egyptfwd initiative

UDACITY

EgFWD- Embedded Systems Professional Nanodegree Program

“On-demand Traffic light control”

Project Documentation

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System Description

Figure 1 traffic light system

On-demand Traffic light system consists of two traffic lights one is for cars and the other one it's for pedestrians to cross the crossway safely.

The system could be summarized in two modes of operation

1. Normal mode: normal traffic light (green -> yellow -> red -> yellow -> repeat) every 5s
2. Pedestrians mode: this mode is activated by pressing the button in the pedestrian's traffic light in this mode the pedestrian's traffic light is operated dependent on the car's traffic light current state as the following:

- ✓ If pressed when the car's Red LED is on, the pedestrian's Green LED and the car's Red LEDs will be on for five seconds, this means that pedestrians can cross the street while the pedestrian's Green LED is on.
- ✓ If pressed when the cars Green LED is on or the cars Yellow LED is blinking, the pedestrian's Red LED will be on then both Yellow LEDs start to blink for five seconds, then the car's Red LED and pedestrian's Green LEDs are on for five seconds, this means that pedestrian must wait until the Green LED is on.
- ✓ At the end of the two states, the cars' Red LED will be off and both Yellow LEDs start blinking for 5 seconds and the pedestrian's Green LED is still on.
- ✓ After five seconds the pedestrian Green LED will be off, and both the pedestrian Red LED and the cars' Green LED will be on.

System Design

Schematic

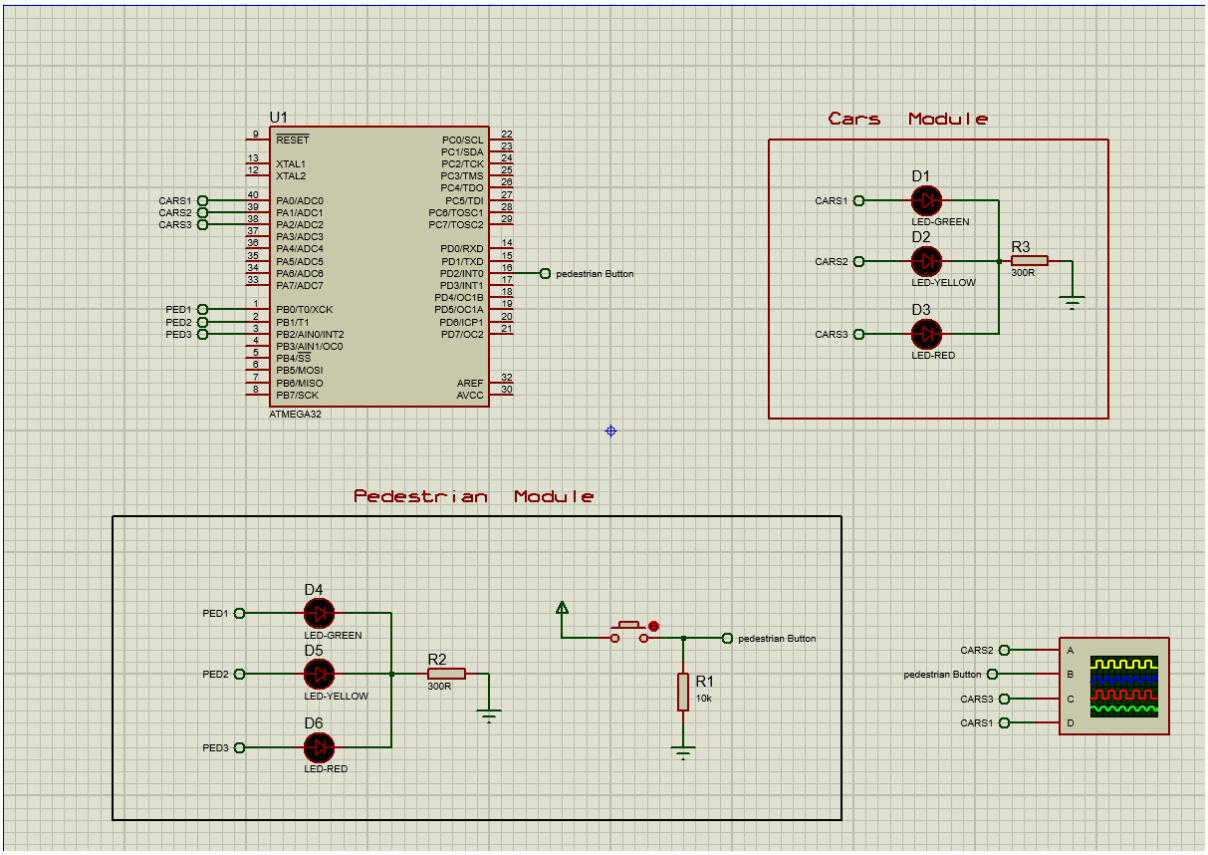


Figure 2 System circuit Schematic

Bill of materials

NO	Part	Quantity
1	ATmega32 microcontroller	1
2	330 Ω Resistor	2
3	10 k Ω Resistor	1
4	Red LED	2
5	Yellow LED	2
6	Green LED	2
7	Button	1

Software High-Level Design

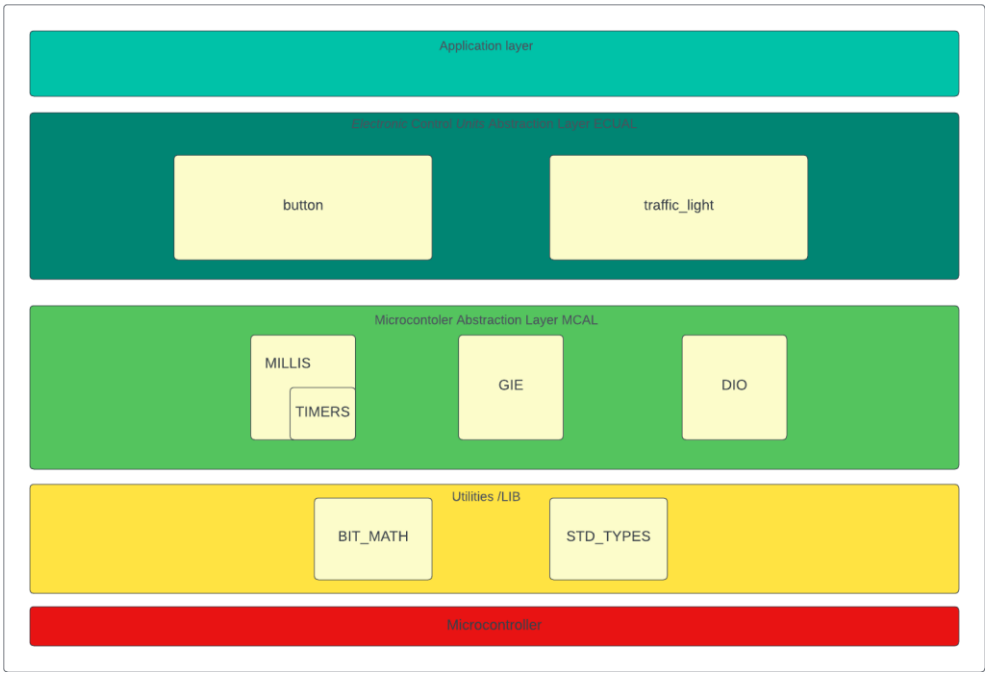


Figure 3 Software layers

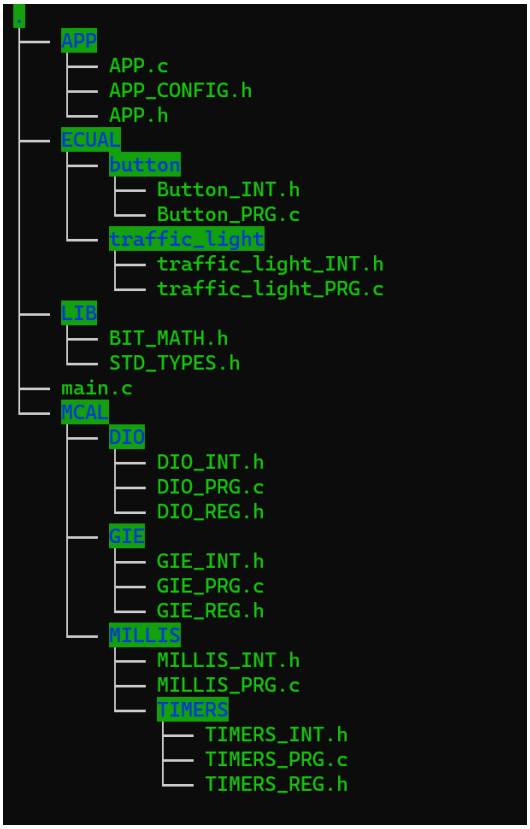
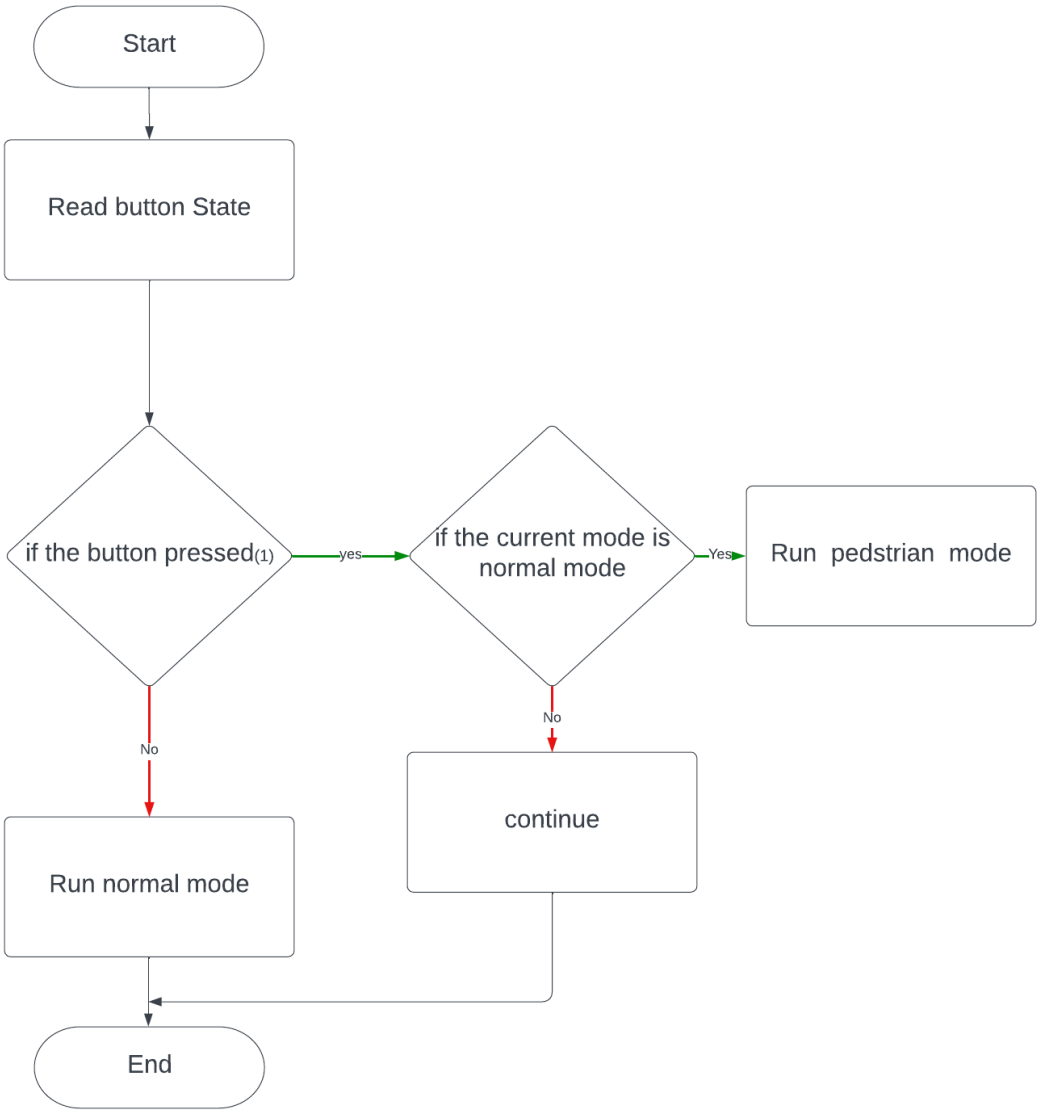


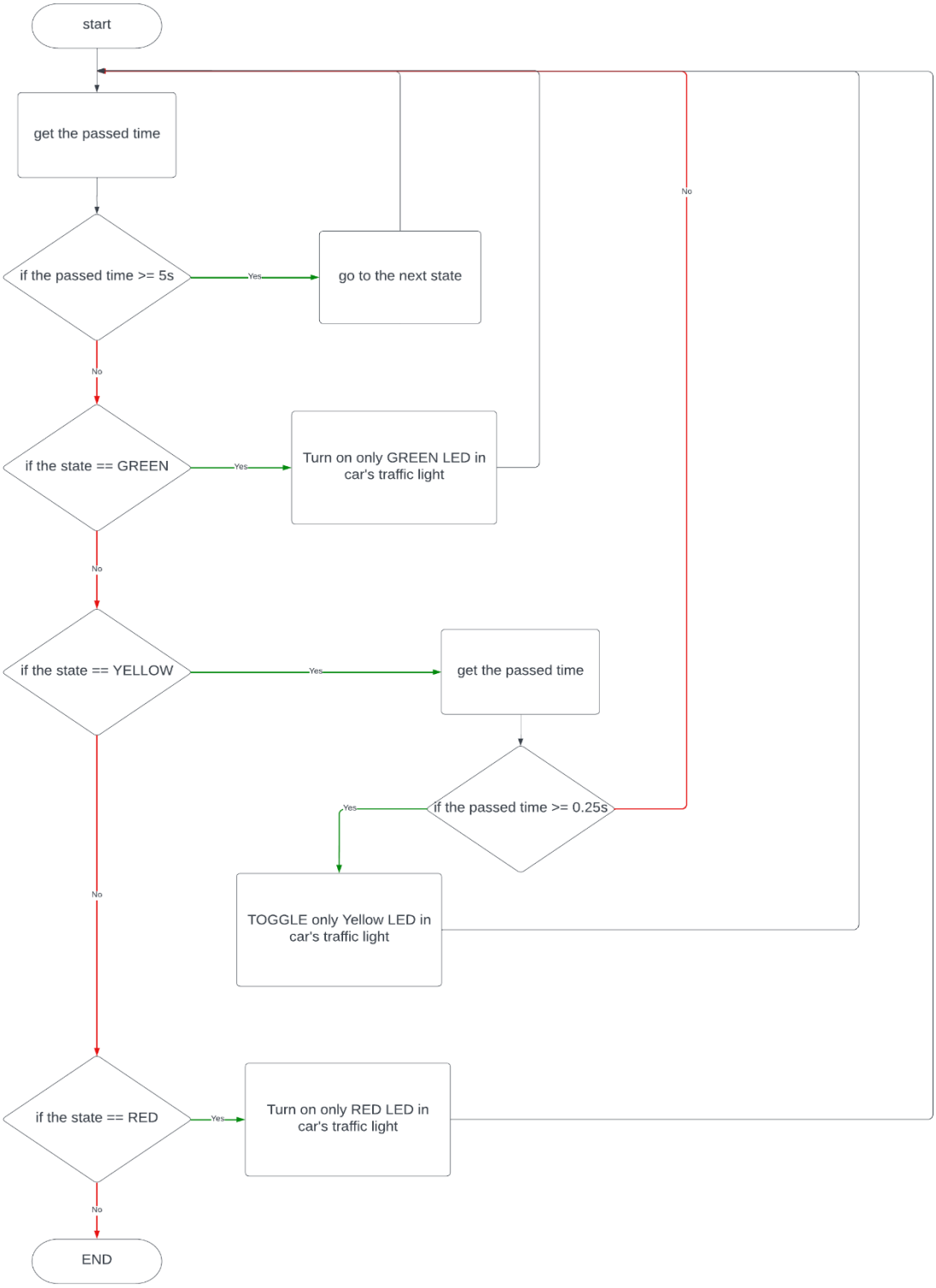
Figure 4 Folder Structure

System Flowchart



(1) if the button is pressed (short single press)

Figure 5 System Simple Flowchart



traffic light state in normal mode : GREEN,YELLOW,RED,YELLOW

Figure 6 Traffic light normal mode Flowchart

Figure 7 Traffic light pedestrian mode Flowchart

System constraints

1- Only timers are allowed to control events timing.
2- Only single short press is allowed for the PEDs button.
3- all drivers should be implemented from scratch and tested.
4- software design should follow SOLID principles.