Embedded Systems Professional Track
EgFWD – Udacity

On-demand Traffic Light control

Project Documentation

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1. System Description

1.1 System Overview

It is an on-demand traffic light control system which includes 2 traffic lights which are 1 for pedestrian and one for vehicles and pedestrian push button to give priority to pedestrian as for example if vehicles traffic light on green state which means vehicles are moving by just pressing pedestrian push button, it forces vehicles traffic light to switch to red state which means vehicles stop and pedestrian traffic light to be on green state which means pedestrian can cross the street as shown in the following fig.1

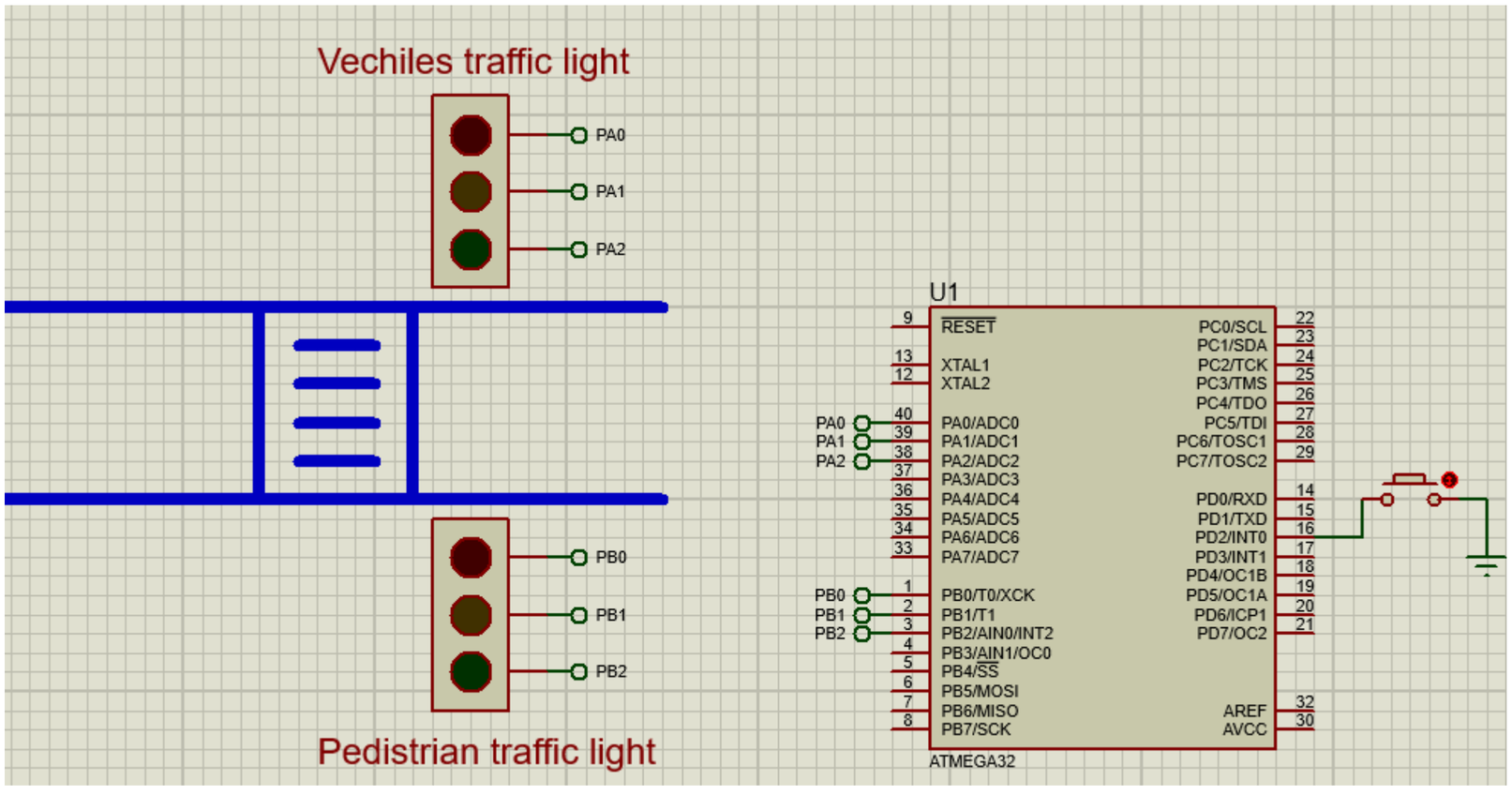


Fig.1 System overview on proteus

1.2 System Functionality

The system has 2 modes, pedestrian and vehicles modes which both of them depends on if push button is pressed or not and depends on the current state, it decides what to do. For example, if push button pressed, it means switch form vehicles mode to pedestrian mode and also depends on in which state in vehicles mode push button get pressed and all of these cases are clear in the coming section 3 flow chart. Note that Pedestrian still allowed to move in red state or red with yellow blinks state of vehicles traffic light even if push button is pressed or not as in these two cases vehicles are not allowed to move or get ready to move.

2. System Design

2.1 System Requirements

The system consists of:

- AVR Atmega32 (8MHz)
- Inside traffic light
    - 2 Green LEDs
    - 2 Orange LEDs
    - 2 Red LEDs
    - 6 300 Ohm resistors
- 1 Push Button (there is no need to connect 10k resistor to it, because we enabled pull up resistor inside Atmega32)

2.2 System constrains

To a void multiple presses on pedestrian push button, when it happens it went directly to pedestrian mode on the first press and there by disabling external interrupt there no meaning of multiple presses on push button and enable it again after done with pedestrian mode. For long press on push button, external interrupt only triggered when it goes to falling edge, so there is no meaning of long press.

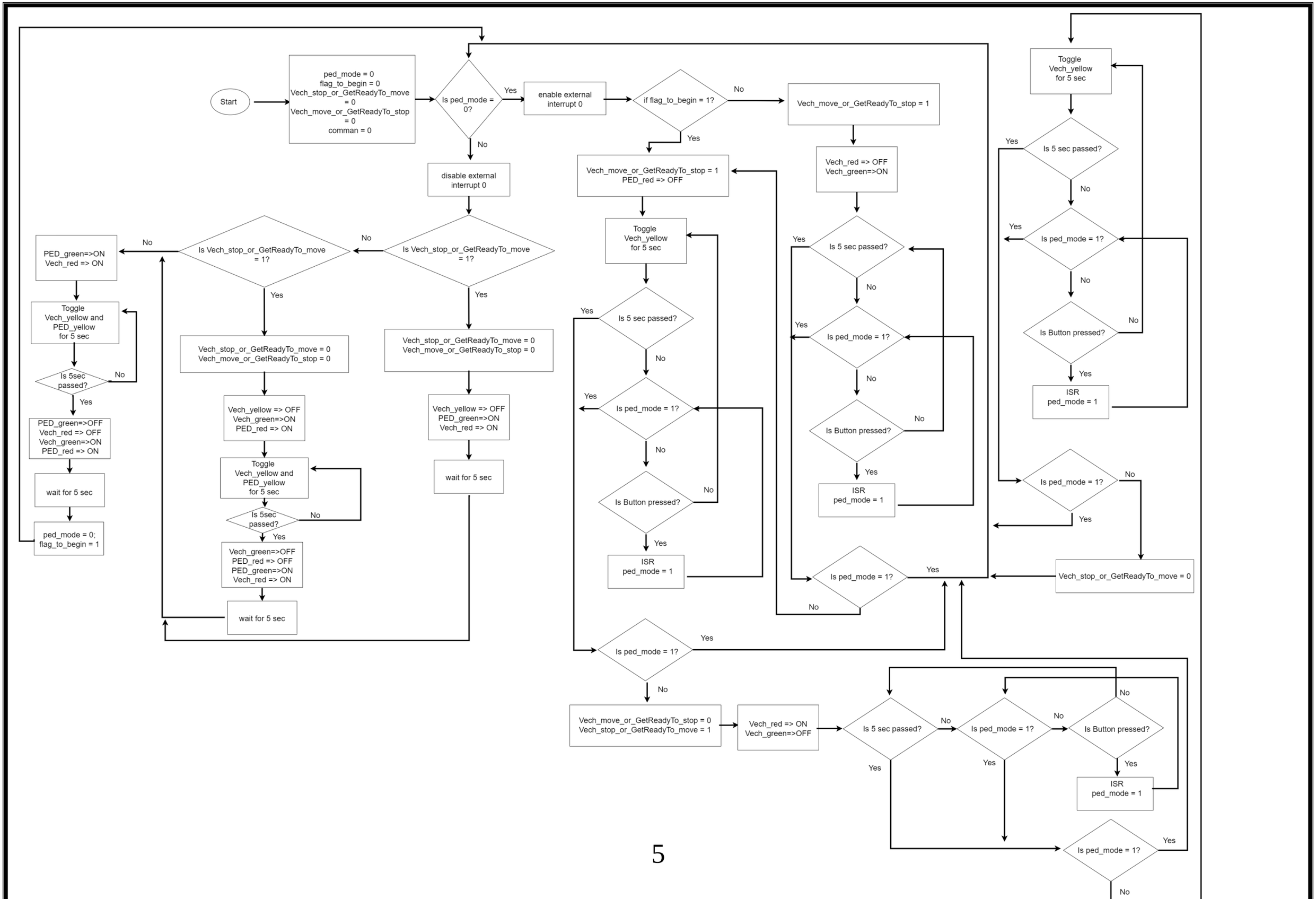
2.2 Operating Environment

The system can be used as traffic light control system on streets with also pedestrian push button to provide full system functionality and switching between 2 modes.

2.3 Input & Output Formats

Inputs: The pedestrian push button.

Outputs: 6 LEDs which are controlled by Atmega32, state of pedestrian push button, and also which vehicles traffic light state pedestrian push button has been pressed.


Start
ped_mode = 0
flag_to_begin = 0
Vech_stop_or_GetReadyTo_move = 0
Vech_move_or_GetReadyTo_stop = 0
comman = 0
Is ped_mode = 0?
Yes
No
enable external interrupt 0
disable external interrupt 0
if flag_to_begin = 1?
Yes
No
Vech_move_or_GetReadyTo_stop = 1
PED_red => OFF
Vech_move_or_GetReadyTo_stop = 1
Vech_red => OFF
Vech_green=>ON
Toggle Vech_yellow for 5 sec
Is 5 sec passed?
Is ped_mode = 1?
Is Button pressed?
ISR ped_mode = 1
Is Vech_stop_or_GetReadyTo_move = 1?
Vech_stop_or_GetReadyTo_move = 0
Vech_move_or_GetReadyTo_stop = 0
Vech_yellow => OFF
PED_green=>ON
Vech_red => ON
wait for 5 sec
PED_green=>ON
Vech_red => ON
Toggle Vech_yellow and PED_yellow for 5 sec
Is 5sec passed?
PED_green=>OFF
Vech_red => OFF
Vech_green=>ON
PED_red => ON
wait for 5 sec
ped_mode = 0;
flag_to_begin = 1
Vech_yellow => OFF
Vech_green=>ON
PED_red => ON
Toggle Vech_yellow and PED_yellow for 5 sec
Is 5sec passed?
Vech_green=>OFF
PED_red => OFF
PED_green=>ON
Vech_red => ON
wait for 5 sec
Vech_move_or_GetReadyTo_stop = 0
Vech_stop_or_GetReadyTo_move = 1
Vech_red => ON
Vech_green=>OFF
Is 5 sec passed?
Is ped_mode = 1?
Is Button pressed?
ISR ped_mode = 1
Toggle Vech_yellow for 5 sec
Is 5 sec passed?
Is ped_mode = 1?
Is Button pressed?
ISR ped_mode = 1
Is ped_mode = 1?
Vech_stop_or_GetReadyTo_move = 0