Lab5 7-Seg LED

實驗五 7-Seg LED

1. Lab objectives 實驗目的

- Understand the principle of using MAX7219.
- Design the program of 7-Seg LED.

- 了解MAX7219使用原理
- 設計7-Seg LED程式

1. Theory 實驗原理

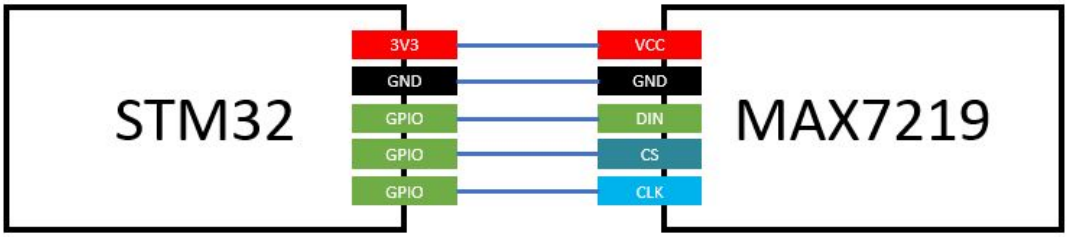
Please check the course material of lab5_note

請參考上課lab5_note講義。

2. Steps 實驗步驟

2.1. Lab5.1: Max7219與7-Seg LED練習(Practice of Max7219 and 7-Seg LED)—without code B decode mode

將stm32的3.3V接到7-Seg　LED板的VCC，GND接到GND，並選擇三個GPIO接腳分別接到DIN、CS和CLK。



完成以下程式碼，並利用GPIO控制Max7219並在7-Seg　LED上顯的第一位依序顯示0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, b, C, d, E, F (時間間隔1秒)，範例影片如下：

https://goo.gl/ZDZcdl

Note:由於decode　mode無法顯示AbCdF等字，因此請將decode　mode關掉。(參考lab5_note講義的table 6)

Connect 3.3V and GND pin on STM32 to VCC and GND port on MAX7219. Choose three GIPO ports on STM32 for DIN, CS and CLK on MAX7219.

Complete the code giving below and display 0, 1, 2, 3…, 9, A, b, C, d, E, F to the first digit of 7-Seg LED at 1 second interval. Example video link is giving above.

Note: Due to the fact that decode mode is unable to display alphabets, please disable decode mode(ref: lab5_note table 6).

```
   .syntax unified
   .cpu cortex-m4
   .thumb
.data
   arr: .byte 0x0, 0x0, 0x0, 0x0, 0x0, 0x0, 0x0, 0x0, 0x0, 0x0, 0x0,
0x0, 0x0, 0x0, 0x0, 0x0 //TODO: put 0 to F 7-Seg LED pattern here

.text
   .global main

main:
    BL   GPIO_init
    BL   max7219_init
loop:
    BL   Display0toF
    B loop

GPIO_init:
   //TODO: Initialize three GPIO pins as output for max7219 DIN, CS
and CLK
   BX LR

Display0toF:
   //TODO: Display 0 to F at first digit on 7-SEG LED. Display one
per second.
   BX LR

MAX7219Send:
   //input parameter: r0 is ADDRESS , r1 is DATA
   //TODO: Use this function to send a message to max7219
   BX LR

max7219_init:
   //TODO: Initialize max7219 registers
   BX LR

Delay:
   //TODO: Write a delay 1sec function
   BX LR
```

2.2. Lab5.2: Max7219與7-Seg LED練習(Practice of Max7219 and 7-Seg LED)—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：

完成以下程式碼，將放在student_id array **裡的學號顯示到**7-seg LED**上。**

Note: **請使用**decode mode

Using GPIO output to display your student ID on 7-Seg LED. Picture above is showing the case that your student ID is 1234567.

Complete the code giving below. Put your student ID in **student_id array** and display it to 7-Seg LED.

Note: Please enable decode mode.

```
   .syntax unified
   .cpu cortex-m4
   .thumb

.data
   student_id: .byte 1, 2, 3,4, 5, 6, 7 //TODO: put your student id
here

.text
   .global main

main:
    BL   GPIO_init
    BL   max7219_init
    //TODO: display your student id on 7-Seg LED
Program_end:
   B Program_end

GPIO_init:
   //TODO: Initialize three GPIO pins as output for max7219 DIN, CS
and CLK
   BX LR

MAX7219Send:
   //input parameter: r0 is ADDRESS , r1 is DATA
   //TODO: Use this function to send a message to max7219
   BX LR

max7219_init:
   //TODO: Initial max7219 registers.
     BX LR
```

3.

3.1. Lab5.3 Max7219與7-SEG LED練習(Practice of Max7219 and 7-Seg LED)—顯示Fibonacci數(Show the Fibonacci number)

請設計一組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。User button長按1秒則將數值歸零。

fib(0) = 0、fib(1) = 1、fib(2) = 1 、…

若fib(N) ≥ 100000000則顯示-1。

範例影片如下：

https://goo.gl/6DF6eY

Note: 請記得處理User button開關彈跳的問題。

Design a program to detect user button on STM32 pressed. When user button is pressed N times, display fib(N) on 7-Seg LED. When user button is held down for 1 second, set displayed number to 0. Example video link is given above.

fib(0) = 0, fib(1) = 1, fib(2) = 1, ……

if fib(N) ≥ 100000000 then display -1.

Note: Please remember to deal with the bouncing problem.