wait [seconds]
move for [90度回數 / 1.7] rotations at [-25 25 % speed]
wait [seconds]
move [straight: 0] by [1.2] rotations at [50 % speed]
wait [seconds]
move for [90度回數 / 1.6] rotations at [25 -25 % speed]
wait [seconds]
move [straight: 0] by [1.5] rotations at [50 % speed]
move for [90度回數 / 1.07] rotations at [-25 25 % speed]
move [straight: 0] by [1.21] rotations at [-30 % speed]
move [straight: 0] by [1.21] rotations at [50 % speed]
wait [0.3] seconds
move for [90度回數 / 1.05] rotations at [25 -25 % speed]
wait [0.3] seconds
move [straight: 0] by [2] rotations at [50 % speed]
move for [2.75] rotations at [50 18 % speed]
wait [0.3] seconds
move for [2.3] rotations at [19 50 % speed]
wait [0.3] seconds
move for [2.35] rotations at [50 18 % speed]
wait [0.3] seconds
move for [4.2] rotations at [100 100 % speed]
```

<-最後的直線全力衝刺

Demo Code 2.

The Scratch script consists of two main sections: "路邊停車" (Follow Edge Stop) and "倒車入庫" (Reverse into Garage). It starts with a "when program starts" hat block. The "路邊停車" section contains a loop that moves straight, turns right, and then turns left. The "倒車入庫" section contains a loop that moves straight, turns right, and then turns left, followed by a reverse into a garage section.

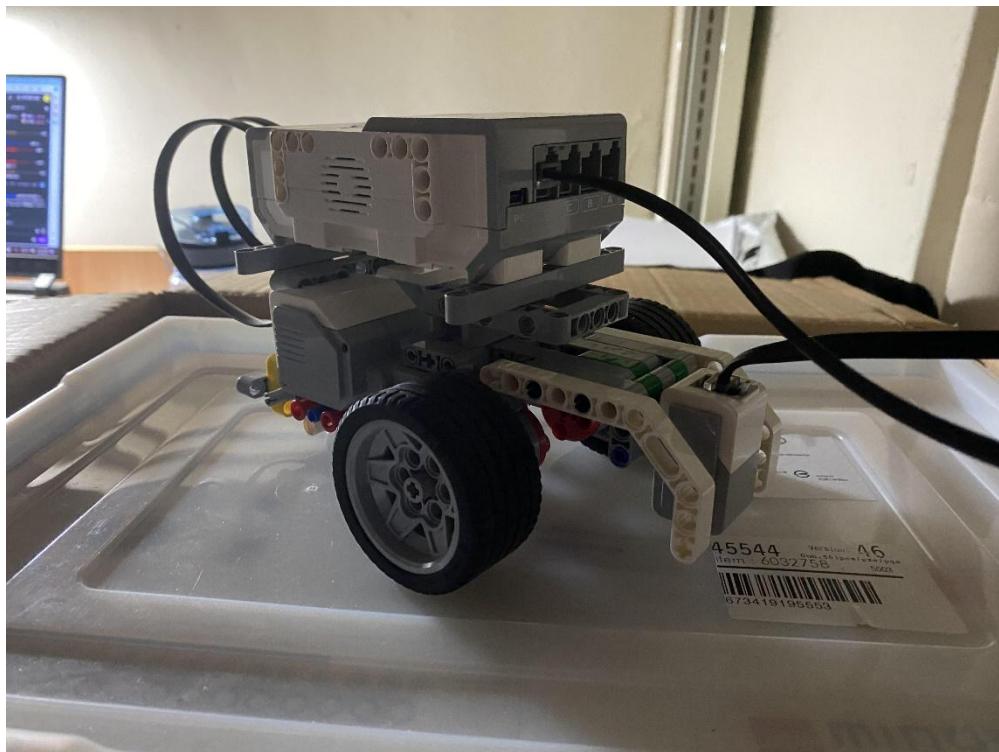
```
when [start] is pressed
  set [90度轉數 v] to [0.4835]
  set [wait v] to [0.1]
  set movement motors to [D v] and [A v]
  move [straight: 0] for [1.8] rotations at [50 % speed]
  wait [seconds]
  move for [90度轉數 / 1.7] rotations at [-25 25 % speed]
  wait [seconds]
  move [straight: 0] for [1.2] rotations at [-30 % speed]
  wait [seconds]
  move for [90度轉數 / 1.7] rotations at [25 -25 % speed]
  wait [seconds]
  move for [90度轉數 / 1.7] rotations at [-25 25 % speed]
  wait [seconds]
  move [straight: 0] for [1.2] rotations at [50 % speed]
  wait [seconds]
  move for [90度轉數 / 1.56] rotations at [25 -25 % speed]
  wait [seconds]
  move [straight: 0] for [4.1] rotations at [50 % speed]
  move for [2.7] rotations at [50 18 % speed]
  move for [2.4] rotations at [19 50 % speed]
  move for [2.4] rotations at [50 18 % speed]
  move for [2.4] rotations at [-50 -18 % speed]
  move for [2.4] rotations at [-19 -50 % speed]
  move for [2.5] rotations at [-50 -18 % speed]
  wait [seconds]
  move [straight: 0] for [1.8] rotations at [-50 % speed]
  wait [seconds]
  move for [90度轉數 / 1.1] rotations at [25 -25 % speed]
  wait [seconds]
  move [straight: 0] for [2.8] rotations at [50 % speed]
  move for [90度轉數 / 1.1] rotations at [-25 25 % speed]
  wait [seconds]
  move [straight: 0] for [1.21] rotations at [-30 % speed]
  wait [seconds]
  move [straight: 0] for [1.21] rotations at [30 % speed]
  wait [seconds]
  move for [90度轉數 / 1.05] rotations at [25 -25 % speed]
  wait [seconds]
  move [straight: 0] for [0.8] rotations at [50 % speed]
```

S型進出可以看到我們的S型出的程式和我們的S行進的程式看起來不能完全抵消，但那是我們試出來可行的結果，可以看出現實的變因有非常多，讓我們不能單以邏輯來思考，必須以試錯才能知道真正的結果，這也讓我們付出了巨大的時間成本。(路邊停車和倒車入庫也是)

- 成果影片：

https://drive.google.com/drive/folders/1nH_DUm7oth7qNoweb33b6GPI9hGtst9?usp=sharing

- 成品照片：





- 測試時的討論與心得：

這次的作業比起上次讓我們覺得挫折不少，我們一開始就採用了劇本的形式來不斷試錯，讓它如何度過每個關卡，左右輪係數多少適合原地轉彎？這裡前進的距離夠不夠？這幾個連續動作間為了讓慣性消失要不要加入暫停？這次程式的試錯和一般的 debug 很不一樣，我們不是用標準的 OJ(在每次都相同的環境下測試我們的程式有那些問題)，每次的測試都會有很多不可控的因素，車子初始位置不同、場地會滑動、車子的重心不穩導致它每次執行同樣的指令前進不同距離、轉不同的角度，可能本來一個適合的參數會被我們認定為錯誤，僅僅因為一些微小的變數。

整體而言這次的作業讓我們透過不斷的試錯，提出假說，提出可能的方案來一步一步逼近完美的解答，這和現實中的做實驗非常類似，我們無法保證我們腦中預想出的情況到現實中一樣管用，我們得透過觀察，以科學的角度

分析來一步一步修正，踏實地尋找更好的結果。