

## 微處理機 LAB 3 7-segment

Due : 兩周後 早上 8:00

第 21 組

PART 1. (40%) 實作題

Lab 3.2 學號顯示 use code-B decode mode:

利用 GPIO 控制 Max7219 並在 7-Seg LED 上顯示自己的學號，例如學號為 1234567 則顯示下圖,請使用 decode mode。

(hint:如學號為 109611135，則取後 8 碼 0961 1135)



學號：110611052

```
#include "stm32l476xx.h"
#include "helper_functions.h"
#include "led_button.h"
#include "7seg.h"

// Define pins for 4 leds
// #define LED_gpio GPIOA
// #define LED1_pin 5
// #define LED2_pin 6
// #define LED3_pin 7
// #define LED4_pin 8

// Define pins for button (default use on-board button PC13)
#define BUTTON_gpio GPIOC
#define BUTTON_pin 13

// Define pins for 7seg
#define SEG_gpio GPIOB
#define DIN_pin 3
#define CS_pin 4
#define CLK_pin 5

// Use to decide which part of the code will run
```

```

// Use define & ifdef to control
//#define lab_led
//#define lab_led_button
#define lab_7seg_non_decode
//#define lab_7seg_decode

int main(){

#ifdef lab_7seg_non_decode

    if(init_7seg(SEG_gpio, DIN_pin, CS_pin, CLK_pin) != 0){
        // Fail to init 7seg
        return -1;
    }

    // Set Decode Mode to non-decode mode
    send_7seg(SEG_gpio, DIN_pin, CS_pin, CLK_pin, SEG_ADDRESS_DECODE_MODE,
0xFF);
    // Set Scan Limit to digit 0 only
    send_7seg(SEG_gpio, DIN_pin, CS_pin, CLK_pin, SEG_ADDRESS_SCAN_LIMIT,
0xFF);
    // Wakeup 7seg
    send_7seg(SEG_gpio, DIN_pin, CS_pin, CLK_pin, SEG_ADDRESS_SHUTDOWN,
0x01);

    int SEG_ADDRESS_DIGIT[8] = {
        SEG_ADDRESS_DIGIT_0,
        SEG_ADDRESS_DIGIT_1,
        SEG_ADDRESS_DIGIT_2,
        SEG_ADDRESS_DIGIT_3,
        SEG_ADDRESS_DIGIT_4,
        SEG_ADDRESS_DIGIT_5,
        SEG_ADDRESS_DIGIT_6,
        SEG_ADDRESS_DIGIT_7,
        /*SEG_ADDRESS_DECODE_MODE,
        SEG_ADDRESS_ITENSITY,
        SEG_ADDRESS_SCAN_LIMIT,
        SEG_ADDRESS_SHUTDOWN,

```

```

    SEG_ADDRESS_DISPLAY_TEST*/

};

int SEG_DATA_DECODE[10] = {
    SEG_DATA_DECODE_0,
    SEG_DATA_DECODE_1,
    SEG_DATA_DECODE_2,
    SEG_DATA_DECODE_3,
    SEG_DATA_DECODE_4,
    SEG_DATA_DECODE_5,
    SEG_DATA_DECODE_6,
    SEG_DATA_DECODE_7,
    SEG_DATA_DECODE_8,
    SEG_DATA_DECODE_9

};

int SEG_DATA_NON_DECODE_LOOP[17] = {
    SEG_DATA_NON_DECODE_0,
    SEG_DATA_NON_DECODE_1,
    SEG_DATA_NON_DECODE_2,
    SEG_DATA_NON_DECODE_3,
    SEG_DATA_NON_DECODE_4,
    SEG_DATA_NON_DECODE_5,
    SEG_DATA_NON_DECODE_6,
    SEG_DATA_NON_DECODE_7,
    SEG_DATA_NON_DECODE_8,
    SEG_DATA_NON_DECODE_9,
    SEG_DATA_NON_DECODE_0,
    SEG_DATA_NON_DECODE_A,
    SEG_DATA_NON_DECODE_B,
    SEG_DATA_NON_DECODE_C,
    SEG_DATA_NON_DECODE_D,
    SEG_DATA_NON_DECODE_E,
    SEG_DATA_NON_DECODE_F

};

// Loop through all elements
int current=0;

```

```

while(1){
    // Write to digit 0

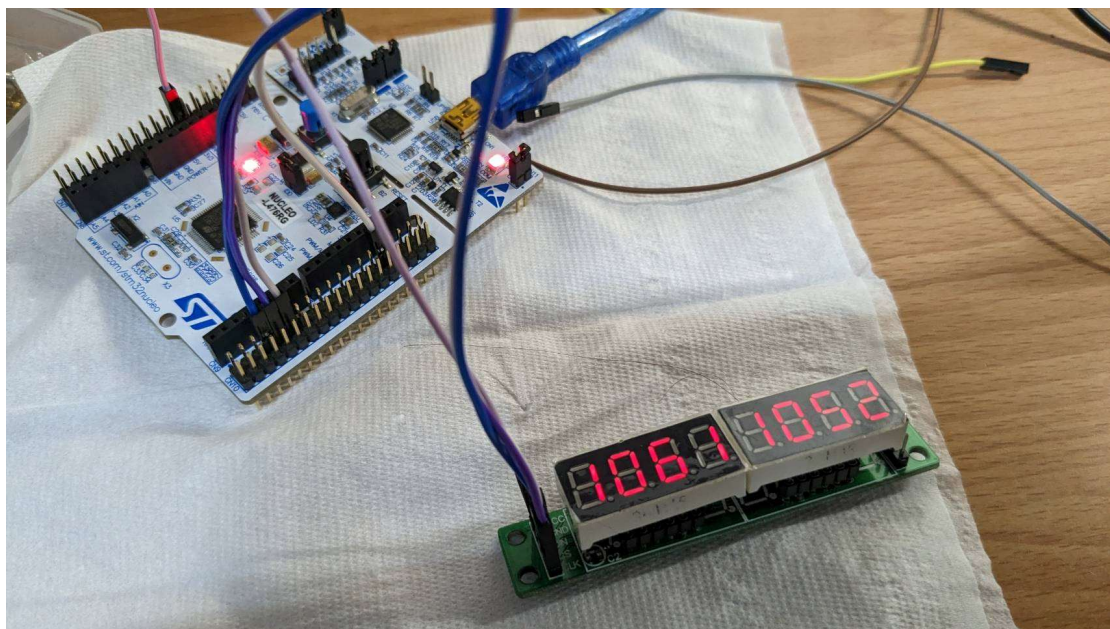
    int student_id = 110611052;
    for(int i=0; i<8; i++){
        send_7seg(SEG_gpio, DIN_pin, CS_pin, CLK_pin,
SEG_ADDRESS_DIGIT[i],student_id%10);
        student_id = (student_id-(student_id%10))/10;
    }
    delay_without_interrupt(1000);
}

#endif

while(1){}

return 0;
}

```



## PART 2. (40%) 實作題

### Lab 3.3 顯示 Fibonacci 數

請完成實驗 錄影及截圖紀錄實驗結果並附上程式碼(main.s 及 include 之 pin.s 檔案)

- 請設計一組 C 語程式偵測實驗板上的 User button，當 User button 按 N 次時 7-Seg LED 上會顯示 fib(N)的值。
- fib(0) = 0、fib(1) = 1、fib(2) = 1、...
- 若 fib(N)  $\geq$  100000000 則顯示-1。

```

• #include "stm32l476xx.h"
• #include "helper_functions.h"
• #include "led_button.h"
• #include "7seg.h"
•
• // Define pins for 4 leds
• //#define LED_gpio GPIOA
• //#define LED1_pin 5
• //#define LED2_pin 6
• //#define LED3_pin 7
• //#define LED4_pin 8
•
• // Define pins for button (default use on-board button PC13)
• #define BUTTON_gpio GPIOC
• #define BUTTON_pin 13
•
• // Define pins for 7seg
• #define SEG_gpio GPIOB
• #define DIN_pin 3
• #define CS_pin 4
• #define CLK_pin 5
•
• // Use to decide which part of the code will run
• // Use define & ifdef to control
• //#define lab_led
• //#define lab_led_button
• #define lab_7seg_non_decode
• //#define lab_7seg_decode
•
• int main(){
•
• #ifndef lab_7seg_non_decode
•
•     if(init_7seg(SEG_gpio, DIN_pin, CS_pin, CLK_pin) != 0){

```

```

    // Fail to init 7seg
    return -1;
}

if(init_button(BUTTON_gpio, BUTTON_pin) != 0 ){
    return -1;
}

// Set Decode Mode to non-decode mode
send_7seg(SEG_gpio, DIN_pin, CS_pin, CLK_pin,
SEG_ADDRESS_DECODE_MODE, 0xFF);

// Set Scan Limit to digit 0 only
send_7seg(SEG_gpio, DIN_pin, CS_pin, CLK_pin,
SEG_ADDRESS_SCAN_LIMIT, 0xFF);

// Wakeup 7seg
send_7seg(SEG_gpio, DIN_pin, CS_pin, CLK_pin,
SEG_ADDRESS_SHUTDOWN, 0x01);

.

.

int SEG_ADDRESS_DIGIT[8] = {
    SEG_ADDRESS_DIGIT_0,
    SEG_ADDRESS_DIGIT_1,
    SEG_ADDRESS_DIGIT_2,
    SEG_ADDRESS_DIGIT_3,
    SEG_ADDRESS_DIGIT_4,
    SEG_ADDRESS_DIGIT_5,
    SEG_ADDRESS_DIGIT_6,
    SEG_ADDRESS_DIGIT_7,
    /*SEG_ADDRESS_DECODE_MODE,
    SEG_ADDRESS_ITENSITY,
    SEG_ADDRESS_SCAN_LIMIT,
    SEG_ADDRESS_SHUTDOWN,
    SEG_ADDRESS_DISPLAY_TEST*/
};

int SEG_DATA_DECODE[10] = {
    SEG_DATA_DECODE_0,
    SEG_DATA_DECODE_1,
    SEG_DATA_DECODE_2,
    SEG_DATA_DECODE_3,

```

```

•     SEG_DATA_DECODE_4,
•     SEG_DATA_DECODE_5,
•     SEG_DATA_DECODE_6,
•     SEG_DATA_DECODE_7,
•     SEG_DATA_DECODE_8,
•     SEG_DATA_DECODE_9
•
•
• };
• int SEG_DATA_NON_DECODE_LOOP[17] = {
•     SEG_DATA_NON_DECODE_0,
•     SEG_DATA_NON_DECODE_1,
•     SEG_DATA_NON_DECODE_2,
•     SEG_DATA_NON_DECODE_3,
•     SEG_DATA_NON_DECODE_4,
•     SEG_DATA_NON_DECODE_5,
•     SEG_DATA_NON_DECODE_6,
•     SEG_DATA_NON_DECODE_7,
•     SEG_DATA_NON_DECODE_8,
•     SEG_DATA_NON_DECODE_9,
•     SEG_DATA_NON_DECODE_0,
•     SEG_DATA_NON_DECODE_A,
•     SEG_DATA_NON_DECODE_B,
•     SEG_DATA_NON_DECODE_C,
•     SEG_DATA_NON_DECODE_D,
•     SEG_DATA_NON_DECODE_E,
•     SEG_DATA_NON_DECODE_F
• };
• for(int i=0; i<8; i++){//reset display
•     send_7seg(SEG_gpio, DIN_pin, CS_pin, CLK_pin,
SEG_ADDRESS_DIGIT[i],SEG_DATA_DECODE_BLANK);
•
•
• }
• //begin with 0
• send_7seg(SEG_gpio, DIN_pin, CS_pin, CLK_pin,
SEG_ADDRESS_DIGIT[0],0);
• // Loop through all elements
• int a=0;
• int b=1;

```

```

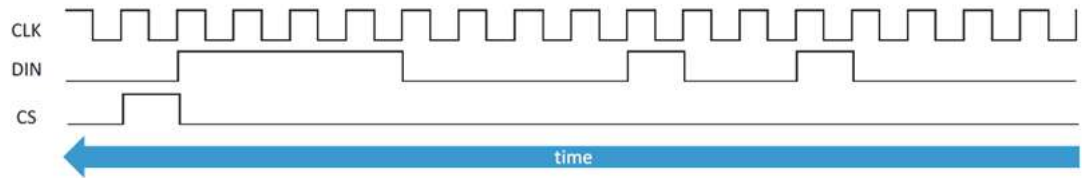
•   int c=0;
•   int number = 0;
•   int state = 0;
•   int ch_state = 0;
•   int button_press_persecond_cycle = 10;
•   int debounce_cycle = 100;
•   int debounce_threshold = 70;
•   int last_botton_pos =1;
•   while(1){
•       // Write to digit 0
•
•
•       for(int i=0; i<button_press_persecond_cycle; i++){
•           int pos_cnt = 0; //count
•           for(int a=0; a<debounce_cycle; a++){
•               if(read_gpio(BUTTON_gpio, BUTTON_pin) == 0){
•                   pos_cnt++;
•               }
•               delay_without_interrupt(1000/(button_press
_persecond_cycle*debounce_cycle));
•           }
•           if(pos_cnt > debounce_threshold){
•               if(last_botton_pos == 1){
•                   last_botton_pos = 0;
•               }
•
•           }else{
•
•               if(last_botton_pos == 0){
•                   if(a>100000000){
•
•                       for(int i=0; i<8; i++){//reset
display
•                           send_7seg(SEG_gpio, DIN_pin,
CS_pin, CLK_pin, SEG_ADDRESS_DIGIT[i],SEG_DATA_DECODE_BLANK);
•
•                       }
•                       send_7seg(SEG_gpio, DIN_pin, CS_pin,
CLK_pin, SEG_ADDRESS_DIGIT[1],SEG_DATA_DECODE_DASH);

```





D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
x	x	x	x	ADDRESS				DATA							
x	x	x	x	1	0	0	1	0	0	0	0	1	1	1	1



學號：1106110－52

$52\%8 = 4 \rightarrow 4^{\text{th}}$  digit display 2

D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
x	x	x	x	address				data							
x	x	x	x	0	1	0	0	x	x	x	x	0	0	1	0

