國立中正大學
National Chung Cheng University

微處理機系統與介面技術

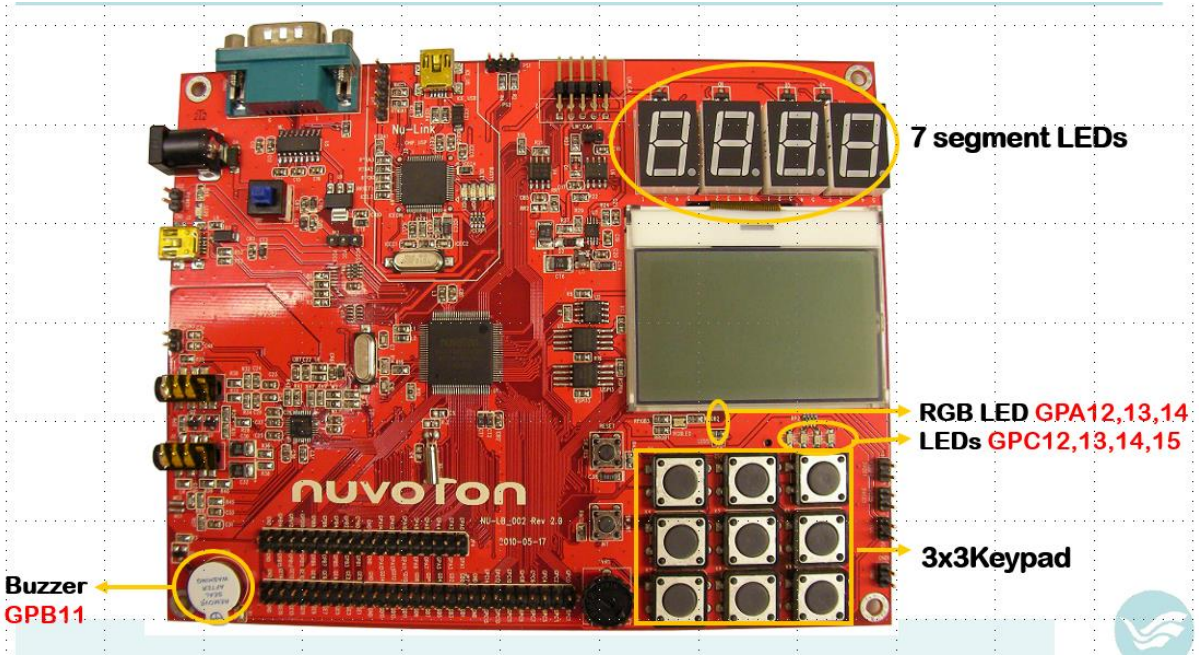
LAB 1 – General Purpose Input / Output

www.neatlab.tw
neat Laboratory
CCU@Taiwan 中正大學

GPIO

- NUC140有五組GPIOA/B/C/D/E,每組GPIO皆有16pins,有些GPIO會有額外的用途(ex.LED,蜂鳴器, UART…)

- GPIO有四種模式:
  - Input
  - Push-pull Output
  - Open-Drain Output
  - Quasi bi-direction



```c
int main(void)
{
    /* Unlock protected registers */
    SYS_UnlockReg();

    /* Init System, peripheral clock and multi-function I/O */
    SYS_Init();

    /* Lock protected registers */
    SYS_LockReg();


    /* Configure PC.12 as Output mode */
    PC->PMD = (PC->PMD & (~GPIO_PMD_PMD12_Msk)) | (GPIO_PMD_OUTPUT << GPIO_PMD_PMD12_Pos);
    GPIO_SetMode(PC, BIT12, GPIO_PMD_OUTPUT);

    while(1){
        PC12 = 0;
        CLK_SysTickDelay(50000);
        PC12 = 1;
        CLK_SysTickDelay(50000);
    }
```

設定GPC12為output
你可以直接呼叫gpio.c裡面的api: GPIO_SetMode
或是直接填暫存器: PC->PMD(GPIO portC Mode Control)

設定GPC12output為1
可以用Go to Definition看更細節的內容

31	30	29	28	27	26	25	24
PMD15		PMD14		PMD13		PMD12	
23	22	21	20	19	18	17	16
PMD11		PMD10		PMD9		PMD8	
15	14	13	12	11	10	9	8
PMD7		PMD6		PMD5		PMD4	
7	6	5	4	3	2	1	0
PMD3		PMD2		PMD1		PMD0	

Bits	Descriptions	
[2n+1:2n]	PMDn	**GPIOx I/O Pin[n] Mode Control** Determine each I/O type of GPIOx pins. 00 = GPIO port [n] pin is in INPUT mode 01 = GPIO port [n] pin is in OUTPUT mode 10 = GPIO port [n] pin is in Open-Drain mode 11 = GPIO port [n] pin is in Quasi-bidirectional mode

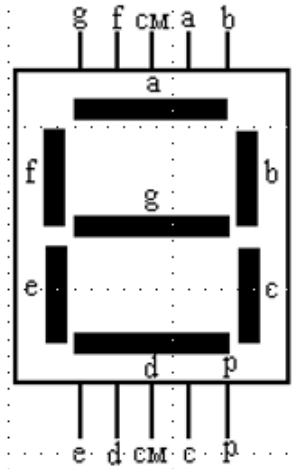
Seven segment display & Keypad

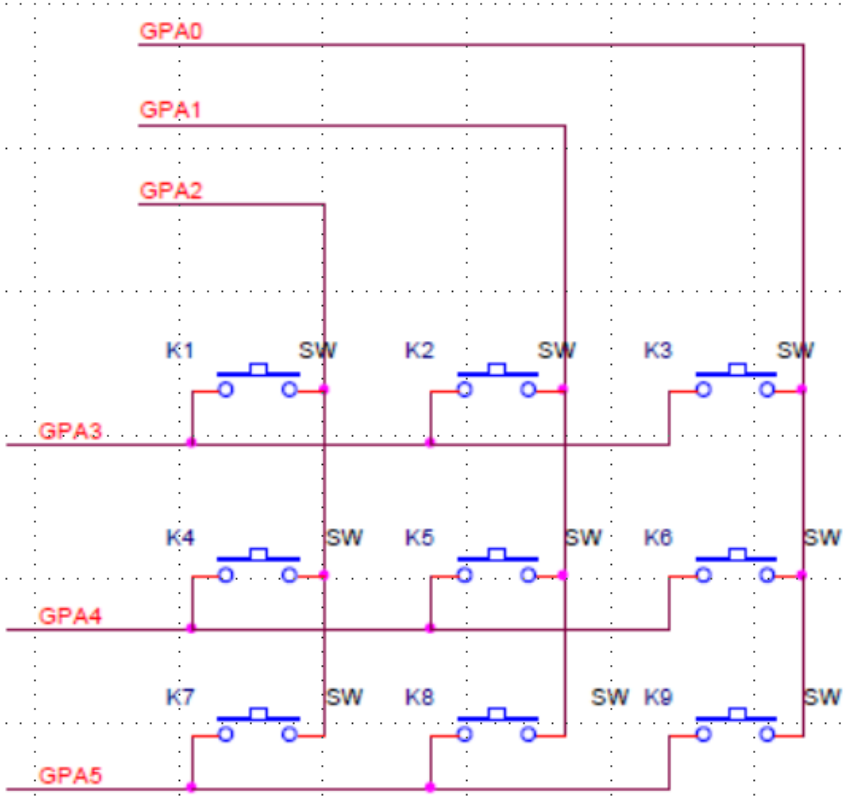
GPC4~7 control which 7-segment to turn on (1 = on, 0 = off)

- GPC4 : First 7-segment (LSB)
- GPC5 : Second 7-segment
- GPC6 : Third 7-segment
- GPC7 : Forth 7-segment (MSB)

GPE0~7 control each segment to turn on (0 = on, 1 = off)

- GPE0 : c
- GPE1 : dot
- GPE2 : f
- GPE3 : a
- GPE4 : b
- GPE5 : d
- GPE6 : e
- GPE7 : g



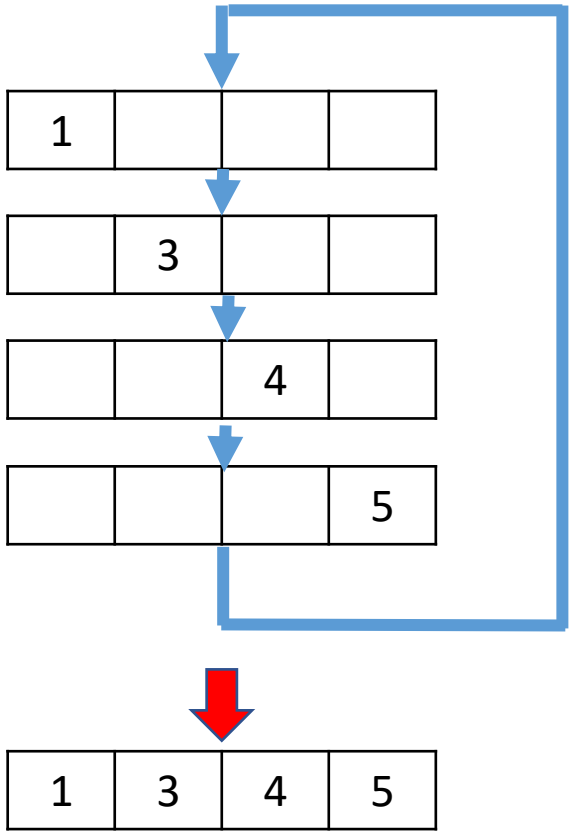


Basic

- 用七段顯示器顯示學號後四碼
- 七段顯示器細節可以參考Seven_Segment.c

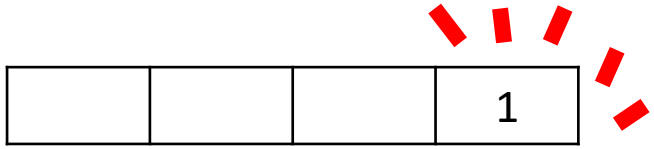
- Tips:四個七段顯示器無法同時顯示不同數字,所以需要快速掃描去顯示自己的學號

- Delay function : CLK_SysTickDelay

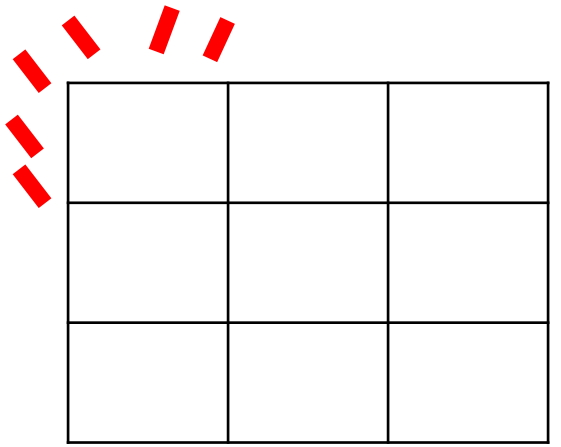


Bonus

- 在7-segment display上面顯示學號，當按下keypad相對應的按鍵的時候顯示數字
- 可參考Sanckey.c



7-segment



keypad

Demo

- Place: 創新大樓515找助教 潘冠豪
- Demo Time: (二)(四)下午兩點半~五點
- Report deadline: 10/11(五)
- Report title format: LABx_ID_Name.pdf

- Demo必須在Report deadline前完成
- Demo前須先上傳程式碼(上傳main所在的.c檔即可)

Graded

- Basic : 70%
- Bonus : 15%
- Report & Code : 15%