Jesse Both

Project 2 Check In

10/15/2021

Ask

Objective:

Create an alarm system utilizing bare metal methodology. The 4x4 button matrix, an LCD and LEDs will be utilized in the design of this project. The user will be able to start and stop the timer. A button must be pressed in order to allow input of the time in the format of *m:ss.* When time is up, several LEDs will light up. Certain LEDs will also become lit every time a button is pressed.

Inputs:

- 4x4 keypad
  - A – start timer
  - B – stop timer
  - C – change count direction
  - D – trigger input time
  - 0-9 – Digits for time input

Outputs:

- LCD (1802)
  - “Time Remaining m:ss” / “Time Passed m:ss”
  - “Times Up” / “Time Reached”
  - Prompt to enter time.
- LED
  - Every time a button is pressed.
  - When time has run out (several)

Constraints:

- Bare Metal
  - All registers must be manipulated with bitwise operation.
- At least 1 interrupt must be used.
- Only MBED API can be utilized. (mbed.h)
- Bounce should be addressed.
- Comments

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CSE 321

Research

- Solution to debounce?
    - Use a sleep and check the input a second time.
        - How much time is required?
- Solution for Timer?
    - Ticker interrupts every second
- Get the keypad to work.
- LCD use PB8 and PB9.
    - LCD library does the rest.

Plan

Keypad:

- State for A
    - Begin count down.
    - Ignore keypad digits input.
- State for B
    - Stop timer.
    - Wait for a new input.
- State for C
    - Reverse count direction.
    - Requires changing the text that is displayed.
- State for D
    - Reset all counting values.
    - Allow digit input.
    - Input must be in the form of m:ss.

Timer:

- Timer information is in a struct with minutes, seconds and the string time.
- Set timer flag every second.
- When timer flag is set –
    - Increment timer
    - Output time to LCD.
    - Check if time is at goal.

- Go to ‘done’ state if true.

LEDs:

- Blue LED (external)
  - This will be the LED that blinks with keypress
- Red LED x3 (external)
  - These LEDs will blink when time is up
- Red LED (onboard)
  - This LED will also blink when time is up.