Traffic Light Control
Embedded Project using ATMEGA32

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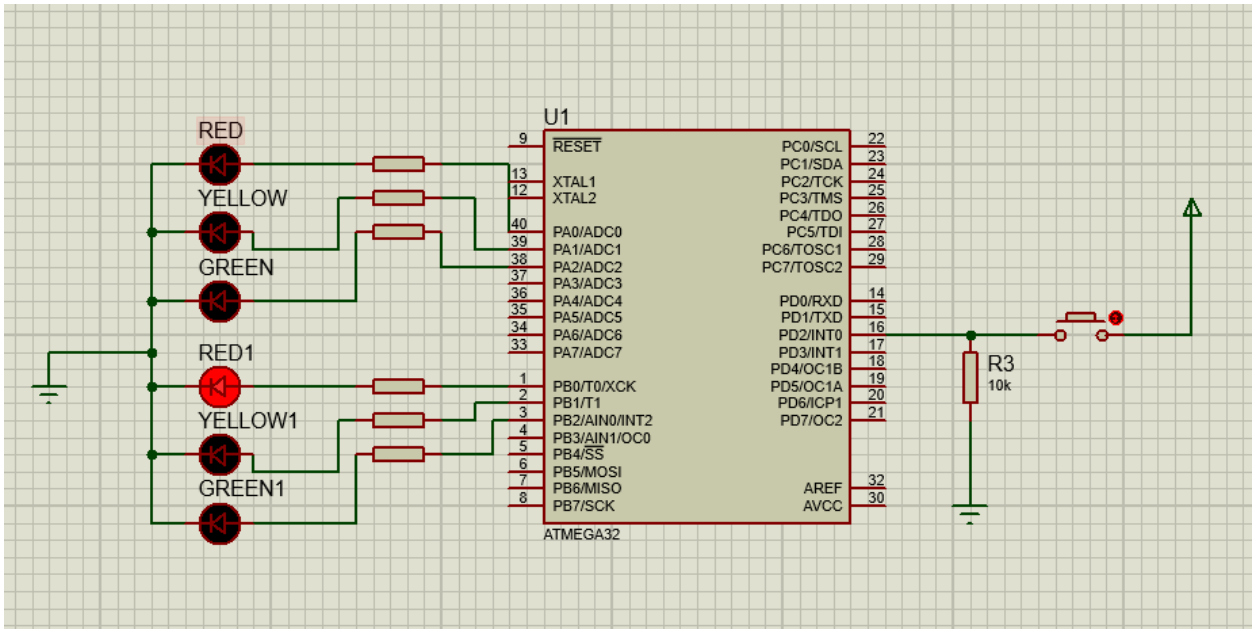
1. System Description

This project is a Traffic Light Control System with a pedestrian option which allows users to push a button to make the user pass the road and stop the cars.

2. System Design



Hardware requirements:

1. **ATmega32 microcontroller**
2. **One push button connected to INT0 pin for pedestrian**
3. **Three LEDs for cars - Green, Yellow, and Red, connected on port A, pins 0, 1, and 2**
4. **Three LEDs for pedestrians - Green, Yellow, and Red, connected on port B, pins 0, 1, and 2**

Software requirements:

In normal mode:

1. **Cars' LEDs will be changed every five seconds starting from Green then yellow then red then yellow then Green for the car while the pedestrians led will switch between the red and the green only.**
2. **The Yellow LED will blink for five seconds before moving to Green only**

In pedestrian mode:

1. **Change from normal mode to pedestrian mode when the pedestrian button is pressed.**
2. **If pressed when the cars' Red LED is on, the pedestrian's Green LED and the cars' Red LEDs will be on for five seconds, this means that pedestrians can cross the street while the pedestrian's Green LED is on.**
3. **If pressed when the cars' Green LED is on or the cars' Yellow LED is blinking, the pedestrian Red LED will be on then both Yellow LEDs start to blink for five seconds, then the cars' Red LED and pedestrian Green LEDs are on for five seconds, this means that pedestrian must wait until the Green LED is on.**
4. **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.**
5. **After the five seconds the pedestrian Green LED will be off and both the pedestrian Red LED and the cars' Green LED will be on.**
6. **Traffic lights signals are going to the normal mode again.**

System Test Stories

User story 1	**As a pedestrian when I will make a short press on the crosswalk button while the cars green light is on and pedestrian red light is off, I will wait for the yellow lights to blink for five seconds then the cars red light is on and pededstrian green light is on for five seconds, so that I can cross the street**
User story 2	**As a pedestrian when I will make a short press on the crosswalk button while the cars yellow light is blinking and pedestrian red light is on, I will wait for all yellow lights to blink for five seconds then the cars red light is on and pededstrian green light is on for five seconds, so that I can cross the street**
User story 3	**As a pedestrian when I will make a short press on the crosswalk button while the cars red light is on and pedestrian green light is on, I expect nothing to be done**

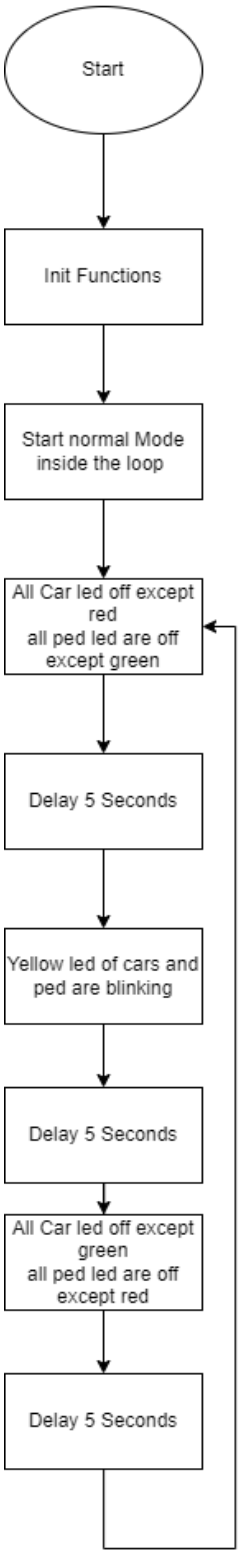
User story 4	**As a pedestrian when I made a long press on the crosswalk button, I expect nothing to be done.**
User story 5	**As a pedestrian when I made a double press on the crosswalk button, I expect that the first press will do the action and nothing to be done after the second press.**

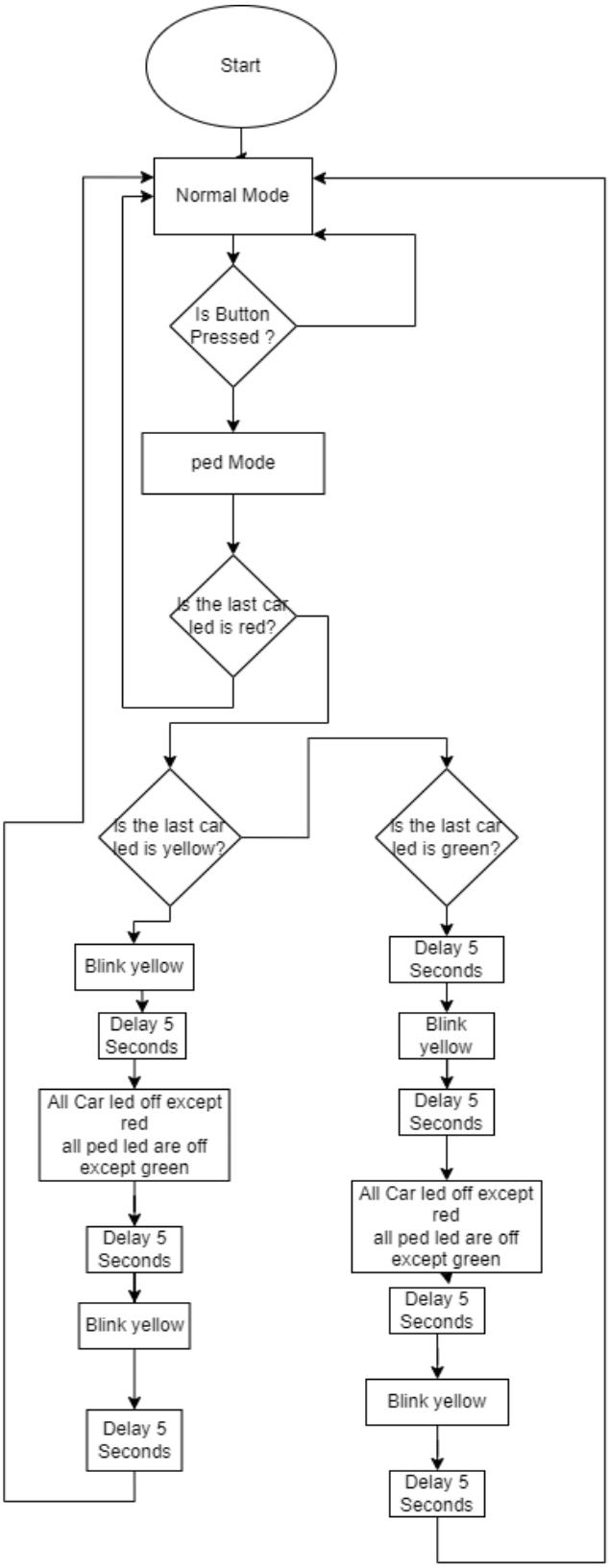
The system constraints

The user can press the button at any case, for the red led car in case nothing will happen.
If the user sees the yellow led of cars blinking so he can press on the button to get the priority and make the cars wait until he passes.
If the user sees the green led of cars is on so he can press the button to make yellow leds start blinking to get a priority to pass the street.

Long & Double press
When the user presses a short press , the interrupt happens and the pedestrian mode is applied.
As I design the interrupt function to disable the interrupt in the beginning and enter the pedestrian mode then after the end of the pedestrian mode we enable the interrupt again, So double press or long press will not affect the logic as the interrupt is disabled after the button pressed immediately.

Flow Chart


Start
Init Functions
Start normal Mode inside the loop
All Car led off except red
all ped led are off except green
Delay 5 Seconds
Yellow led of cars and ped are blinking
Delay 5 Seconds
All Car led off except green
all ped led are off except red
Delay 5 Seconds


Start
Normal Mode
Is Button Pressed ?
ped Mode
Is the last car led is red?
Is the last car led is yellow?
Is the last car led is green?
Blink yellow
Delay 5 Seconds
All Car led off except red
all ped led are off except green
Delay 5 Seconds
Blink yellow
Delay 5 Seconds
Delay 5 Seconds
Blink yellow
Delay 5 Seconds
All Car led off except red
all ped led are off except green
Delay 5 Seconds
Blink yellow
Delay 5 Seconds