Arduino 利用Arduino Uno R3 建置音樂播放器

## 介紹

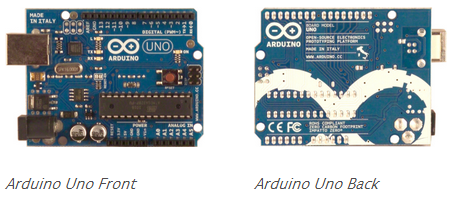
待補

## Arduino開發軟體

待補

## Arduino硬體

此範例使用到Arduino uno r3(如圖表 1)這塊開發板有如圖表 2。…待補…

圖表 1 Arduino uno r3的正反面圖

圖表 2 Arduino uno r3 所提供之???

|  |
| --- |
| ATmega328 microcontroller |
| Input voltage - 7-12V |
| 14 Digital I/O Pins (6 PWM outputs) |
| 6 Analog Inputs |
| 32k Flash Memory |
| 16Mhz Clock Speed |

## 1.1音樂播放器

### Problem

我有音譜想要製作一個音樂播放器

### Solution

先定義各個音階的頻率片段程式碼如圖表 3詳細對應如圖表 4

圖表 3常數定義片段

|  |
| --- |
| #define NOTE\_ 0  #define NOTE\_B0 31  #define NOTE\_C1 33  …略… |

圖表 4聲音常數頻率對應表

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 音調 | 頻率 | 音調 | 頻率 | 音調 | 頻率 | 音調 | 頻率 |
| NOTE\_ | 0 | NOTE\_B0 | 31 | NOTE\_C1 | 33 | NOTE\_CS1 | 35 |
| NOTE\_D1 | 37 | NOTE\_DS1 | 39 | NOTE\_E1 | 41 | NOTE\_F1 | 44 |
| NOTE\_FS1 | 46 | NOTE\_G1 | 49 | NOTE\_GS1 | 52 | NOTE\_A1 | 55 |
| NOTE\_AS1 | 58 | NOTE\_B1 | 62 | NOTE\_C2 | 65 | NOTE\_CS2 | 69 |
| NOTE\_D2 | 73 | NOTE\_DS2 | 78 | NOTE\_E2 | 82 | NOTE\_F2 | 87 |
| NOTE\_FS2 | 93 | NOTE\_G2 | 98 | NOTE\_GS2 | 104 | NOTE\_A2 | 110 |
| NOTE\_AS2 | 117 | NOTE\_B2 | 123 | NOTE\_C3 | 131 | NOTE\_CS3 | 139 |
| NOTE\_D3 | 147 | NOTE\_DS3 | 156 | NOTE\_E3 | 165 | NOTE\_F3 | 175 |
| NOTE\_FS3 | 185 | NOTE\_G3 | 196 | NOTE\_GS3 | 208 | NOTE\_A3 | 220 |
| NOTE\_AS3 | 233 | NOTE\_B3 | 247 | NOTE\_C4 | 262 | NOTE\_CS4 | 277 |
| NOTE\_D4 | 294 | NOTE\_DS4 | 311 | NOTE\_E4 | 330 | NOTE\_F4 | 349 |
| NOTE\_FS4 | 370 | NOTE\_G4 | 392 | NOTE\_GS4 | 415 | NOTE\_A4 | 440 |
| NOTE\_AS4 | 466 | NOTE\_B4 | 494 | NOTE\_C5 | 523 | NOTE\_CS5 | 554 |
| NOTE\_D5 | 587 | NOTE\_DS5 | 622 | NOTE\_E5 | 659 | NOTE\_F5 | 698 |
| NOTE\_FS5 | 740 | NOTE\_G5 | 784 | NOTE\_GS5 | 831 | NOTE\_A5 | 880 |
| NOTE\_AS5 | 932 | NOTE\_B5 | 988 | NOTE\_C6 | 1047 | NOTE\_CS6 | 1109 |
| NOTE\_D6 | 1175 | NOTE\_DS6 | 1245 | NOTE\_E6 | 1319 | NOTE\_F6 | 1397 |
| NOTE\_FS6 | 1480 | NOTE\_G6 | 1568 | NOTE\_GS6 | 1661 | NOTE\_A6 | 1760 |
| NOTE\_AS6 | 1865 | NOTE\_B6 | 1976 | NOTE\_C7 | 2093 | NOTE\_CS7 | 2217 |
| NOTE\_D7 | 2349 | NOTE\_DS7 | 2489 | NOTE\_E7 | 2637 | NOTE\_F7 | 2794 |
| NOTE\_FS7 | 2960 | NOTE\_G7 | 3136 | NOTE\_GS7 | 3322 | NOTE\_A7 | 3520 |
| NOTE\_AS7 | 3729 | NOTE\_B7 | 3951 | NOTE\_C8 | 4186 | NOTE\_CS8 | 4435 |
| NOTE\_D8 | 4699 | NOTE\_DS8 | 4978 |  |  |  |  |

要播放音樂首先要知道音調、速度，建立音調與速度的兩個一維陣列。

圖表 5音調與速度陣列的片段程式碼

|  |
| --- |
| int melody[] = {  NOTE\_, NOTE\_D4, NOTE\_C4, NOTE\_A3, NOTE\_C4, NOTE\_C4, NOTE\_A3, NOTE\_C4, NOTE\_C4, NOTE\_A3, NOTE\_C4, NOTE\_A3, NOTE\_G3, NOTE\_,  …略….  }  int noteDurations[] = {  16, 16, 16, 16, 8, 16, 16, 8, 16, 16, 16, 16, 8, 8,  16, 16, 16, 16, 8, 16, 16, 8, 16, 16, 16, 16, 8, 8,  …略….  }; |

先於setup含式中定義要做為輸出的接腳，音樂播放僅需1隻output輸出，即可撥放音樂。

程式部份，將發音包裝成一個function(命名為play)要求音調、速度、陣列長度三個參數進行呼叫，而play會將陣列的每一筆資料經過處理後透過tone的函數發出聲音，詳細程式碼如圖表 6。

圖表 6發音主要程式

|  |
| --- |
| void play(int \*melody, int \*noteDurations, int num){  for(int note = 0; note < num; note++){  int noteDuration = 3000 / noteDurations[note];  tone(2, melody[note], noteDuration);  delay(noteDuration \* 1.30);  }  }  void setup(){ //設定腳位輸出狀態  }  void loop()  {  play(melody, noteDurations, sizeof(melody) / sizeof(int));  delay(2000); //延遲  } |