電通二乙微處理器實驗 實驗結報

實驗名稱	MUSIC		
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1. 實驗目的
   練習利用陣列與 define 設定節奏與音高
   複習 4x4 鍵盤使用方法
2. 實驗步驟
   接上電路
   利用 Arduino 使蜂鳴器發出音樂
   接上 4x4 keypad
   設定每個按鍵音高
   設定 A~Z 的長短音
   利用 Serialmonitor 測試
3. 程式碼

```
#define ZERO 294
#define NOTE_D4 294
#define NOTE_E4 330
#define NOTE_F4 350
#define NOTE_G4 393
#define NOTE_A4 441
#define NOTE_B4 495
#define NTD7 556
#define SOHIGH 882
#define WHOLE 1
#define HALF 0.5
#define QUARTER 0.25
#define EIGHTH 0.25
#define SIXTEENTH 0.625
int tune[]=
{
  NOTE_F4,NOTE_F4,NOTE_G4,NOTE_A4,
  NOTE_A4,NOTE_G4,NOTE_F4,NOTE_E4,
  NOTE_D4,NOTE_D4,NOTE_E4,NOTE_F4,
  NOTE_F4,NOTE_E4,NOTE_E4,
  NOTE_F4,NOTE_F4,NOTE_G4,NOTE_A4,
  NOTE_A4,NOTE_G4,NOTE_F4,NOTE_E4,
  NOTE_D4,NOTE_D4,NOTE_E4,NOTE_F4,
  NOTE_E4,NOTE_D4,NOTE_D4,
  NOTE_E4,NOTE_E4,NOTE_F4,NOTE_D4,
  NOTE_E4,NOTE_F4,NOTE_G4,NOTE_F4,NOTE_D4,
  NOTE_E4,NOTE_F4,NOTE_G4,NOTE_F4,NOTE_E4,
  NOTE_D4,NOTE_E4,SOHIGH,ZERO,
```

```
  NOTE_F4,NOTE_F4,NOTE_G4,NOTE_A4,
  NOTE_A4,NOTE_G4,NOTE_F4,NOTE_G4,NOTE_E4,
  NOTE_D4,NOTE_D4,NOTE_E4,NOTE_F4,
  NOTE_E4,NOTE_D4,NOTE_D4
};
float durt[]=
{
  WHOLE,WHOLE,WHOLE,WHOLE,
  WHOLE,WHOLE,WHOLE,WHOLE,
  WHOLE,WHOLE,WHOLE,WHOLE,
  WHOLE+HALF,HALF,WHOLE+WHOLE,
  WHOLE,WHOLE,WHOLE,WHOLE,
  WHOLE,WHOLE,WHOLE,WHOLE,
  WHOLE,WHOLE,WHOLE,WHOLE,
  WHOLE+HALF,HALF,WHOLE+WHOLE,
  WHOLE,WHOLE,WHOLE,WHOLE,
  WHOLE,HALF,HALF,WHOLE,WHOLE,
  WHOLE,HALF,HALF,WHOLE,WHOLE,
  WHOLE,WHOLE,WHOLE,WHOLE,
  WHOLE,WHOLE,WHOLE,WHOLE,
  WHOLE,WHOLE,WHOLE,HALF,HALF,
  WHOLE,WHOLE,WHOLE,WHOLE,
  WHOLE+HALF,HALF,WHOLE+WHOLE,
};
int length;

void setup()
{
  pinMode(2,OUTPUT);
  length=sizeof(tune)/sizeof(tune[0]);
}
void loop()
{
  for(int x=0;x<length;x++)
  {
    tone(2,tune[x]);
    delay(500*durt[x]);
    noTone(2);
  }
  delay(2000);
}
```

```
#include <Keypad.h>
const byte ROWS = 4;
const byte COLS = 4;
```

```
char keys[ROWS][COLS] = { {'F', 'E', 'D', 'C'}, {'B', '3', '6', '9'},
  {'A', '2', '5', '8'}, {'0', '1', '4', '7'}
};
byte rowPins[ROWS] = {5, 4, 3, 2};
byte colPins[COLS] = {9, 8, 7, 6};
int tune;
Keypad keypad = Keypad( makeKeymap(keys), rowPins, colPins, ROWS,
COLS );
void setup() {
  Serial.begin(9600);
}
void loop() {
  char key = keypad.getKey();
  if(key=='0')
    tune=131;
  if(key=='1')
    tune=147;
   if(key=='2')
    tune=165;
    if(key=='3')
    tune=131;
    if(key=='4')
    tune=175;
    if(key=='5')
    tune=196;
    if(key=='6')
    tune=220;
    if(key=='7')
    tune=131;
    if(key=='8')
    tune=247;
    if(key=='9')
    tune=131;
    if(key=='A')
    tune=262;
    if(key=='B')
    tune=294;
    if(key=='C')
    tune=330;
    if(key=='D')
    tune=349;
    if(key=='E')
    tune=392;
    if(key=='F')
```

```
    tune=440;
   if (key != NO_KEY) {
    tone(11,tune);
    delay(2000);
    noTone(11);
   }
}
```

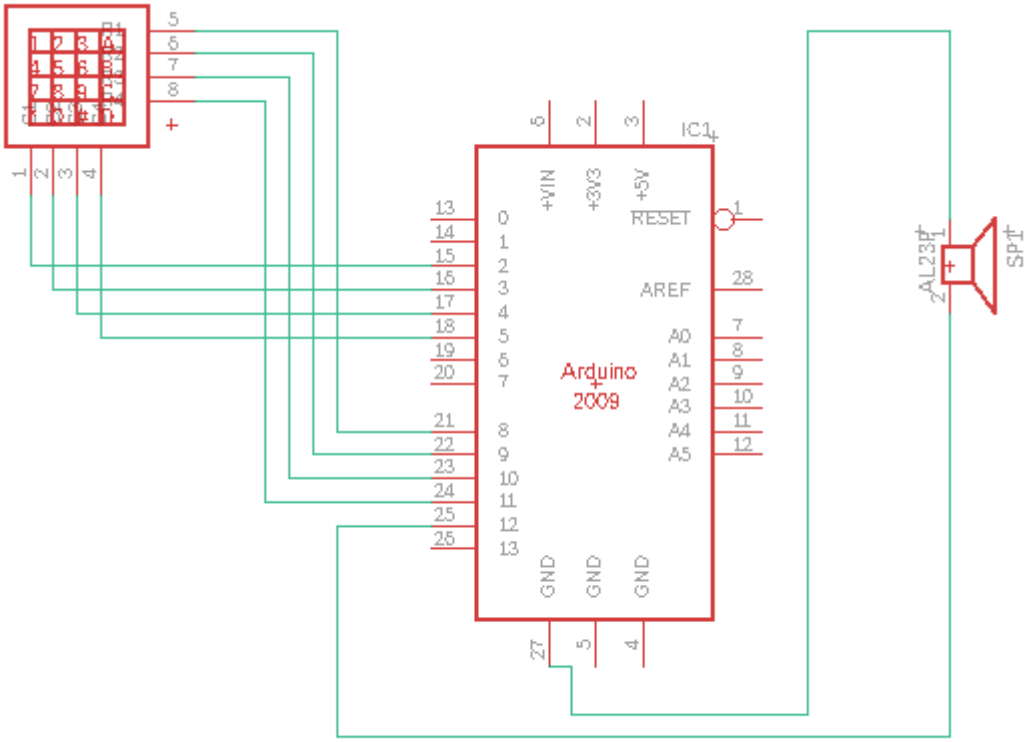
```
void setup() {
  pinMode(11, OUTPUT);
  Serial.begin(9600);
}
void shorter() {
  tone(11, 440);
  delay(100);
  noTone(11);
  delay(100);
}
void longer() {
  tone(11, 440);
  delay(300);
  noTone(11);
  delay(100);
}
char key;
void loop() {
  if (Serial.available())
    {
      key = Serial.read();
    }
    switch (key) {
      case 'A':
        shorter();
        longer();
        break;
      case 'B':
        longer();
        shorter();
        shorter();
        shorter();
        break;
      case 'C':
        longer();
        shorter();
```

```
            longer();
            shorter();
            break;
          case 'D':
            longer();
            shorter();
            shorter();
            break;
          case 'E':
            shorter();
            break;
          case 'F':
            shorter();
            shorter();
            longer();
            shorter();
            break;
          case 'G':
            longer();
            longer();
            shorter();
            break;
          case 'H':
            shorter();
            shorter();
            shorter();
            shorter();
            break;
          case 'I':
            shorter();
            shorter();
            break;
          case 'J':
            shorter();
            longer();
            longer();
            longer();
            break;
          case 'K':
            longer();
            shorter();
            longer();
            break;
          case 'L':
```

```
      shorter();
      longer();
      shorter();
      shorter();
      break;
    case 'M':
      longer();
      longer();
      break;
    case 'N':
      longer();
      shorter();
      break;
    case 'O':
      longer();
      longer();
      break;
    case 'P':
      shorter();
      longer();
      longer();
      shorter();
      break;
    case 'Q':
      longer();
      shorter();
      longer();
      longer();
      break;
    case 'R':
      shorter();
      longer();
      shorter();
      break;
    case 'S':
      shorter();
      shorter();
      shorter();
      break;
    case 'T':
      longer();
      break;
    case 'U':
      shorter();
```

```
            shorter();
            longer();
            break;
          case 'V':
            shorter();
            shorter();
            shorter();
            longer();
            break;
          case 'W':
            shorter();
            longer();
            longer();
            break;
          case 'X':
            longer();
            shorter();
            shorter();
            longer();
            break;
          case 'Y':
            longer();
            shorter();
            longer();
            longer();
            break;
          case 'Z':
            longer();
            longer();
            shorter();
            shorter();
            break;
        }
}
```

4. 實驗結果及分析



5. 心得討論

找一段音樂跟設定他的節奏與旋律真的很麻煩，還有最後的摩斯密碼也是。很繁瑣。這次最麻煩的就是他們了，接線簡單多了。光程式就花了我好多時間。