LS.V2 System Design

Author: Mahmoud Saeed Mowafey.

Reviewers: Sprints.

Date: 10/04/2023

Overview

You are supposed to have a system that controls some LEDs lighting sequence according to button pressing using external interrrupt.

System design for LS_V2 in Sprint number 3.

Requirements

1. **Read System Requirements Specifications**
    1. ***Description***
        1. ***Hardware Requirements***
            1. **Four LEDs (LED0, LED1, LED2, LED3)**
            2. **One button (BUTTON1)**
        2. ***Software Requirements***
            1. **Initially, all LEDs are OFF**
            2. **Once BUTTON1 is pressed, LED0 will be ON**
            3. **Each press further will make another LED is ON**
            4. **At the fifth press, LED0 will changed to be OFF**
            5. **Each press further will make only one LED is OFF**
            6. **This will be repeated forever**
            7. **The sequence is described below**
                1. **Initially (OFF, OFF, OFF, OFF)**
                2. **Press 1 (ON, OFF, OFF, OFF)**
                3. **Press 2 (ON, ON, OFF, OFF)**
                4. **Press 3 (ON, ON, ON, OFF)**
                5. **Press 4 (ON, ON, ON, ON)**
                6. **Press 5 (OFF, ON, ON, ON)**
                7. **Press 6 (OFF, OFF, ON, ON)**
                8. **Press 7 (OFF, OFF, OFF, ON)**
                9. **Press 8 (OFF, OFF, OFF, OFF)**
                10. **Press 9 (ON, OFF, OFF, OFF)**
            8. **USE EXTERNAL INTERRUPTS**

Layered architecture

It divides the system into a set of layers, each of which has a specific responsibility and interacts with other layers in a well-defined way.

The **MCAL** which contains the microcontroller drivers.

The **ECUAL** which contains the connected electronics components that will use the microcontroller drivers.

The **APP** Layer that will contain code application that performs the desired functionalities.

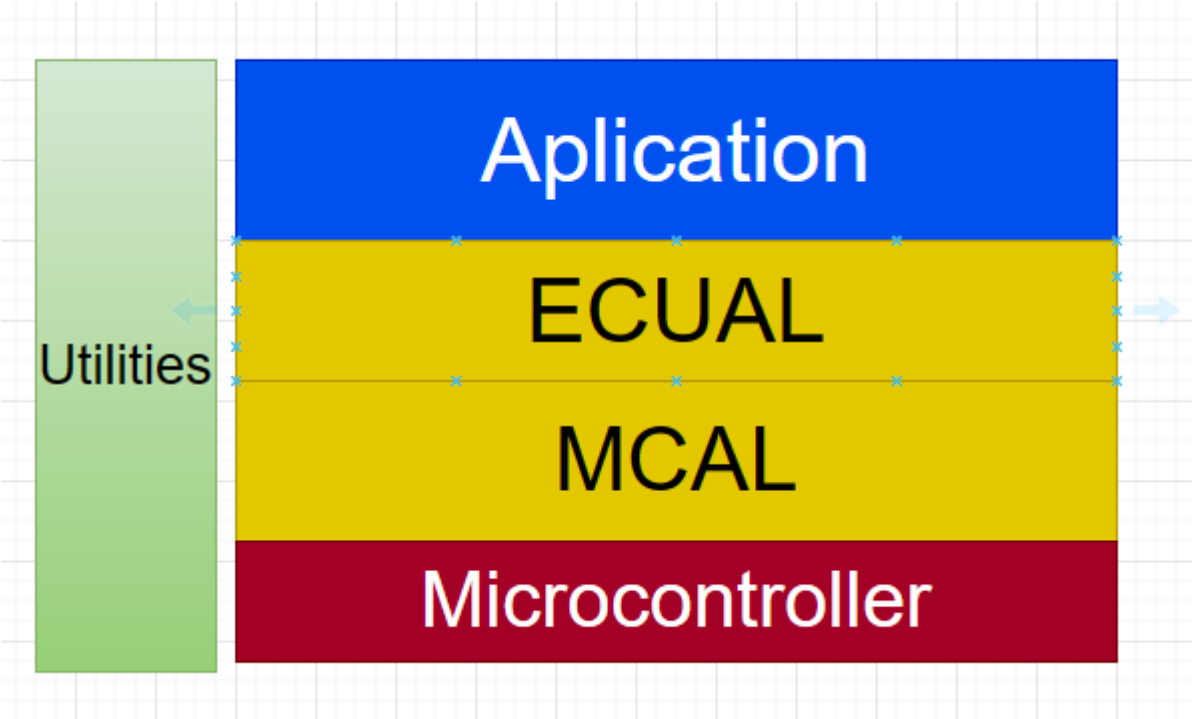


Figure 1: System Layered Architecture

System modules/drivers

It shows the different modules that will be used inside each layer.

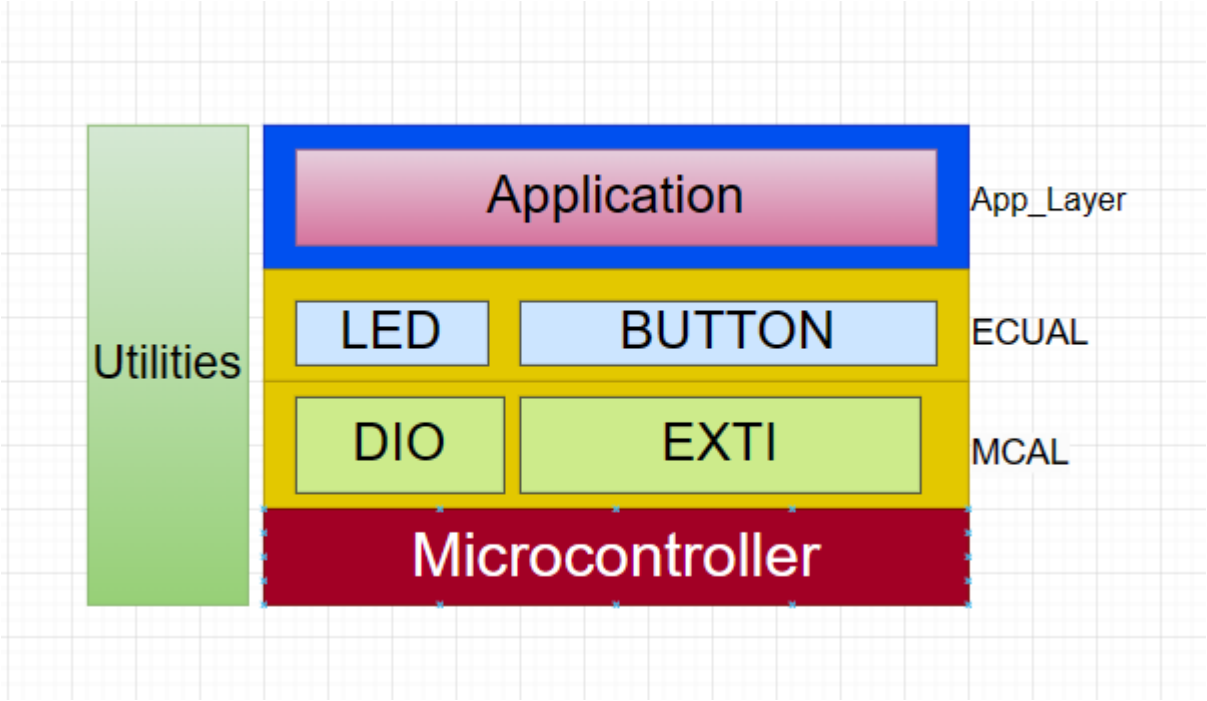


Figure 2: System Modules for each layer

APIs for each module

It defines the high level interface of each module/component.

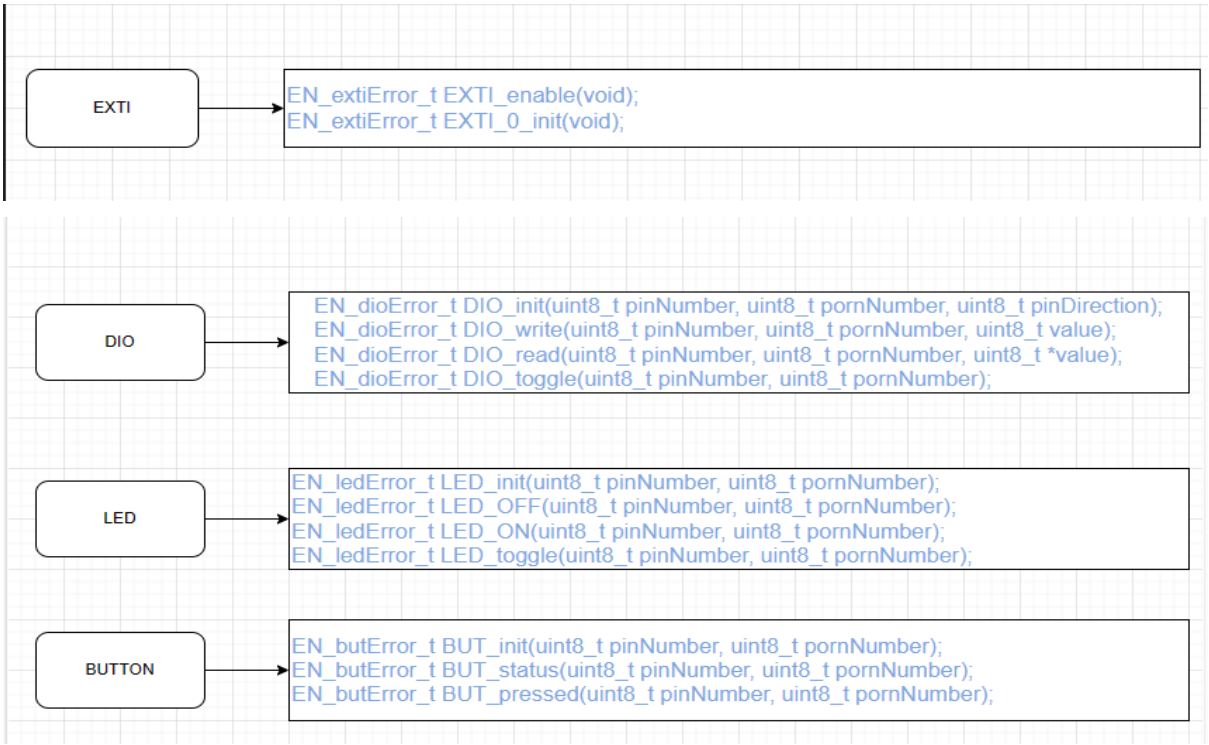
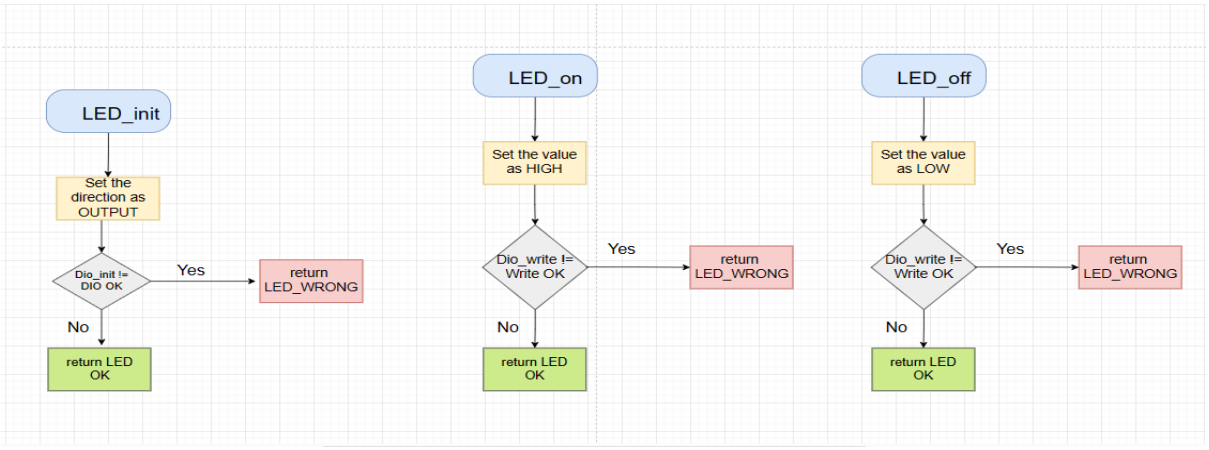
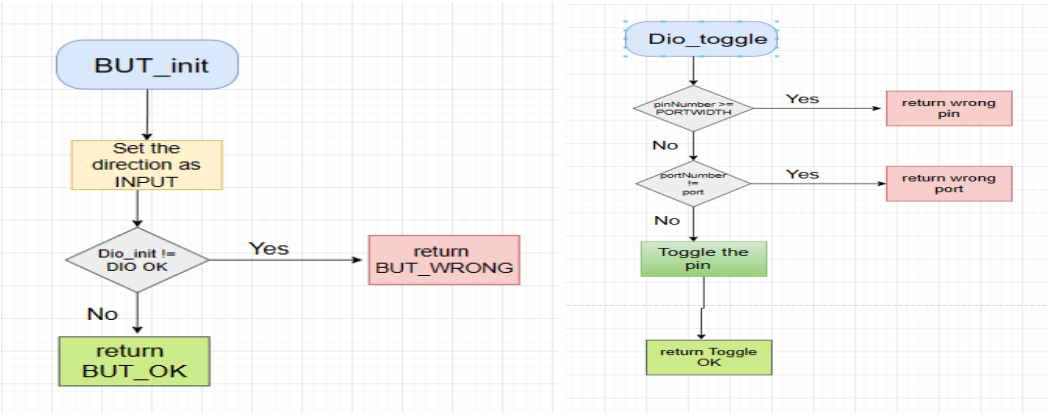


Figure 3: APIs_with_documentation_1

APIs flowcharts





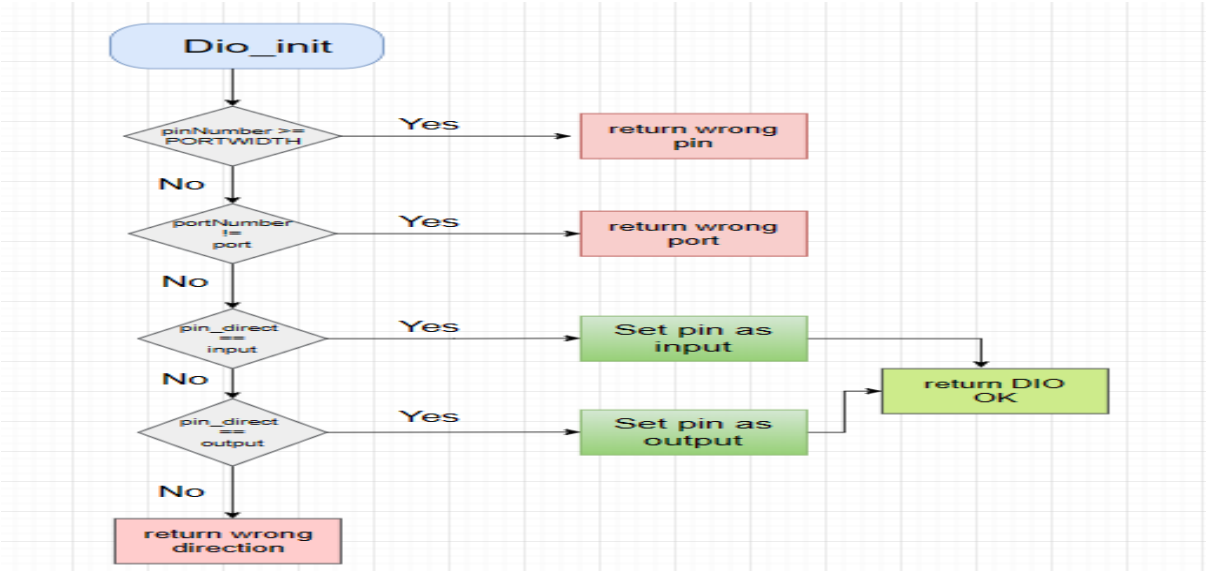


Figure 4: APIs_Flowcharts

Project State Machine

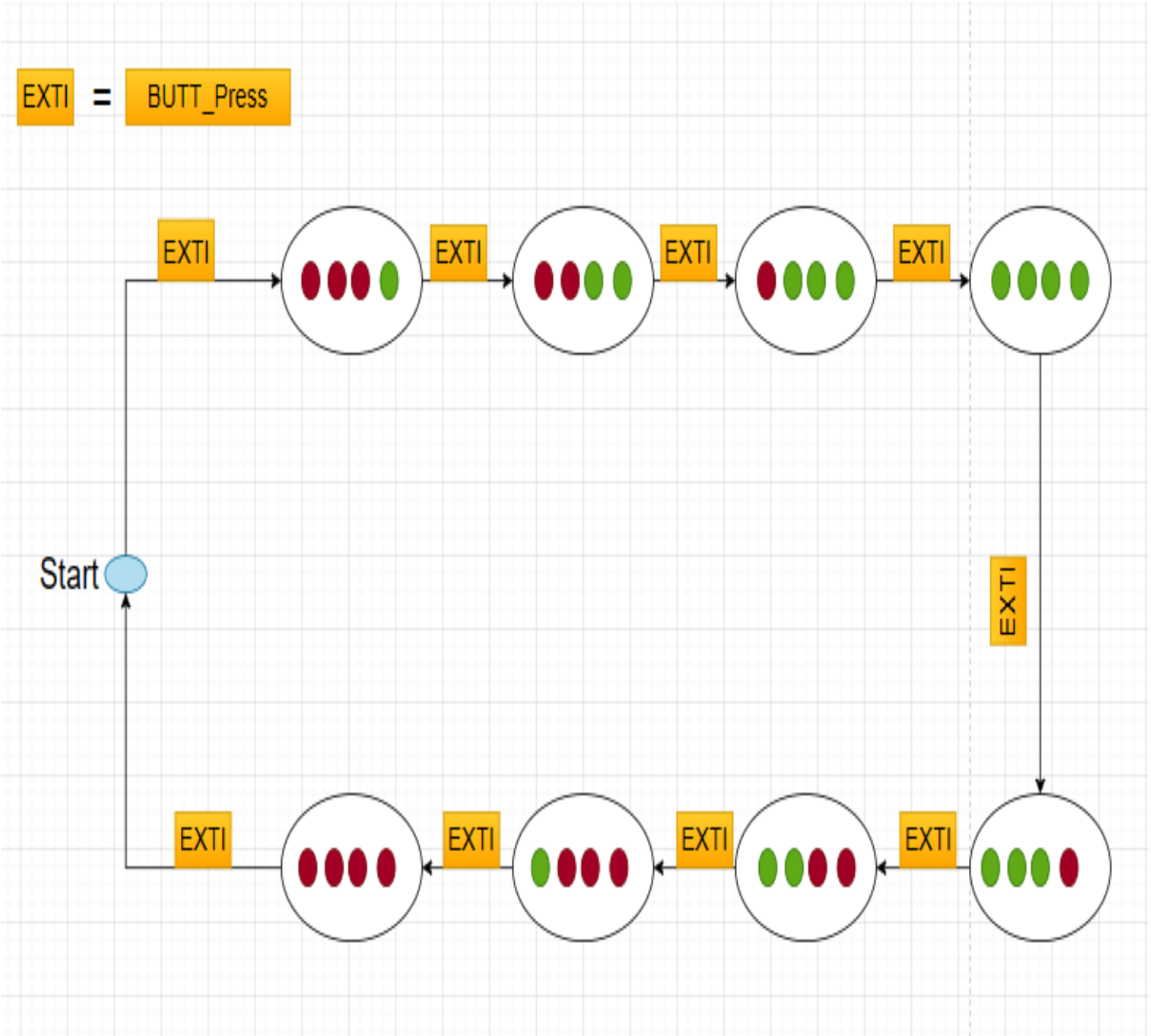


Figure 5: LS_V.2_State_Machine