正修科技大學

嵌入式系統概論期末報告

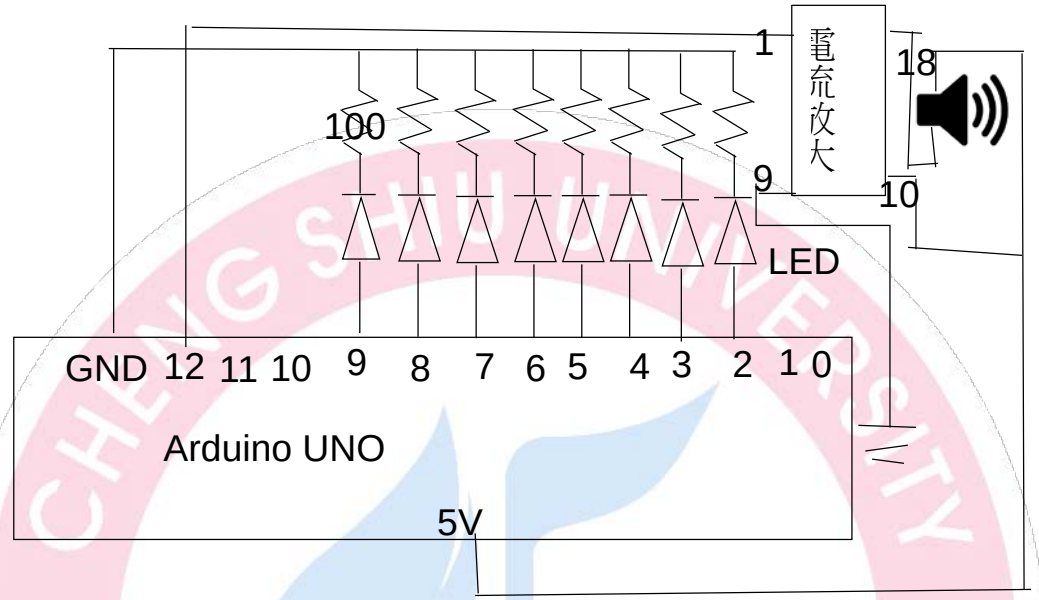
Arduoino UNO

四子二甲 40703137 鄭暘騰

內容

實習 7 電子琴(109/5/1)

1.電路圖



2.習題：動作如下

動作	喇叭	LED 98765432
1	Do	○○○○○○○●
2	Re	○○○○○○●●
3	Mi	○○○○○●●●
4	Fa	○○○○●●●●
5	So	○○○●●●●●
6	La	○○●●●●●●
7	Si	○●●●●●●●
8	do	●●●●●●●●

三、程式碼

```
#define NOTE_C5 523
#define NOTE_D5 587
#define NOTE_E5 659
#define NOTE_F5 698
#define NOTE_G5 784
#define NOTE_A5 880
#define NOTE_B5 988
#define NOTE_C6 1047
int melody[]={NOTE_C5,NOTE_D5,NOTE_E5,NOTE_F5,NOTE_G5,NOTE_A5,NOTE_B5,NOTE_C6};
int duration=500;
void setup() {
pinMode(2,OUTPUT);
pinMode(3,OUTPUT);
pinMode(4,OUTPUT);
pinMode(5,OUTPUT);
pinMode(6,OUTPUT);
pinMode(7,OUTPUT);
pinMode(8,OUTPUT);
pinMode(9,OUTPUT);
}
void loop()
{digitalWrite(2,LOW);
digitalWrite(3,LOW);
digitalWrite(4,LOW);
digitalWrite(5,LOW);
digitalWrite(6,LOW);
digitalWrite(7,LOW);
digitalWrite(8,LOW);
digitalWrite(9,LOW);
tone(12,melody[0],duration);
digitalWrite(2,HIGH);
delay(1000);
tone(12,melody[1],duration);
digitalWrite(2,HIGH);
digitalWrite(3,HIGH);
delay(1000);
tone(12,melody[2],duration);
digitalWrite(2,HIGH);
digitalWrite(3,HIGH);
digitalWrite(4,HIGH);
delay(1000);
tone(12,melody[3],duration);
digitalWrite(2,HIGH);
digitalWrite(3,HIGH);
digitalWrite(4,HIGH);
digitalWrite(5,HIGH);
delay(1000);
tone(12,melody[4],duration);
digitalWrite(2,HIGH);
digitalWrite(3,HIGH);
digitalWrite(4,HIGH);
digitalWrite(5,HIGH);
digitalWrite(6,HIGH);
delay(1000);
tone(12,melody[5],duration);
```

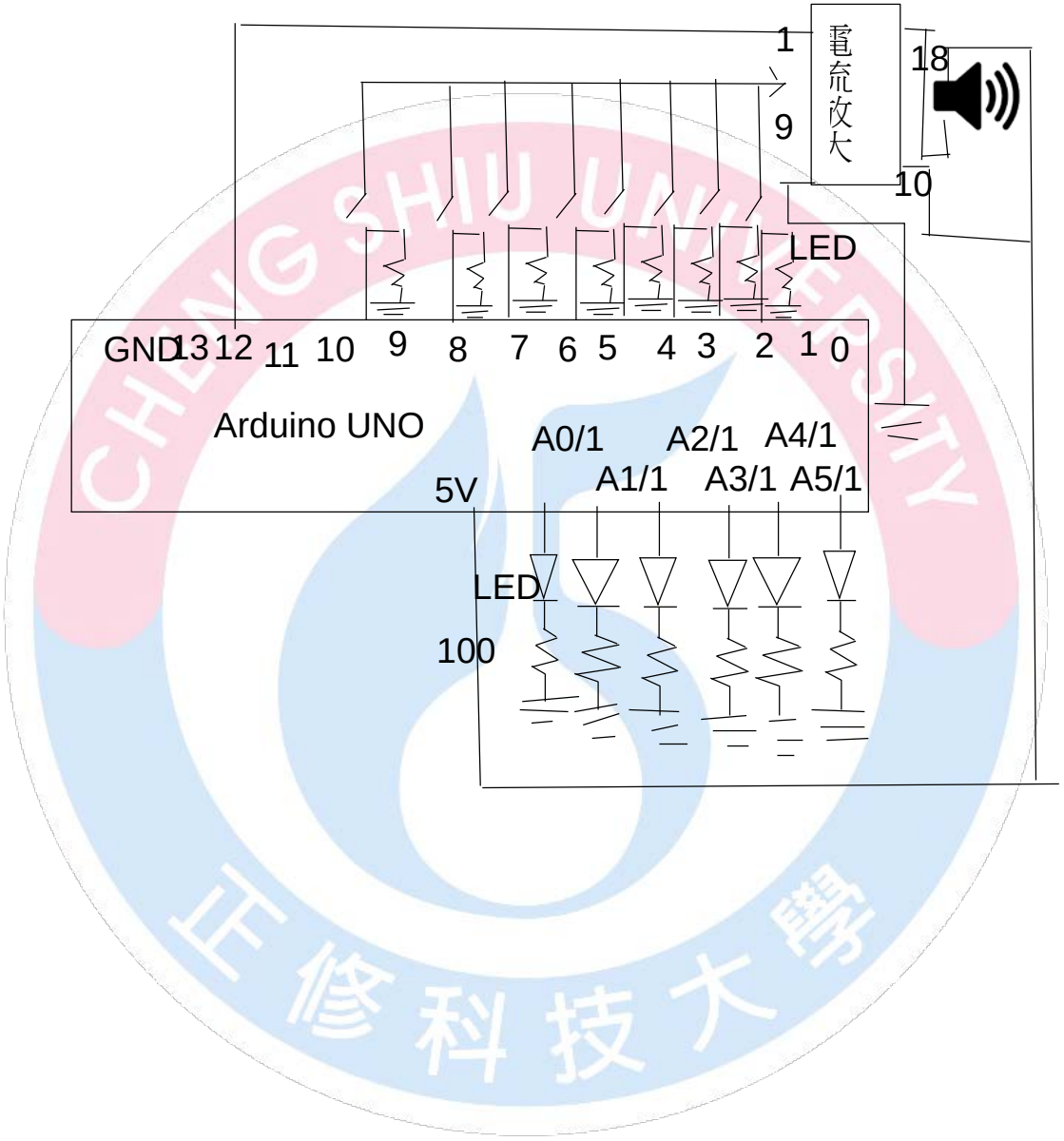
```
digitalWrite(2,HIGH);
digitalWrite(3,HIGH);
digitalWrite(4,HIGH);
digitalWrite(5,HIGH);
digitalWrite(6,HIGH);
digitalWrite(7,HIGH);
delay(1000);
tone(12,melody[6],duration);
digitalWrite(2,HIGH);
digitalWrite(3,HIGH);
digitalWrite(4,HIGH);
digitalWrite(5,HIGH);
digitalWrite(6,HIGH);
digitalWrite(7,HIGH);
digitalWrite(8,HIGH);
delay(1000);
tone(12,melody[7],duration);
digitalWrite(2,HIGH);
digitalWrite(3,HIGH);
digitalWrite(4,HIGH);
digitalWrite(5,HIGH);
digitalWrite(6,HIGH);
digitalWrite(7,HIGH);
digitalWrite(8,HIGH);
digitalWrite(9,HIGH);
delay(1000);
digitalWrite(2,LOW);
digitalWrite(3,LOW);
digitalWrite(4,LOW);
digitalWrite(5,LOW);
digitalWrite(6,LOW);
digitalWrite(7,LOW);
digitalWrite(8,LOW);
delay(1000);
}
```

四、心得

可以讓 arduino uno 說台語還有唱校歌嗎?

實習 8 電子琴(二)109/05/8

一、電路圖



二、習題：動作如下

動作	開關	喇叭發音	LED 顯示
1	2	Do	●○○○○○
2	3	Re	○●○○○○
3	4	Mi	○○●○○○
4	5	Fa	○○○●○○
5	6	So	○○○○●○
6	7	La	○○○○○●
7	8	Si	●●●●●●
8	9	Do	○○●●○○

三、程式碼

```
#define NOTE_C5
523
#define NOTE_D5
587
#define NOTE_E5
659
#define NOTE_F5
698
#define NOTE_G5
784
#define NOTE_A5
880
#define NOTE_B5
988
#define NOTE_C6
1047
int
melody[]={NOTE_C
5,NOTE_D5,NOTE
_E5,NOTE_F5,NO
TE_G5,NOTE_A5,
NOTE_B5,NOTE_
C6};
int duration=500;
int val=0;
void setup(){
pinMode(2,INPUT);
pinMode(3,INPUT);
pinMode(4,INPUT);
pinMode(5,INPUT);
pinMode(6,INPUT);
pinMode(7,INPUT);
pinMode(8,INPUT);
pinMode(9,INPUT);
pinMode(14,OUTP
UT);
pinMode(15,OUTP
UT);
pinMode(16,OUTP
UT);
pinMode(17,OUTP
UT);
pinMode(18,OUTP
UT);
pinMode(19,OUTP
UT);}
void loop()
{digitalWrite(14,LO
W);
digitalWrite(15,LO
W);
digitalWrite(16,LO
W);
digitalWrite(17,LO
W);
digitalWrite(18,LO
W);
digitalWrite(19,LO
W);
val=digitalRead(2);
 if(val==HIGH)
{tone(12,melody[0],
duration);
digitalWrite(14,HIG
H);}
val=digitalRead(3);
   if(val==HIGH)
{tone(12,melody[1],
duration);
digitalWrite(15,HIG
H);}
val=digitalRead(4);
if(val==HIGH)
{tone(12,melody[2],
duration);
digitalWrite(16,HIG
H);}
val=digitalRead(5);
if(val==HIGH)
{tone(12,melody[3],
duration);
digitalWrite(17,HIG
H);}
val=digitalRead(6);
if(val==HIGH)
{tone(12,melody[4],
duration);
digitalWrite(18,HIG
H);}
val=digitalRead(7);
if(val==HIGH)
{tone(12,melody[5],
duration);
digitalWrite(19,HIG
H);}
val=digitalRead(8);
if(val==HIGH)
{tone(12,melody[6],
duration);
digitalWrite(14,HIG
H);
digitalWrite(15,HIG
H);
digitalWrite(16,HIG
H);
digitalWrite(17,HIG
H);
```

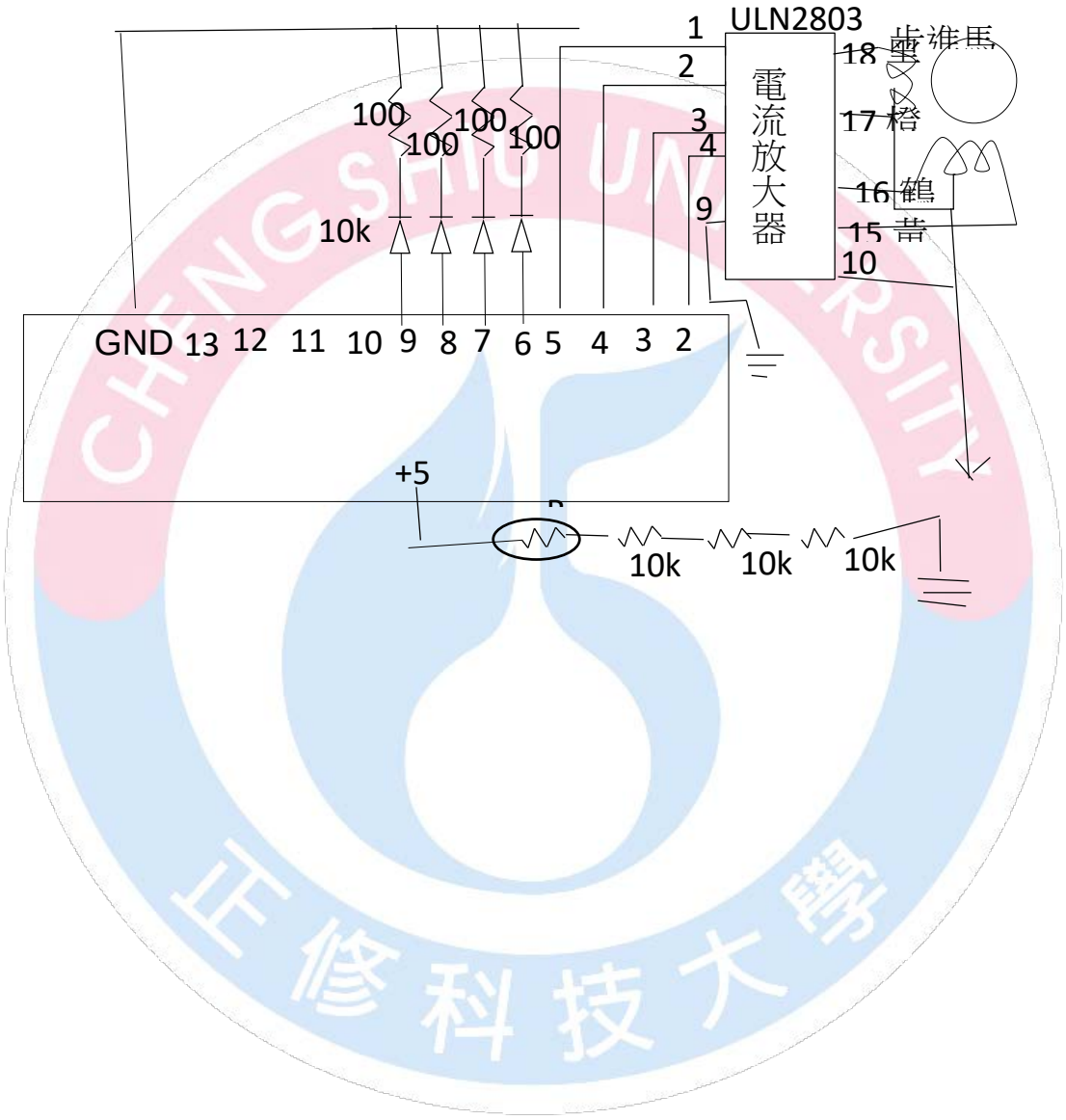
```
digitalWrite(18,HIGH);
digitalWrite(19,HIGH);
}
val=digitalRead(9);
if(val==HIGH)
{tone(12,melody[7],duration);
digitalWrite(16,HIGH);
digitalWrite(17,HIGH);
}
}
```

四、心得

我發現這個程是不用在每個動作寫LOW

實習 9 光敏控制步進馬達(109/5/15)

一、電路圖



2.習題：動作如下

動作	光敏電阻	步進馬達	LED	
1	全照光	順轉	●●○○ ○○●●	左 2 右 2 閃爍
2	半照光	逆轉	●●●● ○○○○	4 個 LED 閃爍
3	全遮光	停止	全滅	

3.光敏電阻工作原理

照光=>R 光↘

$=> V_0 = 5 \times \frac{R_1}{R_1+R_{光}}$↗

遮光⇒ R 光↗

$=> V_0 = 5 \times \frac{R_1}{R_1+R_{光}}$↘

※要打開串列監控視窗

Seral Monitor

請上網填學生滿意度調查

四、程式碼

```
int photocellVal = 0;
int photocellPin = 2;
void setup()
{pinMode(2,OUTPUT);
pinMode(3,OUTPUT);
pinMode(4,OUTPUT);
pinMode(5,OUTPUT);
pinMode(6,OUTPUT);
pinMode(7,OUTPUT);
pinMode(8,OUTPUT);
pinMode(9,OUTPUT);
Serial.begin(9600);
}
void loop()
{
photocellVal = analogRead(photocellPin);
Serial.println(photocellVal);
if (photocellVal>500)
{digitalWrite(2,HIGH);
digitalWrite(3,LOW);
digitalWrite(4,LOW);
digitalWrite(5,LOW);
digitalWrite(6,HIGH);
digitalWrite(7,HIGH);
digitalWrite(8,LOW);
digitalWrite(9,LOW);
delay(100);

digitalWrite(2,LOW);
digitalWrite(3,HIGH);
digitalWrite(4,LOW);
digitalWrite(5,LOW);
digitalWrite(6,LOW);
digitalWrite(7,LOW);
digitalWrite(8,HIGH);
digitalWrite(9,HIGH);
delay(100);
digitalWrite(2,LOW);
digitalWrite(3,LOW);
digitalWrite(4,HIGH);
digitalWrite(5,LOW);
digitalWrite(6,HIGH);
digitalWrite(7,HIGH);
digitalWrite(8,LOW);
digitalWrite(9,LOW);
delay(100);

digitalWrite(2,LOW);
digitalWrite(3,LOW);
digitalWrite(4,LOW);
digitalWrite(5,HIGH);
digitalWrite(6,LOW);
digitalWrite(7,LOW);
digitalWrite(8,HIGH);
digitalWrite(9,HIGH);
delay(100);}
else if(photocellVal<120)
{digitalWrite(2,LOW);
digitalWrite(3,LOW);
```

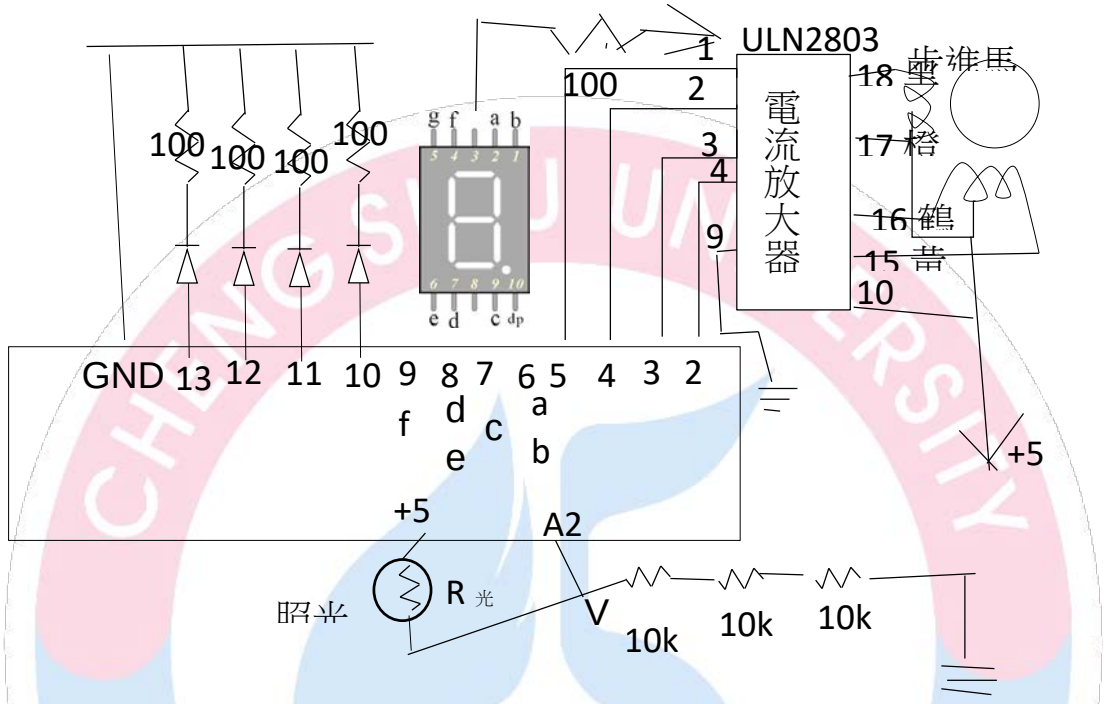
```
digitalWrite(4,LOW);
digitalWrite(5,LOW);
digitalWrite(6,LOW);
digitalWrite(7,LOW);
digitalWrite(8,LOW);
digitalWrite(9,LOW);}
else if(500<photocellVal<120)
{digitalWrite(2,LOW);
digitalWrite(3,LOW);
digitalWrite(4,LOW);
digitalWrite(5,HIGH);
digitalWrite(6,HIGH);
digitalWrite(7,HIGH);
digitalWrite(8,HIGH);
digitalWrite(9,HIGH);
delay(100);

digitalWrite(2,LOW);
digitalWrite(3,LOW);
digitalWrite(4,HIGH);
digitalWrite(5,LOW);
digitalWrite(6,LOW);
digitalWrite(7,LOW);
digitalWrite(8,LOW);
digitalWrite(9,LOW);
delay(100);
digitalWrite(2,LOW);
digitalWrite(3,HIGH);
digitalWrite(4,LOW);
digitalWrite(5,LOW);
digitalWrite(6,HIGH);
digitalWrite(7,HIGH);
digitalWrite(8,HIGH);
digitalWrite(9,HIGH);
delay(100);
digitalWrite(2,HIGH);
digitalWrite(3,LOW);
digitalWrite(4,LOW);
digitalWrite(5,LOW);
digitalWrite(6,HIGH);
digitalWrite(7,HIGH);
digitalWrite(8,HIGH);
digitalWrite(9,HIGH);
delay(100);}
}
```

四、心得

我覺得我可以好好的讀書。天氣太熱了，冷卻水的水管發霉了，造成水管不通。還是塑膠管比較不會出問題。

實習 10 光敏控制步進馬達 7 段

1.電路圖



10bit 的類比輸入接腳

所以有 2^{10}=1024 準位

2.習題：動作如下

動作	光敏電阻	步進馬達	7 段顯示器	LED	
1	照光	順轉	順轉	●●○○ ○○●●	左 2 右 2 閃爍
2.	半遮光	逆轉	逆轉	●●●● ○○○○	4 個 LED 閃爍
3.	全遮光	停止	全滅	全滅	

3.工作原理

(光敏電阻)

照光⇒R 光↘

$=> V_0 = 5 \times \frac{R_1}{R_1+R_{光}}$↗

遮光⇒ R 光↗

$\Rightarrow V_0 = 5 \times \frac{R_1}{R_1+R_{光}}$↘

4.注意：要啟動 Serial Monter

(串列監控視窗)

◎麻煩填問卷調查

4.程式碼：

```
int photocellVal = 0;
int photocellPin = 2;
void setup()
{pinMode(2,OUTPUT);
pinMode(3,OUTPUT);
pinMode(4,OUTPUT);
pinMode(5,OUTPUT);
pinMode(6,OUTPUT);
pinMode(7,OUTPUT);
pinMode(8,OUTPUT);
pinMode(9,OUTPUT);
pinMode(10,OUTPUT);
pinMode(11,OUTPUT);
pinMode(12,OUTPUT);
pinMode(13,OUTPUT);
Serial.begin(9600);
}
void loop()
{
photocellVal = analogRead(photocellPin);
Serial.println(photocellVal);
if (photocellVal>600)
{digitalWrite(2,HIGH);
digitalWrite(3,LOW);
digitalWrite(4,LOW);
digitalWrite(5,LOW);
digitalWrite(6,LOW);
digitalWrite(7,HIGH);
digitalWrite(8,HIGH);
digitalWrite(9,HIGH);
digitalWrite(10,HIGH);
digitalWrite(11,HIGH);
digitalWrite(12,LOW);
digitalWrite(13,LOW);
delay(100);
digitalWrite(2,LOW);
digitalWrite(3,HIGH);
digitalWrite(4,LOW);
digitalWrite(5,LOW);
digitalWrite(6,HIGH);
digitalWrite(7,LOW);
digitalWrite(8,HIGH);
digitalWrite(9,HIGH);
digitalWrite(10,LOW);
digitalWrite(11,LOW);
digitalWrite(12,HIGH);
digitalWrite(13,HIGH);
delay(100);
digitalWrite(2,LOW);
digitalWrite(3,LOW);
digitalWrite(4,HIGH);
digitalWrite(5,LOW);
digitalWrite(6,HIGH);
digitalWrite(7,HIGH);
digitalWrite(8,LOW);
digitalWrite(9,HIGH);
digitalWrite(10,HIGH);
digitalWrite(11,HIGH);
digitalWrite(12,LOW);
```

```
digitalWrite(13,LOW);
delay(100);

digitalWrite(2,LOW);
digitalWrite(3,LOW);
digitalWrite(4,LOW);
digitalWrite(5,HIGH);
digitalWrite(6,HIGH);
digitalWrite(7,HIGH);
digitalWrite(8,HIGH);
digitalWrite(9,LOW);
digitalWrite(10,LOW);
digitalWrite(11,LOW);
digitalWrite(12,HIGH);
digitalWrite(13,HIGH);
delay(100);}
else if(photocellVal<400){digitalWrite(2,LOW);
digitalWrite(3,LOW);
digitalWrite(4,LOW);
digitalWrite(5,LOW);
digitalWrite(6,HIGH);
digitalWrite(7,HIGH);
digitalWrite(8,HIGH);
digitalWrite(9,LOW);
digitalWrite(10,LOW);
digitalWrite(11,LOW);
digitalWrite(12,LOW);
digitalWrite(13,LOW);
}
else if(600<photocellVal<400){digitalWrite(2,LOW);
digitalWrite(3,LOW);
digitalWrite(4,LOW);
digitalWrite(5,HIGH);
digitalWrite(6,HIGH);
digitalWrite(7,HIGH);
digitalWrite(8,HIGH);
digitalWrite(9,LOW);
digitalWrite(10,HIGH);
digitalWrite(11,HIGH);
digitalWrite(12,HIGH);
digitalWrite(13,HIGH);
delay(100);
digitalWrite(2,LOW);
digitalWrite(3,LOW);
digitalWrite(4,HIGH);
digitalWrite(5,LOW);
digitalWrite(6,HIGH);
digitalWrite(7,HIGH);
digitalWrite(8,LOW);
digitalWrite(9,HIGH);
digitalWrite(10,LOW);
digitalWrite(11,LOW);
digitalWrite(12,LOW);
digitalWrite(13,LOW);
delay(100);
digitalWrite(2,LOW);
digitalWrite(3,HIGH);
```

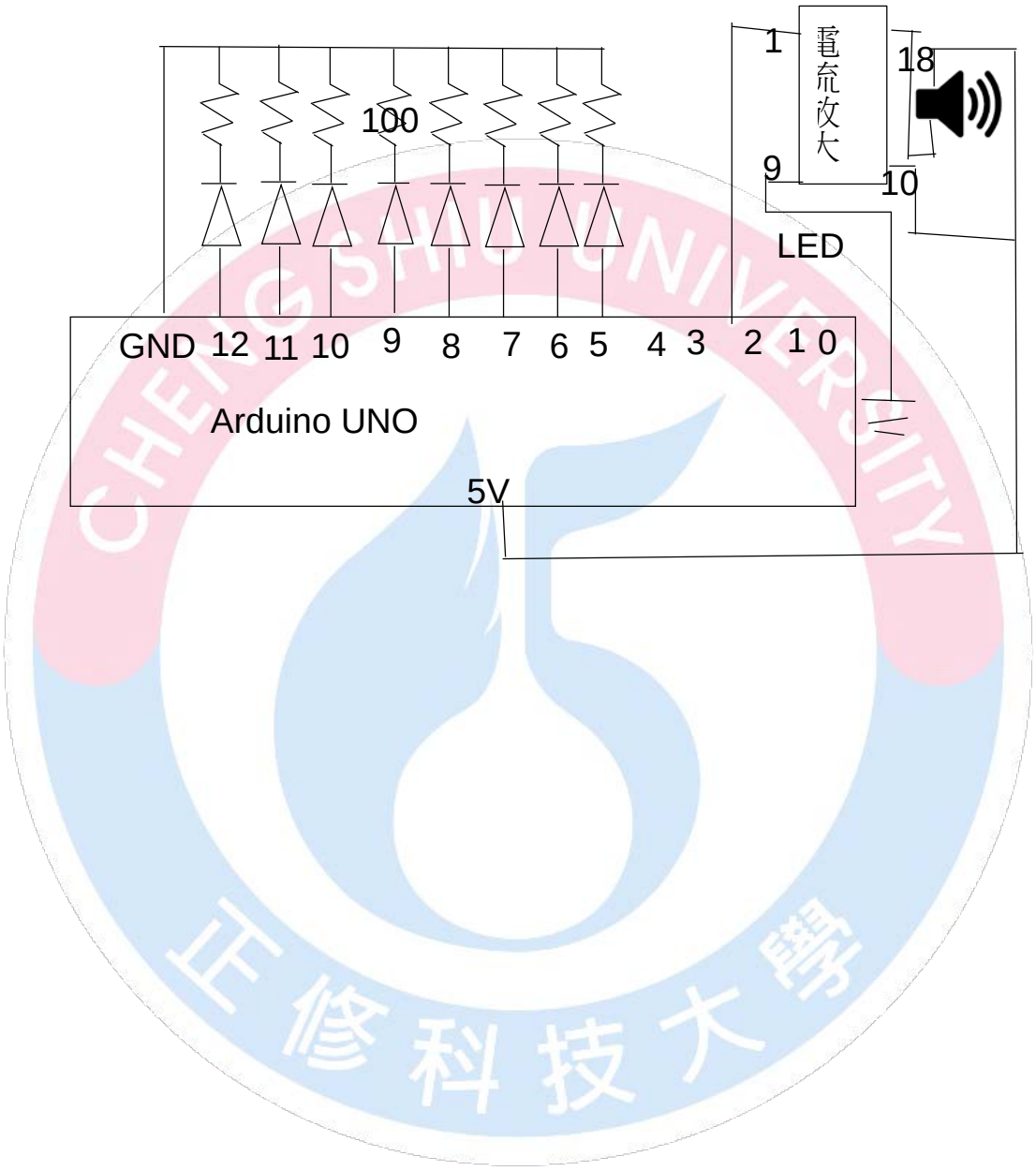
```
digitalWrite(4,LOW);
digitalWrite(5,LOW);
digitalWrite(6,HIGH);
digitalWrite(7,LOW);
digitalWrite(8,HIGH);
digitalWrite(9,HIGH);
digitalWrite(10,HIGH);
digitalWrite(11,HIGH);
digitalWrite(12,HIGH);
digitalWrite(13,HIGH);
delay(100);
digitalWrite(2,HIGH);
digitalWrite(3,LOW);
digitalWrite(4,LOW);
digitalWrite(5,LOW);
digitalWrite(6,LOW);
digitalWrite(7,HIGH);
digitalWrite(8,HIGH);
digitalWrite(9,HIGH);
digitalWrite(10,LOW);
digitalWrite(11,LOW);
digitalWrite(12,LOW);
digitalWrite(13,LOW);
delay(100);}
}
```

四、心得

光敏電阻在不同的座位數字會不一樣。為什麼全加器的 S 跟 C 會不一樣。

實習 11 播放旋律實習(109/05/29)

1.電路圖



2.習題：利用 Arduino 播放一

首小星星之音樂

並且 LED 顯示對

應之音符

音波：20HZ-2000HZ

超音波>20000HZ

(20KHZ)

音符

音符	C	D	E	F	G	A	B	C
旋律	Do	Ra	Mi	Fa	So	La	Si	Do
頻率	523	587	659	694	784	880	988	1047

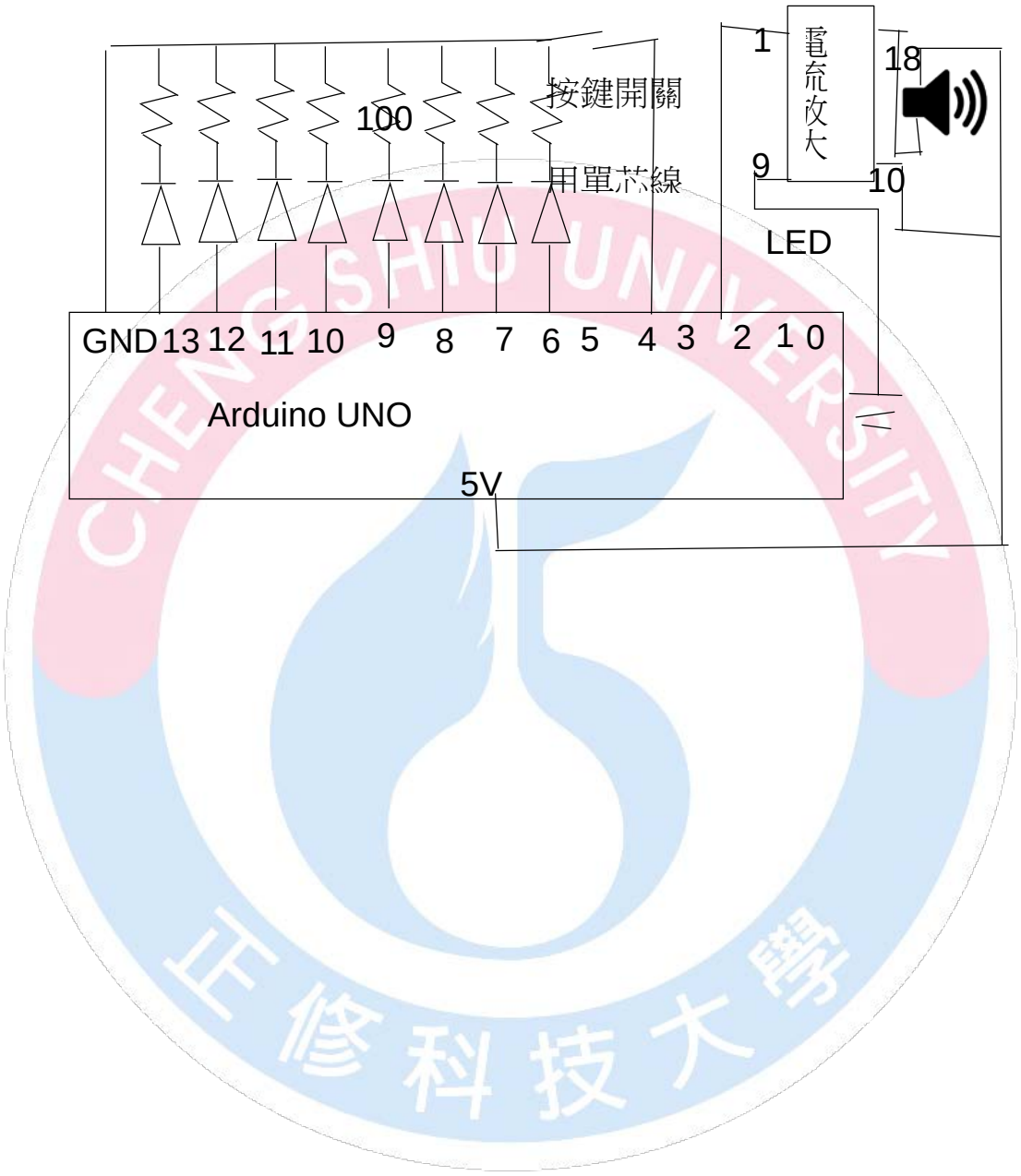
3.程式碼

```
const int speaker=2;
const int
led[8]={6,7,8,9,10,11,12,13};
char
toneName[]="CDEFGABC";
unsigned int
frequency[7]={523,587,659,694
,784,880,988};
char
beeTone[]="CCGGAAGFFEED
DCGGFFEEDGGFFEEDCCG
GAAGFFEEDDC";
byte
beeBeat[]={1,1,1,1,1,1,2,1,1,1,
1,1,1,2,1,1,1,1,1,1,2,1,1,1,1,1,1
,2,1,1,1,1,1,1,2,1,1,1,1,1,1,2};
const int
beeLen=sizeof(beeTone);
unsigned long tempo=140;
int i,j,k;
void setup() {
for(i=0;i<6;i++)
pinMode(led[i],OUTPUT);
}
void loop() {
   for(i=0;i<beeTone;i++)

{playTone(beeTone[i],beeBeat[i]
);}
   delay(3000);}
void playTone(char toneNo,byte
beatNo)
{unsigned long
duration=beatNo*60000/tempo;
for(j=0;j<7;j++)
{if(toneNo==toneName[j])
{tone(speaker,frequency[j]);
for(k=0;k<6;k++)
digitalWrite(led[k],LOW);
digitalWrite(led[j],HIGH);
delay(duration);
noTone(speaker);
digitalWrite(led[j],LOW);}}}
```

四、心得

我覺得這首歌太普通了，可以換成校歌。有沒有校歌的簡譜。

實習 12 音樂盒實習


1
18
9
10
LED
100
按鍵開關
用單芯線
GND 13 12 11 10 9 8 7 6 5 4 3 2 1 0
Arduino UNO
5V

2.習題：設計 Arduono 程式.使用一個

按鍵開關控制播放

四首音樂同時使用 LED

顯示播放的音符.

音符	C	D	E	F	G	A	B	C
旋律	Do	Ra	Mi	Fa	So	La	Si	Do
頻率	523	587	659	694	784	880	988	1047

三、程式碼

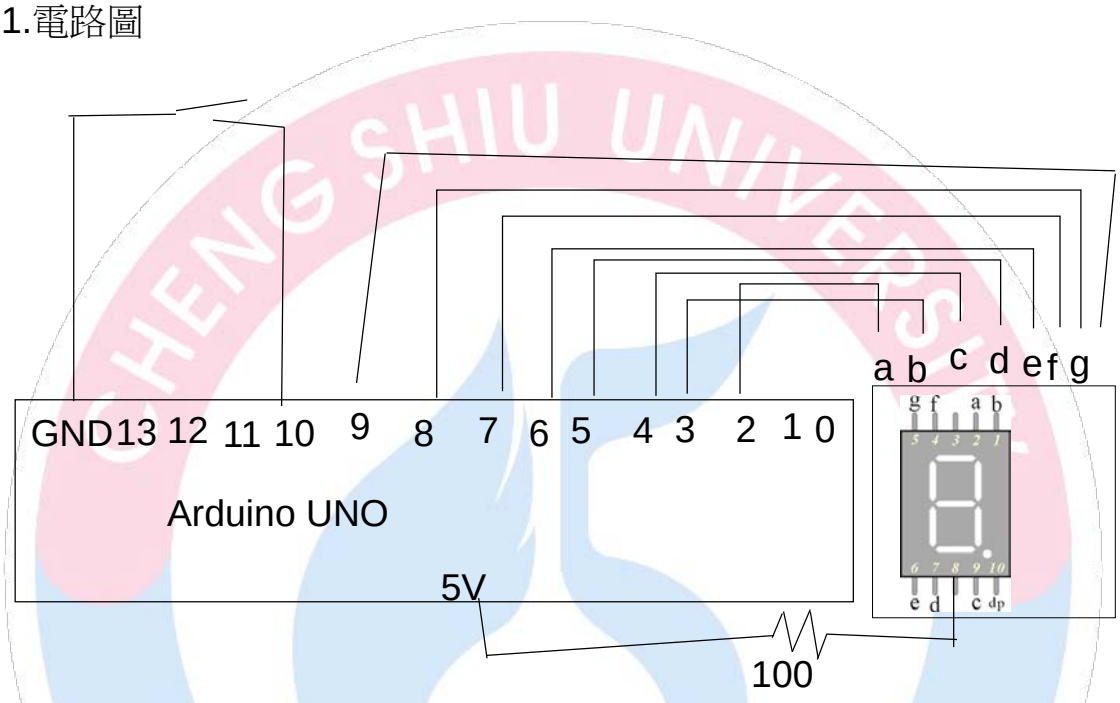
```
const int speaker=2;
const int sw=4;
const int
led[7]={6,7,8,9,10,11,12};
const int debounce=20;
char toneName[]="CDEFGAB";
unsigned int
frequency[7]={523,587,659,694
,784,880,988};
char
beeTone[]="GEEFDDCDEFGG
GGEEFDDEGGEDDDDEFEEE
EEFGGEEFDDCEGGC";
char
starTone[]="CCGGAAGFFEED
DCGGFFEEDGGFFEEDCCG
GEEGFFEEDDC";
char
Tone3[]="EDCDEEEDDDEGG
EDCDEEEDDEDC";
char
Tone4[]="CDEDCEGFEDEFED
CEGFEDGEDC";
byte
beeBeat[]={1,1,2,1,1,2,1,1,1,1,
1,1,2,1,1,2,1,1,2,1,1,1,4,1,1,1,1
,1,1,2,1,1,1,1,1,1,2,1,1,2,1,1,2,
1,1,1,4};
byte
starBeat[]={1,1,1,1,1,1,2,1,1,1,
1,1,1,2,1,1,1,1,1,1,2,1,1,1,1,1,1
,2,1,1,1,1,1,1,2,1,1,1,1,1,1,2};
byte
Beat3[]={3,1,2,2,2,2,4,2,2,4,3,1
,2,2,4,2,2,3,1,4};
byte
Beat4[]={2,2,3,1,2,2,4,2,2,3,1,2
,2,4,2,2,3,1,2,2,4};
unsigned long tempo=240;
const int
beeLen=sizeof(beeTone);
const int
strLen=sizeof(starTone);
const int Len3=sizeof(Tone3);
const int Len4=sizeof(Tone4);
int len=0;
int num;
int keyVal=0;
void setup(){
pinMode(sw,INPUT_PULLUP);
for(int i=0;i<7;i++){
pinMode(led[i],OUTPUT);
digitalWrite(led[i],LOW);}}
void loop()
{
if (digitalRead(sw)==0)
{delay(debounce);
while(digitalRead(sw)==0);
keyVal++;
if(keyVal>4)keyVal=0;num=0;
if(keyVal==1)len=beeLen;
else if(keyVal==2)len=strLen;
else if(keyVal==3)len=Len3;
else if(keyVal==4)len=Len4;}
if(keyVal==1&&len>0)
{playTone(beeTone[num],beeB
eat[num]);
num++;len--;}
else if(keyVal==2&&len>0)
{playTone(starTone[num],starB
eat[num]);
num++;len--;}
else if(keyVal==3&&len>0)
```

```
{playTone(Tone3[num],Beat3[num]);
num++;len--;}
else if(keyVal==4&&len>0)
{playTone(beeTone[num],beeBeat[num]);
num++;len--;}
}
void playTone(char toneNo,byte beatNo)
{
unsigned long duration=beatNo*60000/tempo;
int i;
for(i=0;i<7;i++)
digitalWrite(led[i],LOW);
for(i=0;i<7;i++)
{if(toneNo==toneName[i])
{tone(speaker,frequency[i]);
digitalWrite(led[i],HIGH);
delay(duration);
noTone(speaker);}}}
```

實習 13 按鍵開關控制 7 段顯示器上下數實習

(109/6/12)

1.電路圖



2.習題：按鍵開關控制一位

7 段顯示器上下數變化

每按下一個開關,顯示器會

改變計數狀態，若原先

為上數,改變為下數；若

原先為下數則改變為上數

上數：0123456789

下數：987654321

七段字型：

程式碼：參考範例

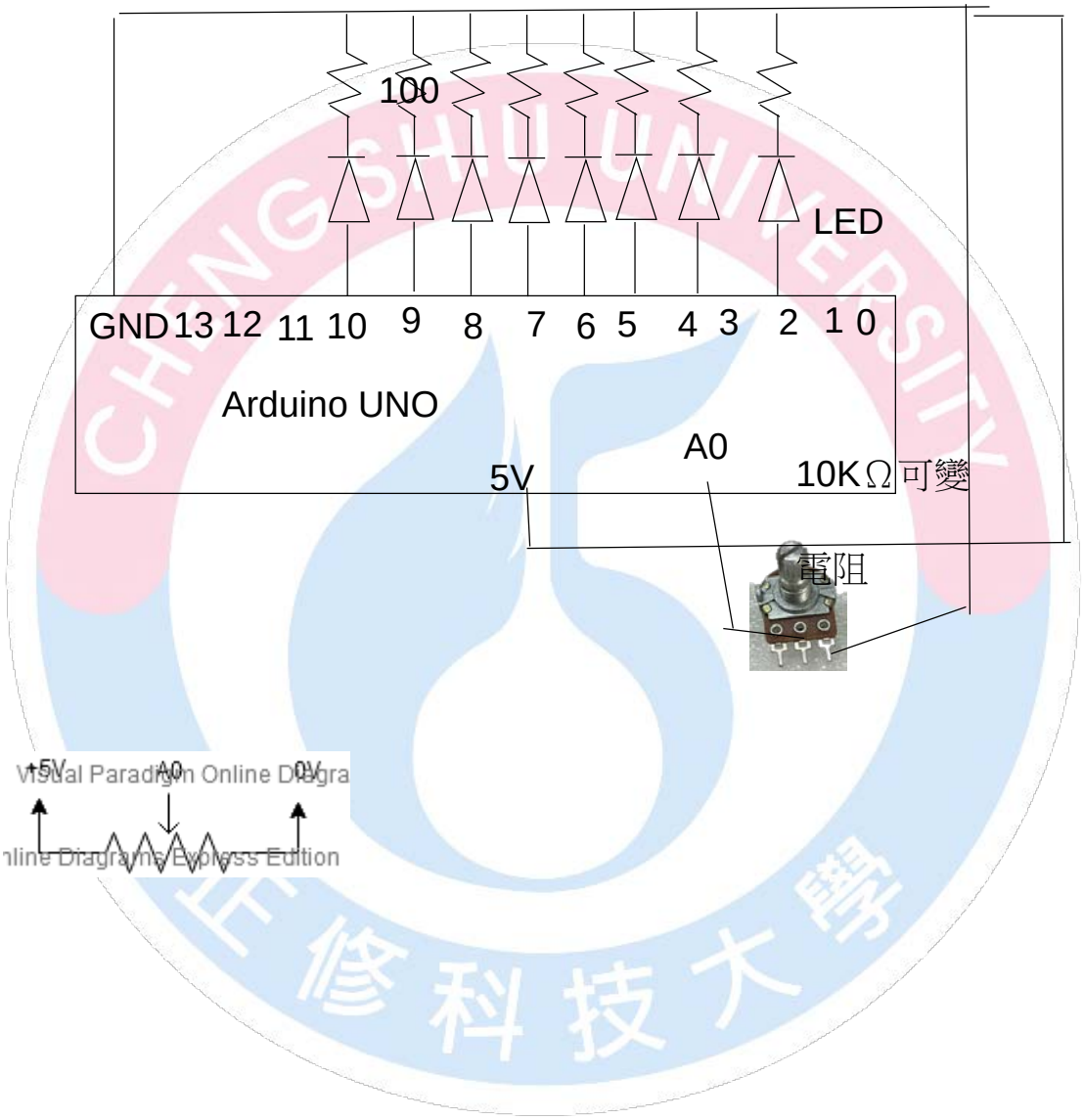
```
int i;
int KeyData;
int numKeys=0;
int val=0;
const int debounceDelay=20;
const byte num[10]={
B11000000,
B11111001,
B10100100,
B10110000,
 B10011001,
 B10010010,
B10000010,
B11111000,
B10000000,
B10010000};
const int
seg[]={2,3,4,5,6,7,8,9};
const int sw=10;
void setup()
{
pinMode(sw,
INPUT_PULLUP) ;
for(i=0;i<8;i++)
pinMode(seg[ i ] ,OUTPUT) ;
}
void loop()
{
KeyData=digitalRead(sw);
if(KeyData==LOW)
{
delay(debounceDelay) ;
while(digitalRead(sw)==LOW);
numKeys++;
}
if(numKeys%2==0)
{
val++;
if(val>9)
val=0;
}
else
{
val--;
if(val<0)
val=9;
}
for(i=0; i<8; i++)
{
if(bitRead(num[val],i))
digitalWrite(seg[i],HIGH) ;
else
digitalWrite(seg[i],LOW);
}
delay( 1000) ;}
```

四、心得

我覺得線太短了，以後要買長一點。

實習 14LED 數位電壓表實習

1.電路圖



2.習題：利用 Arduino A0 接收類比電壓值旋轉 10KΩ可變電阻，改變電壓值

由 10 個 LED 顯示相對應的電壓值,每個 LED 代表 0.5V 之電壓刻度.例如 3V 則點亮 6 個 LED。

3.程式碼：

```
const int led [10]={2,3,4,5,6,7,8,9,10,11};
int i;
int val;
void setup() {
for(i=0;i<10;i++)
pinMode(led[i],OUTPUT);
}
void loop() {
   val=analogRead(0);
   val=map(val,0,1023,0,9);
   for(i=0;i<=val;i++)
   digitalWrite(led[i],HIGH);
   for(i=val+1;i<10;i++)
   digitalWrite(led[i],LOW);
}
```

四、心得

我覺得這個程式語言好裝又不會跑不動。我發現音響電容器壞了換電容器就修好了。最近又發現一款電路圖軟體。比小畫家還好用