

# **CDA 3631C Embedded Operating Systems**

## **LAB ASSIGNMENT 4: Programming and Configuring External Interrupts**

**Date Posted: 28 October 2019 Date Due: 8 November 2019 (11:59 PM)**

### **Concept:**

This lab will help students learn how to program and configure external Interrupts by realizing the internal connection between the external interrupts and the processor.

### **Introduction:**

This lab will walk you through the steps to enable, pend, clear interrupts and will help to write Handler codes to attain different functionalities based on different interrupts.

### **Assignment:**

Create a new project using the following steps.

1. Open the Keil uVision5 development environment.
2. Click “Project”, then “New  $\mu$ Vision Project...”
3. In the “Create New Project” dialog window, change to an appropriate directory and enter a name for the project file.
4. In the ARM hierarchy, select “STMicroelectronics”, “STM32F2 Series”, “STM32F207”, “STM32F207IG”, “STM32F207IGHx”.
5. In the Manage Run-Time Environment dialog window, there are two components that (for now) always need to be added. Click on CMSIS->CORE and click on Device-> Startup.
6. In Runtime Environment, Go to Board supports, add LED, and all the required files related to it.

### **7. PROBLEM STATEMENT:**

In this lab, you are asked to design a prototype of an intelligent human count monitoring system using STM32F207 evaluation board.

Whenever a person enters the room, an external interrupt is triggered using WAKEUP button, and Whenever a person leaves the room, an external interrupt is triggered using USER button. The system should be able to output the number of people present in a room in real-time. The count of number of people inside the room should be displayed as output on the 8 LEDs. For example: if person count is 21, then LED pattern should be 00010101. (0= LED off, 1= LED on)

Whenever WAKEUP is pressed, all the LEDs should also blink once from LED0 to LED7 with few ms delay (this will hint an entry of a person); and then display the current count of people inside the room. Similarly, whenever USER button is pressed all LEDs should blink from LED7 to LED0 (this will hint an exit of a person), and display the updated count.

WAKEUP is connected to GPIO port A pin0 (PA0) and USER is connected to GPIO port G pin15 (PG15) as can be seen in Fig.

### **Steps to configure an external Interrupt:**

1. Enable the clock for respective GPIO port (Using Reset and Clock Control (RCC) register)
2. Configure the System (SYSCFG) Register EXTICR Register to configure the Line of Interrupt. (SYSCFG-> EXTI[0] Register)
3. Set the mode of GPIOx pin(i) to "INPUT". (using GPIO port mode register (GPIOx\_MODER) (x = A..I))
4. Set the interrupt Triggering level: Falling edge (using Falling trigger selection register (EXTI\_FTSR)) or Rising edge (using Rising trigger selection register (EXTI\_RTSR)).
5. Unmask the Interrupt over EXTI Mask Register (Interrupt mask register (EXTI\_IMR))
6. Enable the External Interrupt for use (ISER register).
7. Write the Handler for all interrupts to perform specific functions.

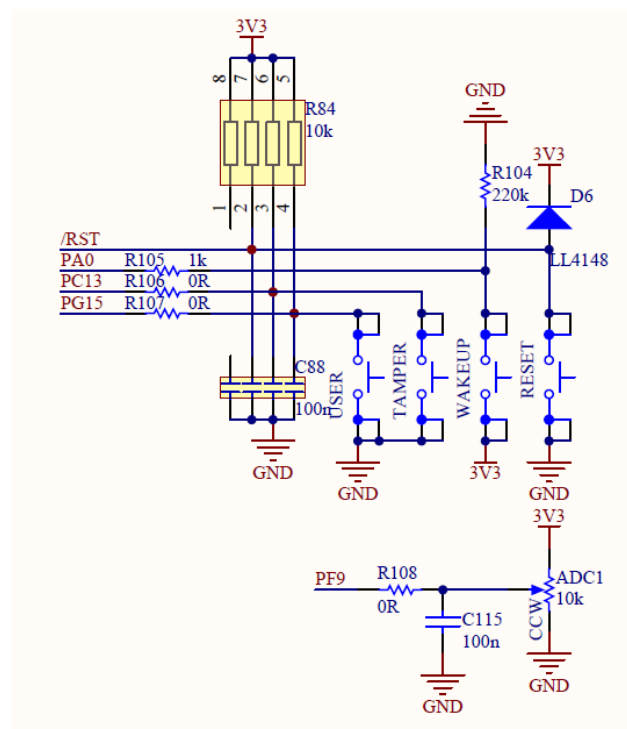


Fig. Button Connection Schematic.

Demonstrate your design to the instructor. Submit a report including:

Cover Page

Objective

Description of Project

Flow Chart

Code attachment