介面實驗

實驗二

如何使用智慧型 IC 開發 ASA-I2C

擴充介面卡

班級：機械 2A

學號：108303013

姓名：黃鉦淳

日期：109/8/25
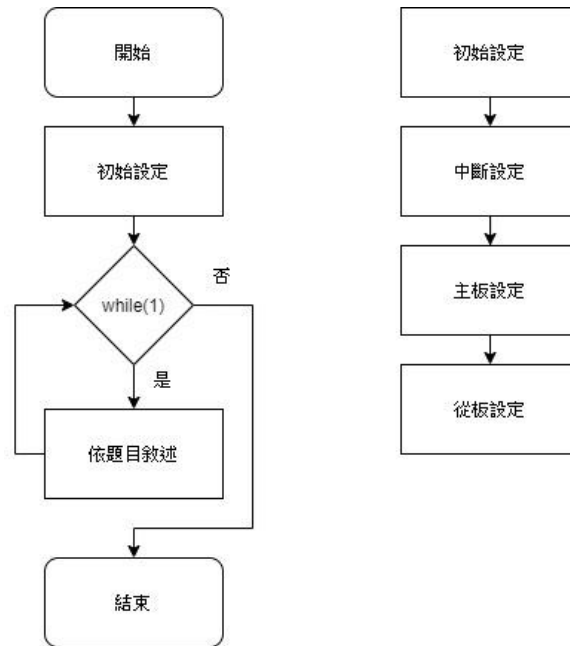
介面實驗工作日誌

實驗二   109 年 8 月 25 日

組別		姓名	黃鉦淳	學號	108303013
實驗起始時間			109/8/18	費時	7 天
實驗結束時間			109/8/25		

所遭遇問題	
解決方法	
完成項目‧及心得	
調查	☐是否有看課程講解影片 是否實用？有何建議？	☐是否有看實驗教學影片 是否實用？有何建議？

一、流程圖

二、程式碼

實驗一、休眠模式下單發量測溫度

```c
#include "c4mlib.h"
#define SLAADD 0x48
#define Mode 5
#define WAITTICK 50
#define TempRegistor 0x00
#define ConfigRegistor 0x01

void SetUp();
float Bin2Dec(uint8_t, uint8_t);

int main()
{
    char ans;
    C4M_STDIO_init();
    SetUp();
    while (1)
    {
        printf("Read Temperature(Y/N):\n");
```

```c
        scanf("%s", &ans);

        if (ans == 'Y' || ans == 'y')

        {

            ans = 'N';

            TWIM_ftm(Mode, SLAADD, ConfigRegistor, 0x80, 7, &one, WAITTICK); //設定單發模式

            TWIM_rec(Mode, SLAADD, TempRegistor, 2, Temperature, WAITTICK);   //接收溫度

            printf("Temperature:%.4f\n\n", Bin2Dec(Temperature[0], Temperature[1] >> 4));

        }

    }


    return 0;
}


void SetUp()
{
    //通訊設定

    TWI_fpt(&TWSR, 0x03, 0, 0);         //TWPS=DIV_BY_1

    TWI_fpt(&TWCR, 0x01, 0, 1);         //致能TWI通訊

    TWI_fpt(&TWCR, 0x45, 0, 0x45);    //致能TWI ACK致能

    TWI_fpt(&TWAR, 0xfe, 1, SLAADD); //設定TWI編號(slave of this card)

    TWI_fpt(&TWAR, 0x01, 0, 0);          //設定廣播關閉

    TWI_fpt(&TWBR, 0xff, 0, 12);         //設定工作時脈 276.48KHz


    uint8_t one = 1, third = 3, Temperature[2] = {0, 0};

    TWIM_ftm(Mode, SLAADD, ConfigRegistor, 0x01, 0, &one, WAITTICK);    //設定休眠模式

    TWIM_ftm(Mode, SLAADD, ConfigRegistor, 0x60, 5, &third, WAITTICK); //設定精度為0.0625度C
}


float Bin2Dec(uint8_t num1, uint8_t num2)
{
    int integer = 0;

    float point = 0;


    for (int i = 6; i > -1; i--)

    {

        integer += (num1 >> i) & 1;

        if (i)

            integer *= 2;

    }
```

```c
    for (int i = 0; i < 4; i++)

    {

        point += (num2 >> i) & 1;

        point /= 2;

    }


    if (num1 / 128)

    {

        return (integer + point) - 128;

    }

    else

    {

        return (integer + point);

    }

}
```

實驗二、比較模式下過溫度中斷警告

```c
#include "c4mlib.h"

#define SLAADD 0x48

#define Mode 5

#define WAITTICK 50

#define TempRegistor 0x00

#define ConfigRegistor 0x01

#define T_low_Registor 0x02

#define T_high_Registor 0x03


void SetUp();

float Bin2Dec(uint8_t, uint8_t);


char TempStatus = 0;

uint8_t Temperature[2] = {0, 0};


int main()

{


    C4M_STDIO_init();

    SetUp();

    printf("-----start-----\n");
```

```c
    while (1)
    {
        // printf("TempStatus=%d\n", TempStatus);
        // printf("Temperature : %.4f degree\n", Bin2Dec(Temperature[0], Temperature[1] >> 4));
        // TWIM_rec(Mode, SLAADD, TempRegistor, 2, Temperature, WAITTICK); //接收溫度
        if (TempStatus)
        {
            TempStatus = 0;
            printf("Temperature too HIGH(OVER 30 Degree)!\n");
            printf("Now temperature is : %.4f Degree\n", Bin2Dec(Temperature[0], Temperature[1] >> 4));
        }
        _delay_ms(200);
    }

    return 0;
}


ISR(INT2_vect)
{
    TempStatus = 1;
    TWIM_rec(Mode, SLAADD, TempRegistor, 2, Temperature, WAITTICK); //接收溫度
}


void SetUp()
{
    //中斷登入設定
    EICRA = 0x30; //設定上升緣觸發
    DDRD = 0xfb;   //PD2輸入
    EIMSK = 0x04; //INT2中斷啟用
    sei();

    //通訊設定
    TWI_fpt(&TWSR, 0x03, 0, 0);         //TWPS=DIV_BY_1
    TWI_fpt(&TWCR, 0x01, 0, 1);         //致能TWI通訊
    TWI_fpt(&TWCR, 0x45, 0, 0x45);      //致能TWI ACK致能
    TWI_fpt(&TWAR, 0xfe, 1, SLAADD); //設定TWI編號(slave of this card)
    TWI_fpt(&TWAR, 0x01, 0, 0);         //設定廣播關閉
    TWI_fpt(&TWBR, 0xff, 0, 12);       //設定工作時脈  276.48KHz
```

```c
    uint8_t zero = 0, one = 1, third = 3;
    uint8_t ThresholdTemp[2] = {29, 30};
    TWIM_ftm(Mode, SLAADD, ConfigRegistor, 0x01, 0, &zero, WAITTICK);          //設定連續感測模式
    TWIM_ftm(Mode, SLAADD, ConfigRegistor, 0x02, 1, &zero, WAITTICK);          //設定溫度比較模式
    TWIM_ftm(Mode, SLAADD, ConfigRegistor, 0x04, 2, &one, WAITTICK);           //設定警告訊號為HI
    TWIM_ftm(Mode, SLAADD, ConfigRegistor, 0x60, 5, &third, WAITTICK);         //設定精度為0.0625度C
    TWIM_trm(Mode, SLAADD, T_low_Registor, 2, &ThresholdTemp[0], WAITTICK);   //設定低溫門檻為29度
    TWIM_trm(Mode, SLAADD, T_high_Registor, 2, &ThresholdTemp[1], WAITTICK); //設定高溫門檻為30度
}


float Bin2Dec(uint8_t num1, uint8_t num2)
{
    int integer = 0;
    float point = 0;

    for (int i = 6; i > -1; i--)
    {
        integer += (num1 >> i) & 1;
        if (i)
            integer *= 2;
    }

    for (int i = 0; i < 4; i++)
    {
        point += (num2 >> i) & 1;
        point /= 2;
    }

    if (num1 / 128)
    {
        return (integer + point) - 128;
    }
    else
    {
        return (integer + point);
    }
}
```

實驗三、量測模式下固定周期量測並顯示

```c
#include "c4mlib.h"
#define SLAADD 0x48
#define Mode 5
#define WAITTICK 50
#define TempRegistor 0x00
#define ConfigRegistor 0x01
#define T_low_Registor 0x02
#define T_high_Registor 0x03

void SetUp();
float Bin2Dec(uint8_t, uint8_t);

char TempStatus = 0;
int counter = 0, sec = 0;
uint8_t Temperature[2] = {0, 0};

int main()
{

    C4M_STDIO_init();
    SetUp();
    printf("-----start-----\n");

    while (1)
    {

        if (TempStatus)
        {
            TempStatus = 0;
            printf("Now temperature is : %.4f Degree\n", Bin2Dec(Temperature[0], Temperature[1] >> 4));
        }
        _delay_ms(200);
    }


    return 0;
}


ISR(TIMER2_COMP_vect)
```

```c
{
    counter++;

    if (counter == 200)
    {
        counter = 0;
        TempStatus = 1;
        TWIM_rec(Mode, SLAADD, TempRegistor, 2, Temperature, WAITTICK); //接收溫度
    }
}


void SetUp()
{
    //中斷登入設定
    REGFPT(&TCCR2, 0x48, 3, 1); //波形:方波
    REGFPT(&TCCR2, 0x07, 0, 4); //除頻值設定 N=256
    REGFPT(&TIMSK, 0x80, 7, 1); //TIM2中斷致能

    uint8_t OCR2_cycle = 215;
    REGPUT(&OCR2, 1, &OCR2_cycle); //除頻值 f=100hz
    sei();

    //通訊設定
    TWI_fpt(&TWSR, 0x03, 0, 0);          //TWPS=DIV_BY_1
    TWI_fpt(&TWCR, 0x01, 0, 1);          //致能TWI通訊
    TWI_fpt(&TWCR, 0x45, 0, 0x45);       //致能TWI ACK致能
    TWI_fpt(&TWAR, 0xfe, 1, SLAADD); //設定TWI編號(slave of this card)
    TWI_fpt(&TWAR, 0x01, 0, 0);          //設定廣播關閉
    TWI_fpt(&TWBR, 0xff, 0, 12);         //設定工作時脈 276.48KHz

    uint8_t zero = 0, one = 1, third = 3;
    TWIM_ftm(Mode, SLAADD, ConfigRegister, 0x01, 0, &zero, WAITTICK);   //設定連續感測模式
    TWIM_ftm(Mode, SLAADD, ConfigRegister, 0x02, 1, &one, WAITTICK);    //設定溫度量測模式
    TWIM_ftm(Mode, SLAADD, ConfigRegister, 0x04, 2, &one, WAITTICK);    //設定警告訊號為HI
    TWIM_ftm(Mode, SLAADD, ConfigRegister, 0x60, 5, &third, WAITTICK); //設定精度為0.0625度C
}


float Bin2Dec(uint8_t num1, uint8_t num2)
{
```

```
int integer = 0;

float point = 0;


for (int i = 6; i > -1; i--)

{

    integer += (num1 >> i) & 1;

    if (i)

        integer *= 2;

}


for (int i = 0; i < 4; i++)

{

    point += (num2 >> i) & 1;

    point /= 2;

}


if (num1 / 128)

{

    return (integer + point) - 128;

}

else

{

    return (integer + point);

}

}
```
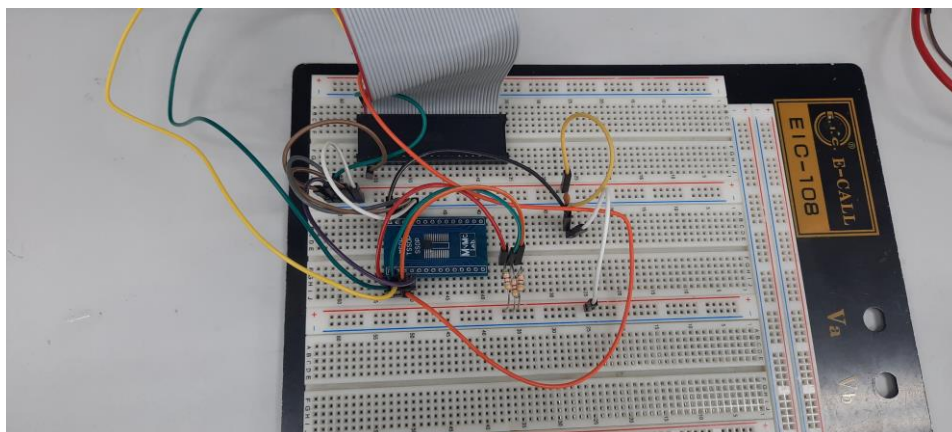
三、實驗數據

1.電路圖

2.實驗數據

```
>>  Read Temperature(Y/N):
<<  Y
>>  Temperature:29.1875
>>
>>  Read Temperature(Y/N):
<<  Y
>>  Temperature:31.5625
>>
>>  Read Temperature(Y/N):
<<  Y
>>  Temperature:29.1250
>>
>>  Read Temperature(Y/N):
<<  Y
>>  Temperature:32.1875
>>
>>  Read Temperature(Y/N):
<<  Y
>>  Temperature:30.5000
```
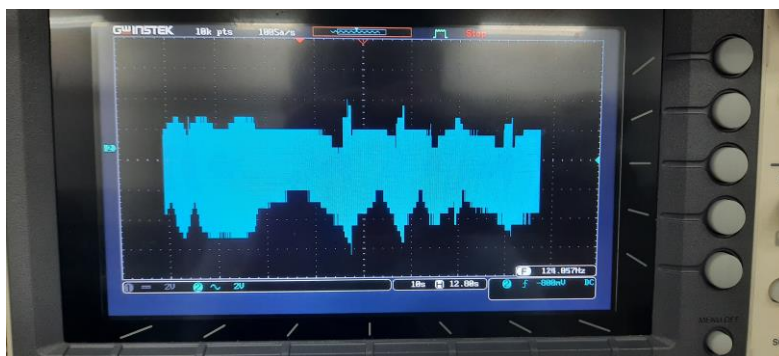
實驗 2-1

```
>>  -----start-----
>>  Temperature too HIGH(OVER 30 Degree)!
>>  Now temperature is : 30.0000 Degree
>>  Temperature too HIGH(OVER 30 Degree)!
>>  Now temperature is : 30.0000 Degree
>>  Temperature too HIGH(OVER 30 Degree)!
>>  Now temperature is : 30.0000 Degree
```

實驗 2-2

```
>>  Now temperature is : 27.3750 Degree
>>  Now temperature is : 27.3750 Degree
>>  Now temperature is : 27.3750 Degree
>>  Now temperature is : 27.3750 Degree
>>  Now temperature is : 29.8125 Degree
>>  Now temperature is : 30.8750 Degree
>>  Now temperature is : 31.3125 Degree
>>  Now temperature is : 31.5625 Degree
>>  Now temperature is : 31.6875 Degree
>>  Now temperature is : 31.6875 Degree
>>  Now temperature is : 31.0625 Degree
>>  Now temperature is : 30.2500 Degree
>>  Now temperature is : 29.6875 Degree
>>  Now temperature is : 29.3125 Degree
>>  Now temperature is : 29.1250 Degree
>>  Now temperature is : 29.0000 Degree
>>  Now temperature is : 28.9375 Degree
```

實驗 2-3

實驗 2-2