Embedded systems professional track

On-demand Traffic Light control Project

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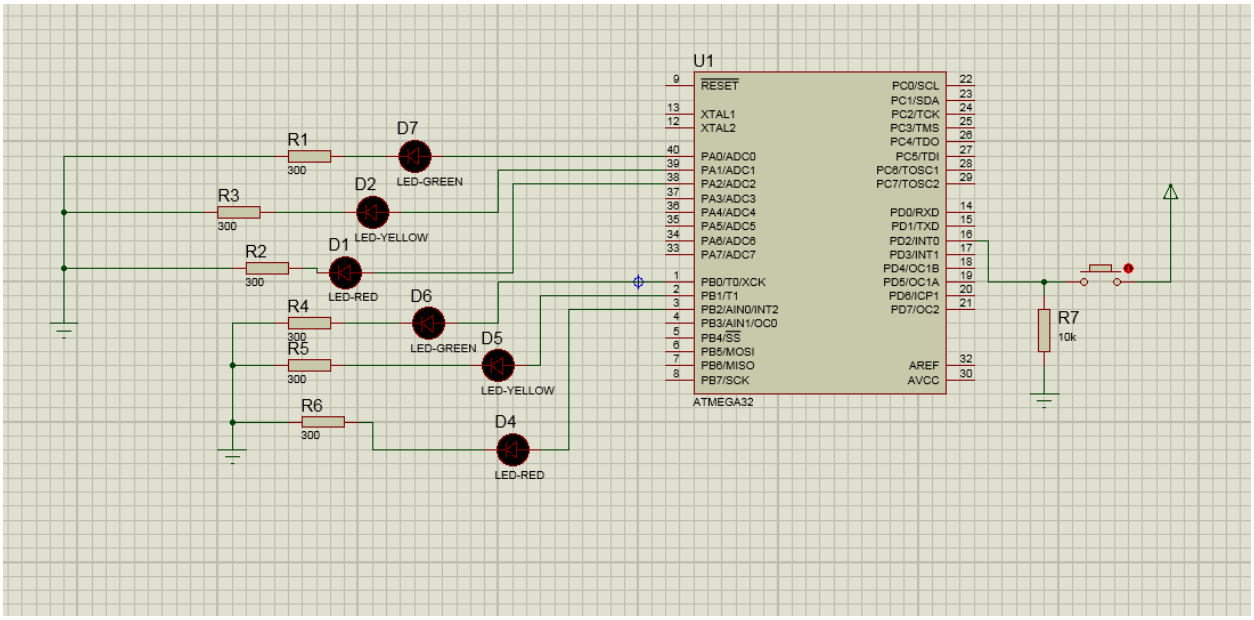
1. System Description

The system aims to provide an on-demand traffic control system. It includes a pedestrian button to allow for pedestrians to pass. The system can detect when the button is pressed. Afterwards, based on current state it would decide what to do. It allows pedestrians to walk by making sure cars are stopped first.



Normal mode:

1) This mode starts with cars green light initially

2) After 5 seconds, cars yellow light starts blinking for another 5 seconds while cars green light is still on. 3) After the 5 seconds, cars green and yellow lights are turned off then cars red light is turned on for 5 seconds.

4) The last phase, the yellow light starts blinking again for 5 seconds with cars red light is still on.

5) At last, the system goes back to (1) again.

Pedestrian mode:

1- 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
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- 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.

4- 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.

5- Traffic lights signals are going to the normal mode again.

2. System Design

Hardware requirements

1- AVR atmega32 microcontroller
2- 2 red LEDs, 2 yellow LEDs, 2 green LEDs.
3- 6 (300 ohm) resistors.
4- 1 (10K ohm) resistor. (pull-down resistor)
5- 1 push button

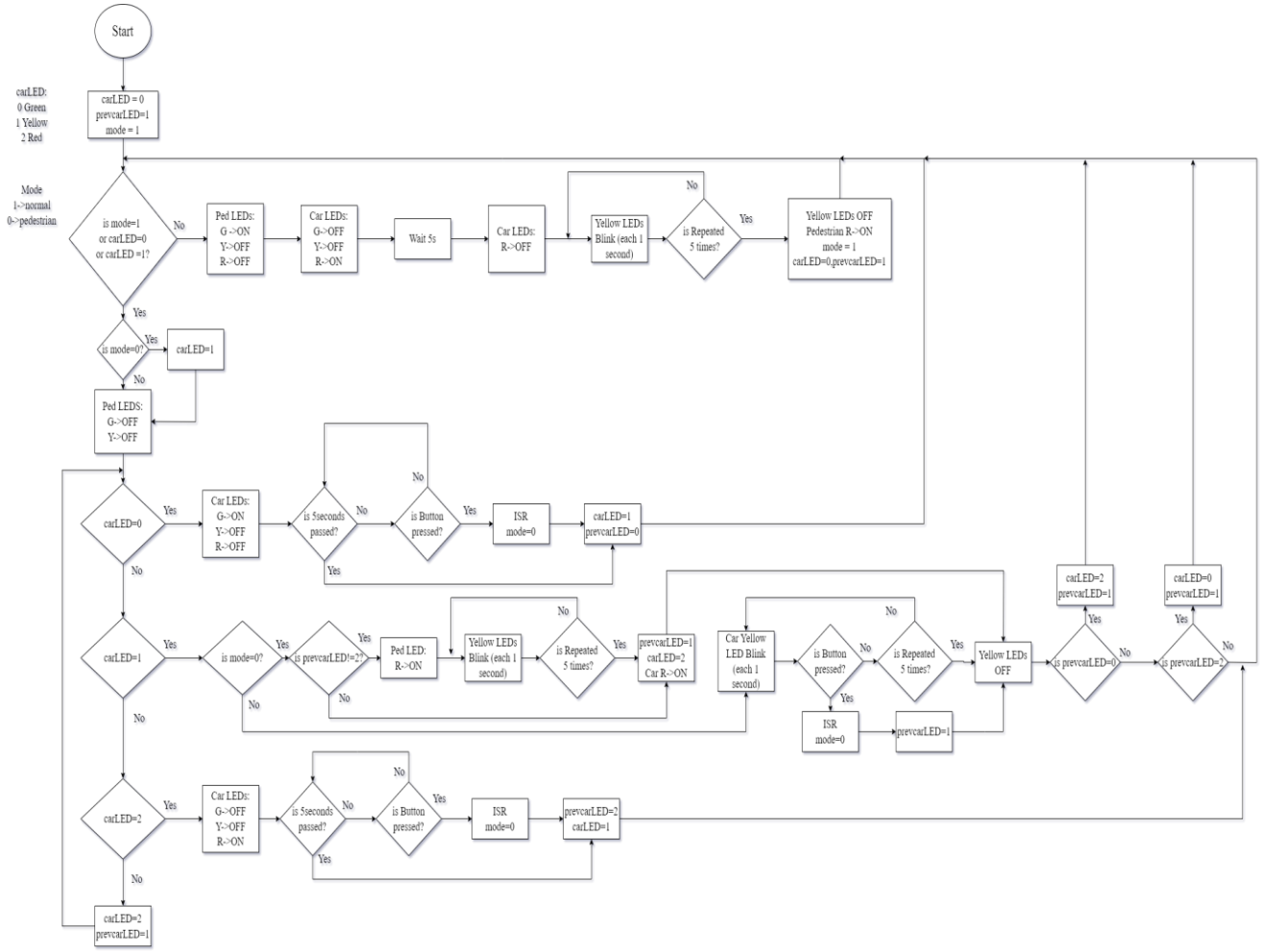
Software requirements

1-Microchip studio IDE
2- Proteus 8 simulator

3-system constraints

1- 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, nothing to be done .
2- a pedestrian when I made a long press on the crosswalk button, nothing to be done.
3- 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.
4- 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
5- 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

4- Flow Chart


Start
carLED:
0 Green
1 Yellow
2 Red
carLED = 0
prevcarLED=1
mode = 1
Mode
1->normal
0->pedestrian
is mode=1
or carLED=0
or carLED =1?
No
Ped LEDs:
G ->ON
Y->OFF
R->OFF
Car LEDs:
G->OFF
Y->OFF
R->ON
Wait 5s
Car LEDs:
R->OFF
Yellow LEDs
Blink (each 1
second)
is Repeated
5 times?
No
Yes
Yellow LEDs OFF
Pedestrian R->ON
mode = 1
carLED=0,prevcarLED=1
Yes
is mode=0?
Yes
carLED=1
No
Ped LEDS:
G->OFF
Y->OFF
carLED=0
Yes
Car LEDs:
G->ON
Y->OFF
R->OFF
is 5seconds
passed?
No
Yes
No
is Button
pressed?
Yes
ISR
mode=0
carLED=1
prevcarLED=0
No
carLED=1
Yes
is mode=0?
Yes
No
is prevcarLED!=2?
Yes
No
Ped LED:
R->ON
Yellow LEDs
Blink (each 1
second)
No
is Repeated
5 times?
Yes
prevcarLED=1
carLED=2
Car R->ON
Car Yellow
LED Blink
(each 1
second)
is Button
pressed?
No
Yes
ISR
mode=0
No
is Repeated
5 times?
Yes
prevcarLED=1
Yellow LEDs
OFF
carLED=2
prevcarLED=1
Yes
is prevcarLED=0
No
carLED=0
prevcarLED=1
Yes
is prevcarLED=2
No
No
carLED=2
Yes
Car LEDs:
G->OFF
Y->OFF
R->ON
is 5seconds
passed?
No
Yes
No
is Button
pressed?
Yes
ISR
mode=0
prevcarLED=2
carLED=1
No
carLED=2
prevcarLED=1

5-System layers