Nick Minor
CSE321 Project 2

ASK

Purpose / Goal

The goal is to create a bare-metal and user-programmable count-down alarm system. There is functionality for the user to input the time duration of the timer as well as starting and stopping the timer. The time remaining on the timer and the completion of the timer is communicated to the user via an LCD screen and LEDs.

Inputs?

Matrix keypad for user-programming and interaction.
The following keys have the functionalities:

- A - Start the timer
- B - Stop the timer
- D - Input the time duration
- 0-9 - Specifying the duration in m:ss

Outputs

LCD Screen to display the time and to communicate messages.
LEDs to show when a key is pressed or when the timer completes.

Constraints and IO relationships

Time is represented as m:ss.
Valid times are between 0:00 and 9:59.
The system must run continuously (forever).
LED and keypad interact by an LED lighting up when a key is pressed.

RESEARCH/IMAGINE

What materials are needed?

- LCD
- Nucleo
- Keypad
- Solderless breadboard
- Jumper wires
- LEDs

How will the system be implemented?

- The system will need to be programmed with the LCD API for display, Mbed OS API for interrupts and bitwise masking with GPIO for other functionalities.
- Bounce will be accounted for by using wait_ms().
- Interrupts and ISRs will be created for usage with the matrix keypad.

What pins will be used?

- PB6, PB7, PB8, PB9 for matrix keypad columns. (input)
- PC6, PC7, PC8, PC9 for LEDs. (output)

PLAN

Configure Matrix Keypad

- Create Interrupt Service Routines for each column of the keypad.
- Assign each column to a pin and create InterruptIn objects for each column.
- Have ISR be triggered on a rising edge for any keypress.
- Light up LEDs depending on the key that was pressed.

Configure LCD Screen

- Place 1802.h and 1802.c in project folder. Include 1802.h in main file.
- Create CSE321_LCD object with the number of columns and rows on the display, dots, SDA pin and SCL pin.
- Initialize LCD.
- Configure LCD to output messages and work with a timer.

Set up interaction between LCD and Matrix Keypad

- Pressing:
    - A: Start the timer
    - B: Stop the timer
    - D: Input the timer duration
    - 0-9: Specify time m:ss