

Project 2

Alarm System

University at Buffalo

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CSE321 – Real Time Embedded System

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Introduction:

An all-in-one count-down alarm system is designed by utilizing the bare metal methodology of embedded operating system interaction in this project.

Specifications:

- Time is entered as m:ss
- Valid times can go up to 9 min and 59 sec
- User can press A to start the timer
- User can press B to stop the timer
- User can press D to input the time
- Every time a value is entered, an LED lights up
- The LCD will display *Time remaining*: followed by the current time
- When the specified time is reached the LCD will display *Times Up* and multiple LEDs will turn on
- The timer runs “forever”

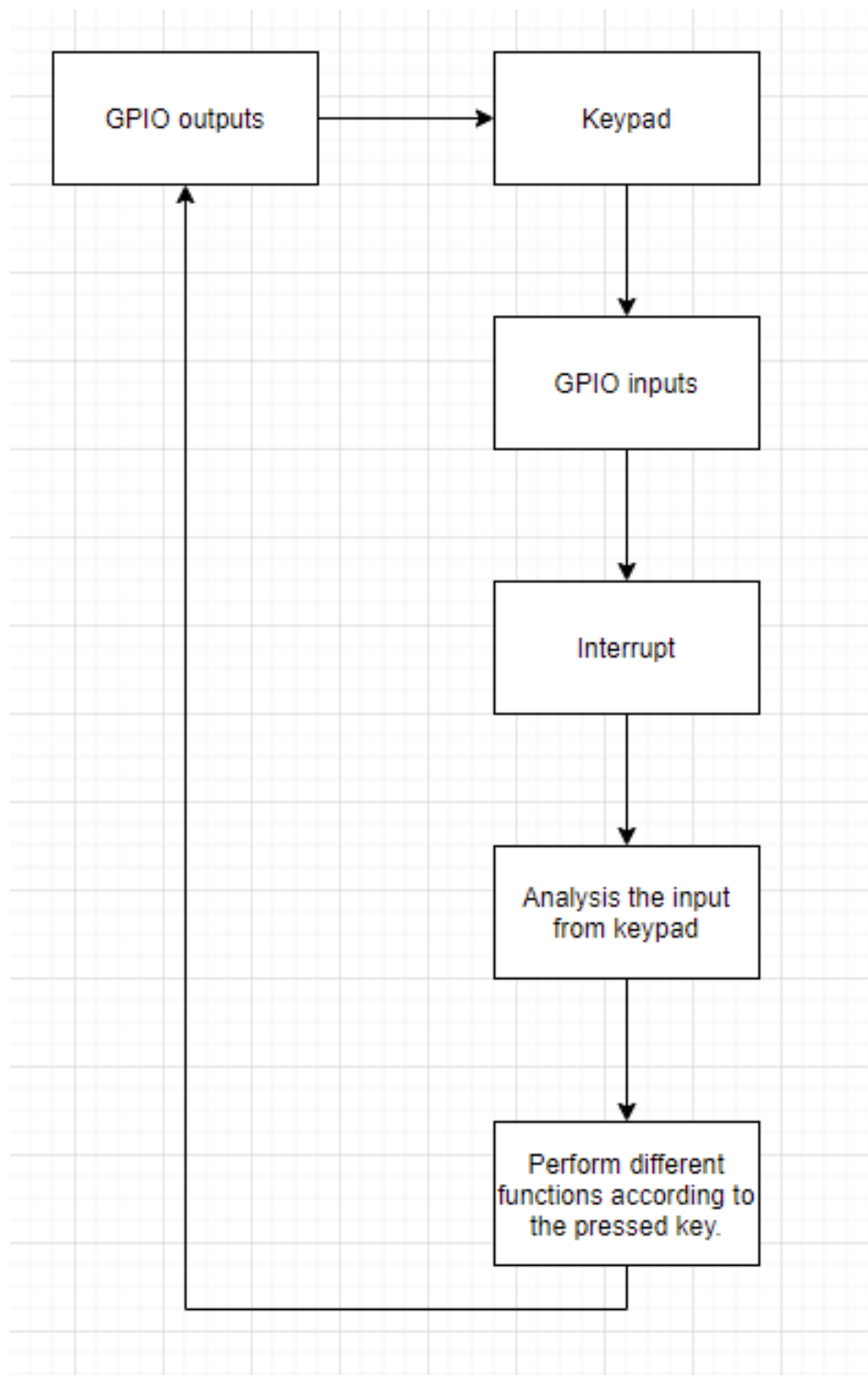
Features:

- It has a fast response time of the keypad.
- The alarm system is easy to implement and build.

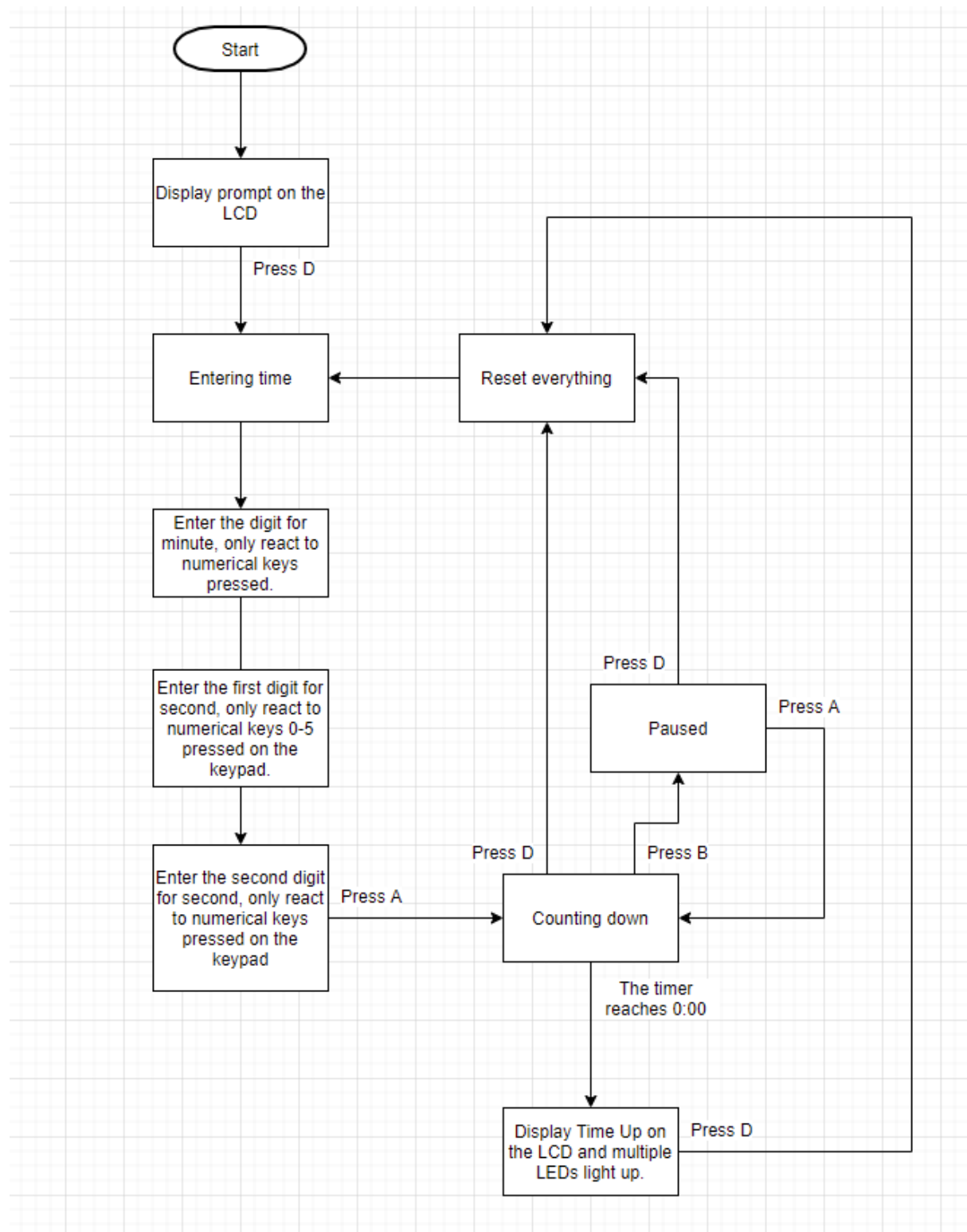
Applications:

This alarm system can be used anywhere that needs a timer to remind people. For example, it can be placed and used in kitchen to time the cooking, and remind the cooker when the time is up, which avoid overcooking.

Block Diagram:



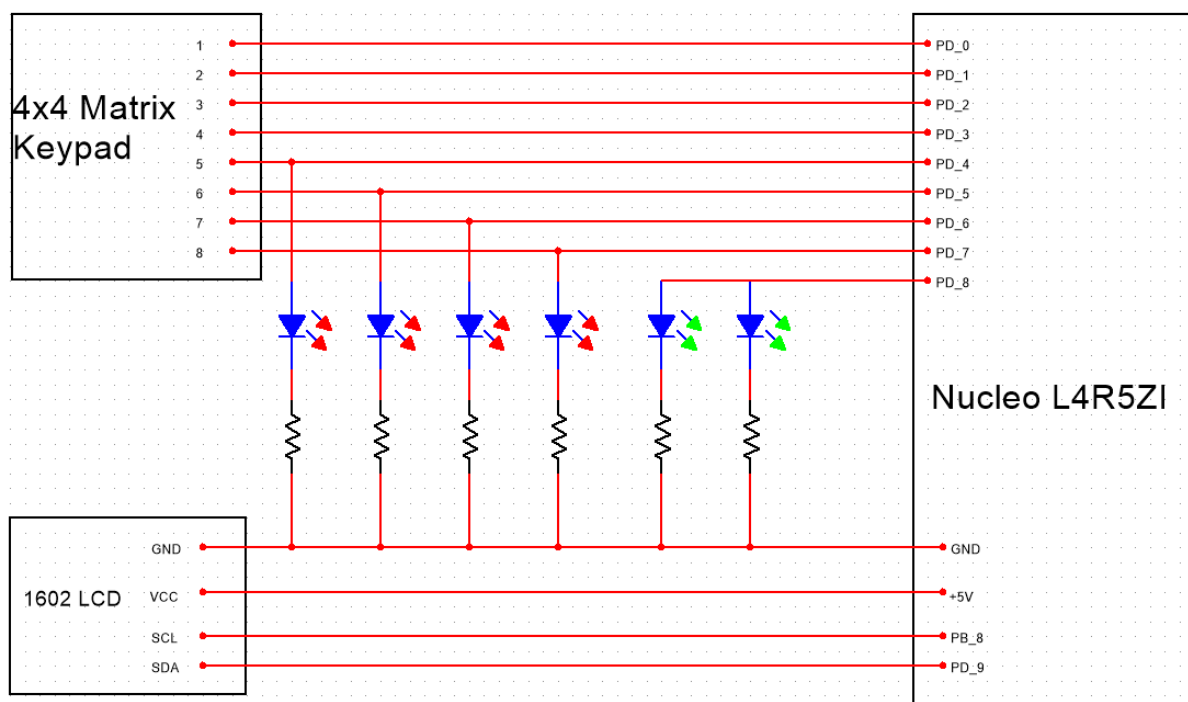
Functionality Diagram:



Bill of Material:

- 6 LEDs
- Jumper wires
- Breadboard
- Resistors
- 1602 LCD
- Nucleo L4R5ZI
- 4x4 matrix membrane keypad

Schematic:



Test Plan:

1. The alarm system should run “forever”. Press D 5 minutes after the time is up.
2. Press any non-numerical keys when entering time, it should not input anything.
3. Press a key other than 0, 1, 2, 3, 4, 5 when entering the second digit for time, it should not input anything
4. Press any key after entering time is completed, it should not do anything.
5. Press A while entering time, it should not start the timer.
6. Press D at any time, it should reset and start entering time.
7. While counting down, press B should pause the timer.

Result:

1. Press D 5 minutes after the time is up can start entering time.
2. Nothing is inputted.
3. Nothing is inputted.
4. Nothing is inputted.
5. Timer does not start.
6. Everything is reset and start entering time.
7. Timer is paused and display "Paused" on the LCD.

Recommendations for improvement:

- More functionalities can be implemented, such as counting up to record the time passed.
- The timer has 0.2 second delay for every 5 minute passed while counting down, precision can be improved by using advanced code techniques.