實驗六 STM32 Keypad Scanning

1. Lab objectives 實驗目的

- Understand the principle of STM32
- Use C code to controll STM32
- design program for 7-seg LED and keypad

- 了解 STM32 使用原理
- 了解如何使用 C code 控制 STM32
- 設計 7-SegLED 和 keypad 程式

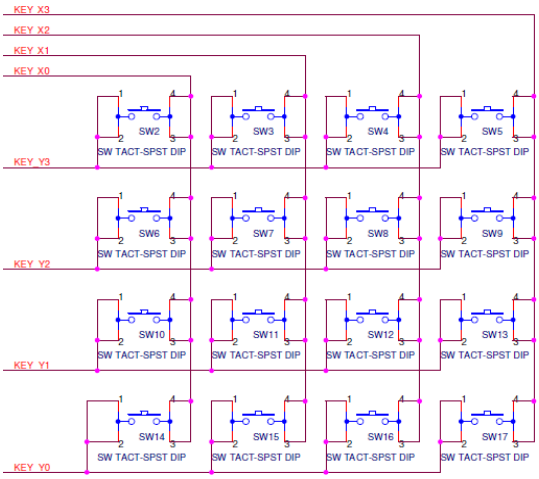
2. Lab principle 實驗原理

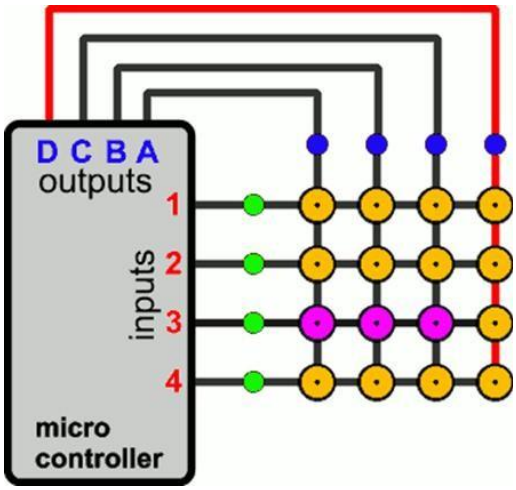
The circuit diagram of keypad is given below. You’re supposed to use 4 input pins and 4 output pins. Use output pins to determine which row you’re scanning. For example, when output value of KEY X0~3 is 1000 and input value of KEY Y0~3 is 1000, then we can say that SW14 is pressed.

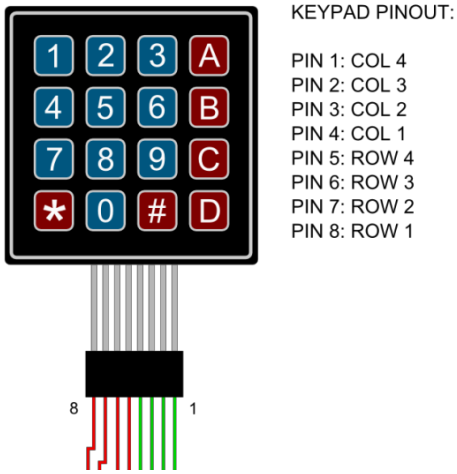
Keypad 電路組成如下，主要是一個 4x4 的鍵盤按鈕所組成會用到 4 個 Input pin 與

4 個 Output pin，其控制原理是利用 Output pin 掃描的方式來決定目前所選擇到的

是哪一行按鍵，例如當 KEY X0~3 輸出 1000 而此時若 KEY Y0~3 所讀到的值是 1000 的話則代表 SW14 按鈕被按下。


KEY_X3
KEY_X2
KEY_X1
KEY_X0
KEY_Y3
KEY_Y2
KEY_Y1
KEY_Y0
SW2
SW3
SW4
SW5
SW6
SW7
SW8
SW9
SW10
SW11
SW12
SW13
SW14
SW15
SW16
SW17
SW TACT-SPST DIP


D C B A
outputs
inputs
1
2
3
4
micro
controller



3. Steps 實驗步驟

3.1. Lab 6.1: Max7219 displayer (30%)

Modify your code in lab5.2 to make it callable by C. Add a C file to complete the code given below, display your student ID on 7-Seg LED.

將 Lab5 所完成的 GPIO_init()與 MAX7219_send()改成可以被 C 所呼叫的版本，並新增一個 Cfile 完成 displayfunction 及利用 max7219_send()將學號顯示於 7 段顯示器上。

3.2. Lab6.2: KeypadScanning (30%)

Use 4 input GPIO pins and 4 output GPIO pins to connect with keypad. Show t he corresponding number of pressed button on 7-SegLED.

Note: Use C to init GPIO used by keypad. Please refer to stm32l476xx.h for G PIO register address and structure define.

利用 4 個 input GPIO 與 4 個 output GPIO pin 連接 keypad，當按下 keypad 利用兩顆七段顯示器顯示所對應的數字。

Note:keypad 所使用到的 GPIO 請利用 C 語言的方式初始化，各 GPIO registera ddress 與 structuredefine 請參考 stm32l476xx.h

```
 #include “stm32l476xx.h”
 //TODO: define your gpio pi
n #defineX0
 #define  X
1   #define
X2  #define
X3  #define
Y0  #define
Y1  #define
Y2  #define
Y3

 unsigned int x_pin[4] = {X0, X1, X2, X3};
 unsigned int y_pin[4] = {Y0, Y1, Y2, Y3};

 /* TODO: initial keypad gpio pin, X as output and Y as input
 */
 void keypad_init()
 {
 }

 /* TODO: scan keypad value
   return:
   >=0: key pressedvalue
   -1: no keypress
 */
 char keypad_scan()
```

各按鍵對應值為：

	X0	X1	X2	X3
Y0	1	2	3	10
Y1	4	5	6	11
Y2	7	8	9	12
Y3	15	0	14	13

3.3. Lab6.3　single and multi buttons 處理單或多按鍵 (40%)

Show pressed button of keypad on 7-Seg LED. Each value of corresponding b utton is given below.

利用 keypad 輸入數字並在七段顯示器顯示，各按鍵對應值為：

	X0	X1	X2	X3
Y0	1	2	3	10
Y1	4	5	6	11
Y2	7	8	9	12
Y3	C	0	C	13

When multiple buttons are pressed, show the sum of values that buttons presse d representing. If shown value is greater than 99999999, don’t modify the numb er showing on 7-Seg LeD until button C is pressed.

當按多按鍵時，會將按鍵值相加並顯示出來(按 1、5、9 則顯示 15)，若準備顯示的值>99999999，則不更動原本七段顯示器上顯示的數字，直到按下消除鍵(C)。