**電通二甲微處理器實驗 實驗結報**

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| **實驗名稱** | Lab09\_中斷控制與超音波測距 | | |
| **組別** | 27 | **組員** | 04050015陳姿華、04052502許書瑜 |

1. **實驗目的**

Arduino 於 當按下 Pin 2 外部中斷 0 時, 讀入超音波測距之值並顯示於 PC上:

(1)如何讀取超音波測距之值

(2) 如何將超音波測距之值顯示於LCD?

(3) Arduino 如何規劃外部中斷 INT0?

(4) 接一 SW, 當 SW 按下時暫停所有中斷, 實驗結果又如何?

1. **實驗步驟**

(1) 讀取超音波測距之值並顯示在 LCD 上

(2) 規劃外部中斷 INT0

\* 修改 int0( ) 程式碼

\* 於 int0 中執行超音波讀值，並將結果顯示在 LCD 上

\* noInterrupt( ) 暫停所有中斷

\* Interrupt( ) 重新啟用中斷

1. **程式碼(pdf中的參考程式碼)**

(1)Example

// HCSR04Ultrasonic/examples/UltrasonicDemo/UltrasonicDemo.pde

#include <Ultrasonic.h>

#define TRIGGER\_PIN 12

#define ECHO\_PIN 13

Ultrasonic ultrasonic(TRIGGER\_PIN, ECHO\_PIN);

void setup() {

Serial.begin(9600);

}

void loop(){

float cmMsec, inMsec;

long microsec = ultrasonic.timing();

cmMsec = ultrasonic.convert(microsec, Ultrasonic::CM); // 計算距離，單位: 公分

inMsec = ultrasonic.convert(microsec, Ultrasonic::IN); // 計算距離，單位: 英吋

Serial.print("MS: "); Serial.print(microsec);

Serial.print(", CM: "); Serial.print(cmMsec);

Serial.print(", IN: "); Serial.println(inMsec);

delay(1000);

}

(2)Example Code(中斷程式碼)

const byte intPin=2; //interrupt pin

const byte ledPin=13; //built-in LED

volatile boolean state=LOW; //initial value of switch pin

void setup() { pinMode(ledPin, OUTPUT); pinMode(intPin, INPUT\_PULLUP);

//enable pull-up resistor of input pin digitalWrite(ledPin, ledState); //set LED OFF attachInterrupt(0, int0, LOW); //assign int0 }

void loop() { if (state) {digitalWrite(ledPin, HIGH);}

//turn LED on

else {digitalWrite(ledPin, LOW);} //turn LED off

}

void int0() { //interrupt handler state=!state; //reverse state

}

1. **實驗結果及分析**

透過超音波感測我們可以量測出距離，也能夠利用開關去控制中斷。

距離的量測很容易發生誤差值!

1. **心得討論**

這次實驗的超音波感測時實在是非常的不容易啊!

很難讀取到我們所要的東西，元件也有故障的現象。

1. **修正電路圖(手繪電路圖)**
2. **修正程式碼**

(1)Lab09\_1(讀取超音波測聚脂值並顯示在LCD上)

#include <LiquidCrystal.h>

LiquidCrystal lcd(12, 11, 9,3,4,5);

#include <Ultrasonic.h>

#define TRIGGER\_PIN 13

#define ECHO\_PIN 8

Ultrasonic ultrasonic(TRIGGER\_PIN, ECHO\_PIN);

void setup() {

Serial.begin(9600);

lcd.begin(16, 2);

}

void loop(){

float cmMsec, inMsec;

long microsec = ultrasonic.timing();

cmMsec = ultrasonic.convert(microsec, Ultrasonic::CM); // 計算距離，單位: 公分

inMsec = ultrasonic.convert(microsec, Ultrasonic::IN); // 計算距離，單位: 英吋

Serial.print("MS: "); Serial.print(microsec);

Serial.print(", CM: "); Serial.print(cmMsec);

Serial.print(", IN: "); Serial.println(inMsec);

delay(1000);

lcd.setCursor (0,0);

lcd.print ("MS: ");lcd.print(microsec);

lcd.setCursor (0,1);

lcd.print ("CM: ");lcd.print(cmMsec);

lcd.print ("IN: ");lcd.print(inMsec);

delay(1000);

lcd.clear();

}

(2)Lab09\_2(暫停/重新打開中斷)

#include <LiquidCrystal.h>

#include <Ultrasonic.h>

LiquidCrystal lcd(12,11,9,3,4,5);

#define TRIGGER\_PIN 13

#define ECHO\_PIN 8

Ultrasonic ultrasonic(TRIGGER\_PIN, ECHO\_PIN);

void setup()

{

Serial.begin(9600);

pinMode(2,INPUT\_PULLUP);

attachInterrupt(0,int0,LOW);

lcd.begin(20, 2);

lcd.print("hello, world!");

}

void loop() {

}

void int0()

{

float cmMsec, inMsec;

long microsec = ultrasonic.timing();

cmMsec = ultrasonic.convert(microsec, Ultrasonic::CM); // 計算距離，單位: 公分

inMsec = ultrasonic.convert(microsec, Ultrasonic::IN); // 計算距離，單位: 英吋

lcd.setCursor (0,0);

lcd.print ("MS:");

lcd.print(microsec);

lcd.print (" CM:");

lcd.print(cmMsec);

lcd.setCursor (0,1);

lcd.print ("IN:");

lcd.print(inMsec);

delay(900);

}

(3)lab09\_3

#include <Ultrasonic.h>

#define TRIGGER\_PIN 12

#define ECHO\_PIN 13

Ultrasonic ultrasonic(TRIGGER\_PIN, ECHO\_PIN);

#include <LiquidCrystal.h>

LiquidCrystal lcd(12, 11, 5,4,3,2);

void setup()

{

Serial.begin(9600);

pinMode(2,INPUT\_PULLUP);

//attachInterrupt(0,int0,LOW);

pinMode(6,INPUT\_PULLUP);

}

void loop() {

if (digitalRead(6) == HIGH)

noInterrupts();

//Serial.print(digitalRead(7));

else

interrupts();

//Serial.print(digitalRead(7));

delay(1000);

float cmMsec, inMsec;

long microsec = ultrasonic.timing();

cmMsec = ultrasonic.convert(microsec, Ultrasonic::CM); // 計算距離，單位: 公分

inMsec = ultrasonic.convert(microsec, Ultrasonic::IN); // 計算距離，單位: 英吋

Serial.print("MS: "); Serial.print(microsec);

Serial.print(", CM: "); Serial.print(cmMsec);

Serial.print(", IN: "); Serial.println(inMsec);

lcd.begin(20, 2);

lcd.print("MS: "); lcd.print(microsec);

lcd.setCursor(0, 1);

lcd.print("CM: "); lcd.print(cmMsec);

lcd.print(", IN: "); lcd.print(inMsec);

delay(1000);

}