UDACITY

egyptfwd initiative

On demand traffic light control system

Submitted by:

Mohamed Gamal Roushdy

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1. System description

The system is a traffic light controller that controls the lights for cars and pedestrians at a crosswalk. Crosswalk button let the signal operations know that someone is planning to cross the street, so the light adjusts, giving the pedestrian enough time to get across.

The microcontroller handles the interrupt by the button press and decides what to do based on the current state. It ensures the safety of pedestrians by stopping cars before allowing them to pass.

2. System Design

The system is composed of **hardware** and **software** components:

The system utilizes the following hardware:

- An ATmega32 microcontroller
- one push button connected to the INT0 pin for pedestrian mode.
- There are three LEDs for cars - Green, Yellow, and Red connected to port A, pins 0, 1, and 2 respectively.
- There are also three LEDs for pedestrians - Green, Yellow, and Red connected to port B, pins 0, 1, and 2 respectively.
- Six 300-ohm resistors.
- One 10K-ohm resistor.

The system software is composed of two modes of operation, **normal mode and pedestrian mode.**

Normal mode:

The cars' LEDs will change every five seconds starting from Green, then Yellow, then Red, then Yellow, then Green. The Yellow LED will blink for five seconds before moving to the Green or Red LEDs.

pedestrian mode:

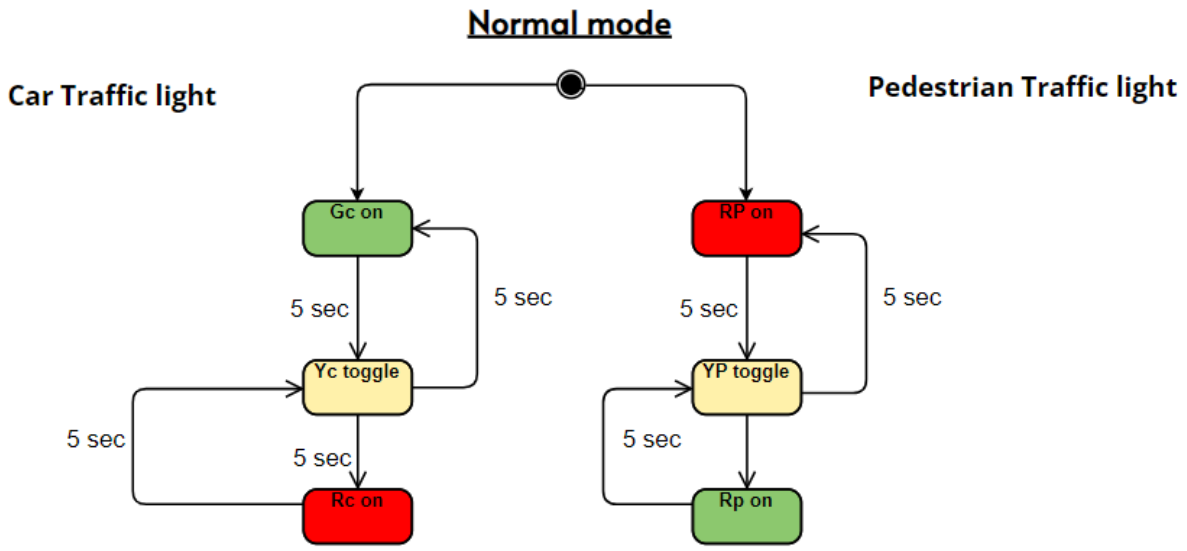
The system changes from **normal** mode to **pedestrian** mode when the pedestrian button is pressed.

If the button is pressed when the cars' Red LED is on, the pedestrian's Green LED and the cars' Red LEDs will be on for five seconds, allowing pedestrians to cross the street.

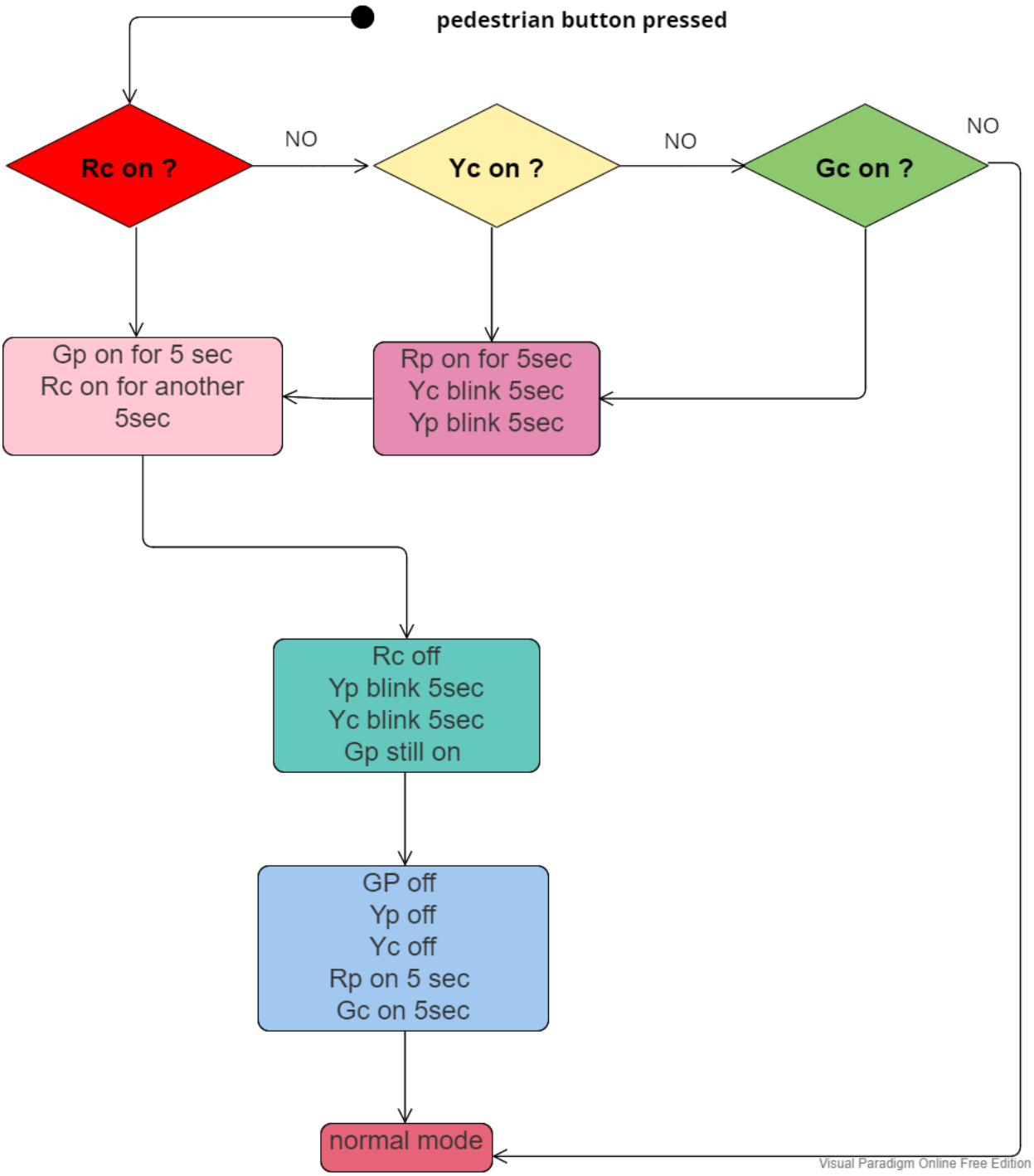
If the button is pressed when the cars' Green LED is on or the cars' Yellow LED is blinking, the pedestrian Red LED will be on, and both Yellow LEDs start to blink for five seconds.

Then the cars' Red LED and pedestrian Green LEDs are on for five seconds, indicating that the 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, returning the traffic lights to normal mode.

3. System state machine



Pedestrian mode



3. System Constraints

- The system must be able to switch between normal mode and pedestrian mode based on the button press which interrupts the normal mode.
- The system must be able to handle multipress and long press on the pedestrian button.
- In normal model the pedestrian traffic lights are opposite to the cars' traffic light.
- The system must return to normal mode after pedestrian mode.