Lab8 STM32 Interrupt and Exception

實驗八 STM32 Interrupt and Exception

1. Lab objectives 實驗目的

● Understand how to set stm32 SysTick timer.
● Understand the setting and principle of NVIC and External.

● 瞭解STM32 SysTick timer 設定
● 瞭解STM32 NVIC和External 設定和原理

2. Theory 實驗原理

Please check the course materials.
請參考上課講義。

3. Steps 實驗步驟

3.1. SysTick timer interrupt setting

設定clock source為HSI的SysTick timer，利用SysTick timer中斷機制，控制LED使它3秒暗一次(timer 3秒 interrupt一次)。

Set the clock source as HSI's SysTick timer, and use the SysTick timer interruption to darken the LED(one time for every three seconds).

```
main.c
extern void FCLK_4MHz_delay_1s();

void SystemClock_Config(){
  }
void SysTick_Handler(void) {
}
int main(){
       SystemClock_Config();
       GPIO_init();
       while(1){
       }
}
```

3.2. Multiple External Interrupt setting

設定keypad的input腳為外部中斷的輸入源，當沒按任何按鍵時，LED(1顆)會保持在亮的狀態，當按下按鍵時會觸發程式進入handler，LED會在handler亮、暗(各0.5秒)輸入的次數，離開handler後LED會回到一開始的狀態。

Set the interruption as input source for input pin of keypad. LED will keep lighting when button is not pressed, otherwise program will be triggered into the handler. LED will flash the time you enter from the keypad in the handler(light and dark each for 0.5 second), after that LED will back to the initial state.

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

```c
main.c

extern void FCLK_4MHz_delay_0.5s();

void init_GPIO(){
}
void EXTI_config(){

}
void NVIC_config(){
}

void EXTIx_IRQHandler(void){

}
int main()
{
  NVIC_config();
  EXTI_config();
  init_GPIO();
}
```

3.3. 製作簡單鬧鐘

利用SysTick timer、User button和蜂鳴器設計一個簡單的鬧鐘，先透過keypad輸入計時鬧鐘時間，每一個數字代表設定幾秒(2為2秒)，當輸入為0時則沒反應，繼續等待下次輸入，時間輸入完畢後，Systick timer會開始計時，而當時間到後，蜂鳴器便會響起(利用delay讓蜂鳴器發出聲音，頻率自訂)直到使用者按下User button後才會停止發出聲音並回到等待使用者輸入狀態，注意timer開始計時到使用者關閉蜂鳴器的期間，keypad不會有任何作用。

Use SysTick timer, user button and buzzer to design a simple alarm clock. Take the keypad as input of the time for alarming, every single number is represented to the second(ex. 2 for 2 second). When input is zero, it won't have any response until next input come in. After enter your input, Systick timer will start counting and buzzer will alarm(using delay to make buzzer alarm, and you can set your own frequency) when the counting finish. After that, when user press user button, buzzer will stop alarming and wait for the next input. Note that keypad cannot work between start counting and user stop the buzzer.

Note:

1.User button 是設定為外部中斷，注意Systick timer中斷和外部中斷的Priority大小關係。

User button is set as outer interruption, pay attention to the priority of Systick timer interruption and outer interruption.

2. Clock source 用default clock

Take default clock as clock source.

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