

## Part 1: Key Planning

### Goal of the Project:

The Purpose of this project is to build a fully functional alarm system using bare metal methodology learned in CSE 321 at the University at Buffalo. The user should be able to set the alarm by minutes and seconds. They should also be able to use a keypad in order to start/stop or adjust the timer.

### Inputs:

- 4 x 4 Matrix Array 16 key membrane switch keypad
- Button A,
- Button B,
- Button D
- Command Prompt

### Outputs:

- Red LED
- Blue LED
- Green LED
- LCD screen

### Relationships between the inputs and outputs:

- Button A will start the timer, show countdown on LCD screen light up Green LED
- Button B will stop the timer and show time remaining on LCD screen and light up Red LED
- Button D will enable the command prompt to allow the user to input a time and light up the blue LED
- Command Prompt will be used to input the time Desired by the user

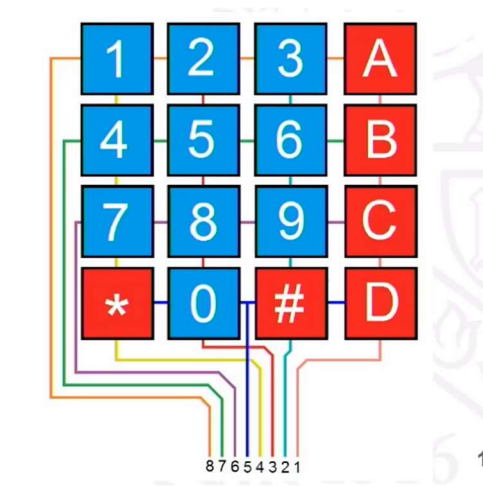
### Constraints:

- Time must be inputted into the prompt in the format **m:ss**
- Time inputted into the prompt can not go higher than 9 minutes and 59 seconds
- Machine must run infinitely checking for inputs at all times

## Project 2

### Layout of key pad

- Keypad configured in a matrix
- 8- 5 represent row
- 1-4 represent columns
- Will need 4 male to male jumper wires for all inputs of keypad



### External LEDS

- Will need three LEDS (one red, one blue and one green)
- Will need a male to male connection for each
- Will need three resistors to protect LED connections

### LCD

- LCD Model is Seed 1802 16x2 LCD
- Need to add provided APIs provided by Dr. Winikus on UB learns(1802.cpp and 1802.h)
- Dr. Winikus has provided appropriate header files and datasheet on UB learns

### APIs

- Mbed.h: <https://os.mbed.com/docs/mbed-os/v6.15/apis/index.html>

### Materials Needed:

- Nucleo-L4R5ZI
- USB A to Micro USB B cable
- 3 LED lights(one red, one blue and one green)
- 3 resistors
- At least 10 male to male jumper wires

## Project 2

- 4 x 4 Matrix Array 16 key membrane switch keypad
- Bread Board
- Seed 1802 16x2 LCD screen

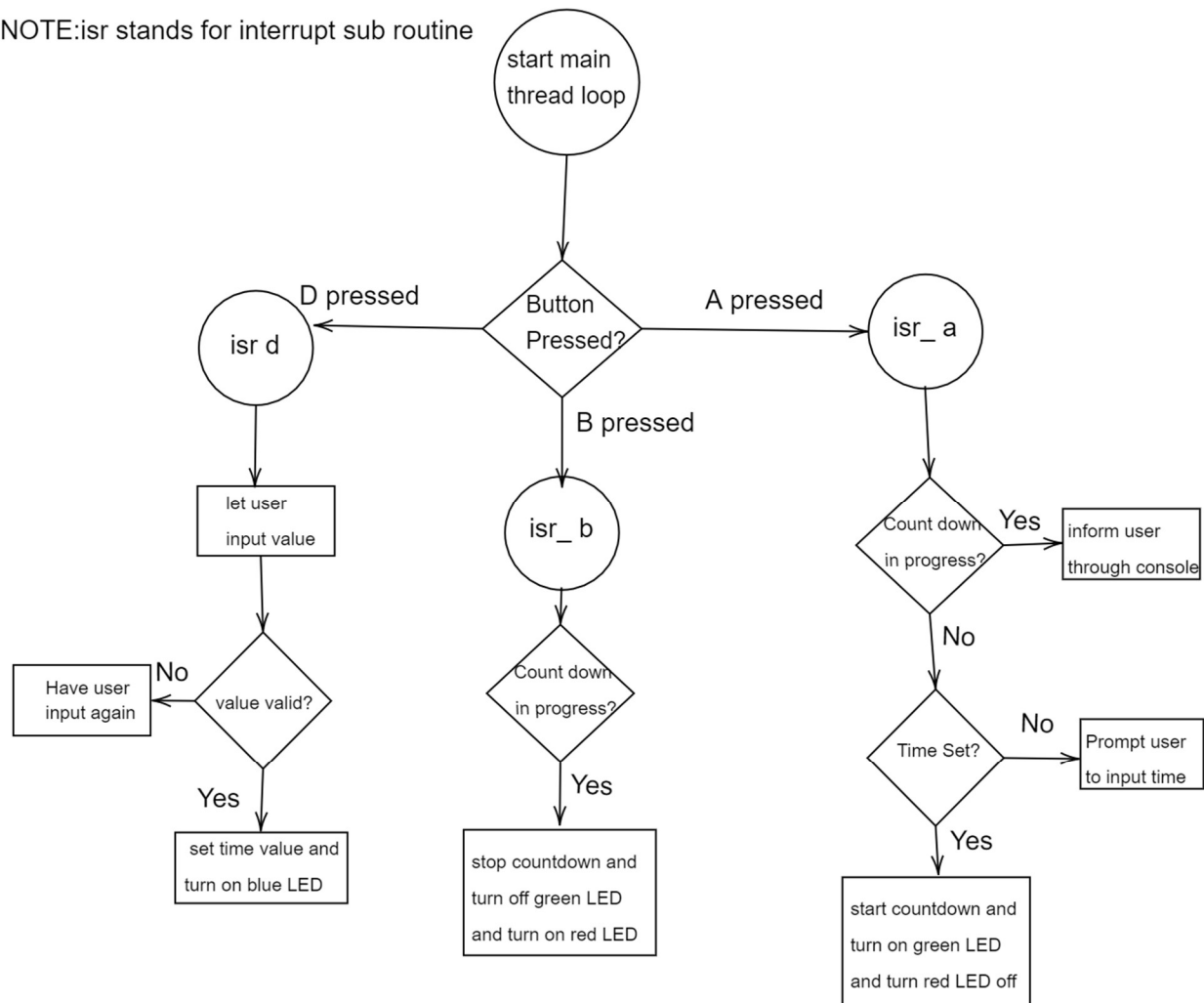
### Main Thread

The main thread should be interrupted on A,B and D being pressed.

Each button will be assigned their own interrupt subroutine as shown in the diagram below

### Main Thread Diagram

NOTE:\_isr stands for interrupt sub routine



Anthony Feliciano

CSE321

Project 2

### Ticker

There will be an additional subroutine for the ticker which will call an additional ISR every second in order to countdown the timer. This sub routine will be responsible for sending information to the timer.

### Prototype

