Traffic light control system manual

System Description:

The traffic light control system is a system responsible for allowing the pedestrians to cross the street safely by just pressing a button that will temporarily (5 seconds) stop the cars' flow by lighting the red light to allow the pedestrians to cross safely to the other side.

System Components:

3 LEDs (red,yellow,green) for representing traffic light.

3 LEDs (red,yellow,green) for representing pedestrian light.

1 push button used for pedestrians.

1 Atmega32 micro-controller for controlling the LEDs and interacting with the button.

System Design:

The system will be divided into 3 layers: ECUAL "ECU layer", MCAL "microcontroller layer" and APP "application layer", then the ECUAL will contain the drivers for Button and LED, and the MCAL will contain the DIO "digital input/output" , interrupt and timer drivers.

The ECUAL layer APIs will use the MCAL layer APIs to control both the input and output of the LEDs and the button.

The APP layer will contain all the logic and syntax for the application to run using the APIs in the ECUAL layer.

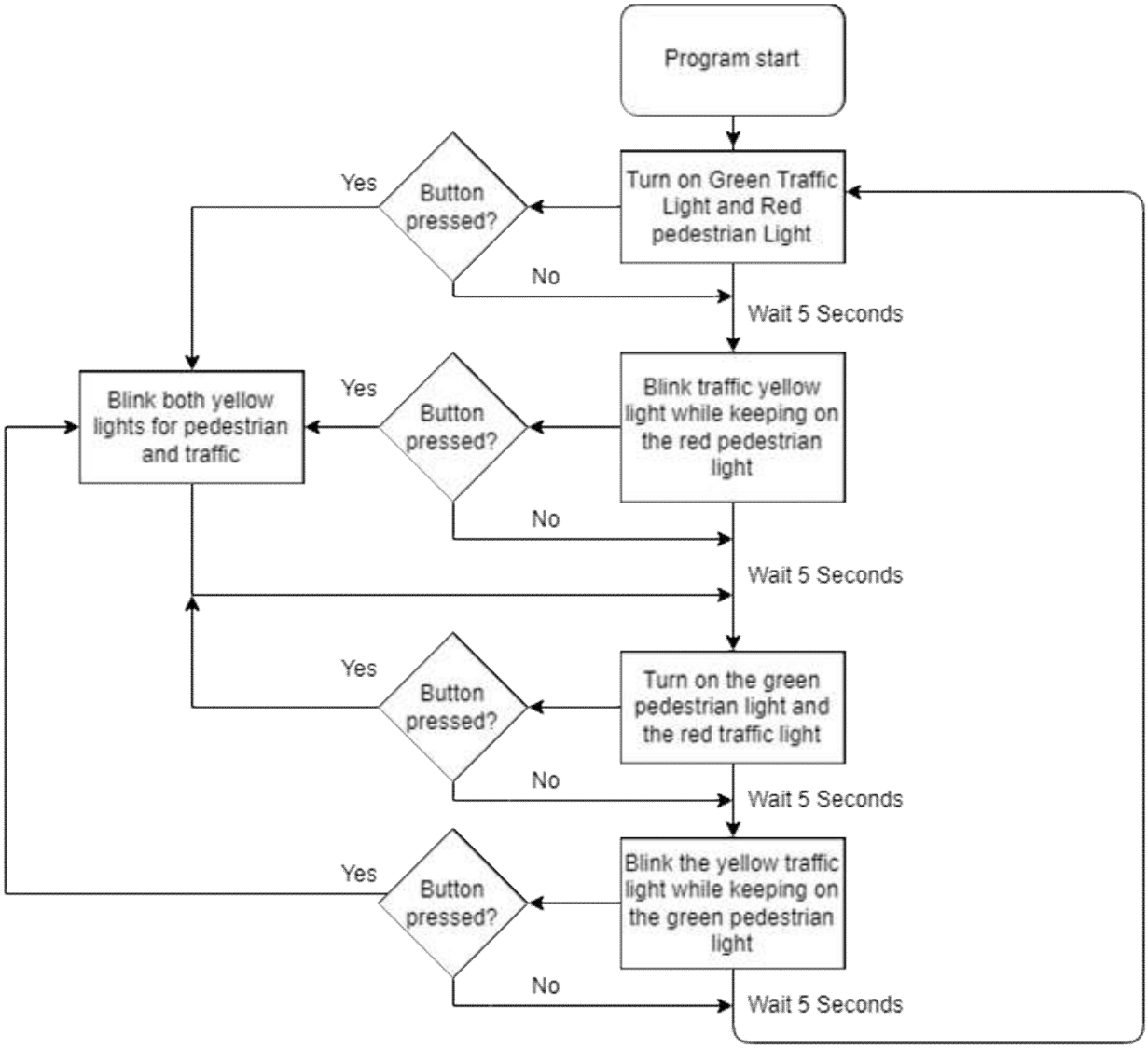
System constraints:

- First constraint is that the button could cause debouncing when pushed giving two separate input pushes which could cause error in the program or calling the external interrupt two times, My code has prevented this issue by adding the if condition inside the ISR of the external interrupt that prevents taking any action while the pedestrian mode is active.

- Second constraint is long pressing the button which could cause the program to loop only on the ISR for the external interrupt, My external interrupt driver is set to activate interrupt only with rising edge of the pin so that nothing happen when the signal coming from the button is kept high for a long time.

- Third constraint is double pressing the button which could reset the timer for pedestrian mode or could crash the code entirely but I prevented that in my ISR code for the external interrupt by adding the if condition to check if the traffic mode is on to proceed with the code or the pedestrian mode is on so that the push could be discarded as if it didn't happen.

Flow Chart:


Program start
Turn on Green Traffic Light and Red pedestrian Light
Button pressed?
Yes
No
Wait 5 Seconds
Blink traffic yellow light while keeping on the red pedestrian light
Button pressed?
Yes
No
Blink both yellow lights for pedestrian and traffic
Wait 5 Seconds
Turn on the green pedestrian light and the red traffic light
Button pressed?
Yes
No
Wait 5 Seconds
Blink the yellow traffic light while keeping on the green pedestrian light
Button pressed?
Yes
No
Wait 5 Seconds