

# Traffic Light Security Alarm Control System Using Pic Microcontroller

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**Abstract-** The more developing the country, the higher the living standard of the people, and the denser the traffic will be. So, there are a lot of traffic congestions and the monitoring and control of city traffic is becoming a major in many countries. The idea of intelligent traffic system is that drivers will not spend time waiting for the traffic light to change.

PIC controlling system is widely used and very popular around the world. Microcontroller control system with traffic security alarm is proposed in this paper. The proposed system is a combination of hardware and software devices. And this is the real time control system with fast dynamics situation. This is implemented by using assembly language programming.

**Index Terms-** Programmable Interface Controller (PIC), embedded system, security control system, detected circuit, PIC 16F877A single display, Power Electronic Devices,

## I. INTRODUCTION

This system utilizes the traffic light security alarm to control the traffic light. There are one main road and one side street at a certain traffic junction. This system aims to develop a computer implemented PIC controller system that would automatically generate the durations of the green light to be lit for both ways as control output giving the main road higher priority. The traffic light is to have three lights (red, yellow, green), be able to shine red, yellow, and green for a certain number of seconds each, and be able to repeat this sequence indefinitely.

It is of a computer that controls the selection and timing of traffic movements in accordance to the varying demands of traffic signal as registered to the controller unit by sensor. The second part is that the visualization is signal face. Signal faces are part of a signal head provided for controlling traffic in a signal direction and consist of one or more signal sections.

These usually comprise of solid red, yellow and green lights. The third part is the detector or sensor. The sensor or detector is a device to indicate the presence of vehicles. The main aim of Intelligent Traffic Signal simulators is to reduce the waiting time of each lane of the cars and congestion [6].

## II. RELATED WORKS

There are a lot of traffic light control systems. In developing the traffic light control system, some use the fuzzy

logic, MATLAB software, Lab VIEW software, PIC microcontroller is used in developing this traffic light control system. Owing to using the chip of PIC microcontroller with sensor, this system developed more than other.

The sensor will help to alarm in crossing the road at the wrong signal. In this system, microcontroller is applied of secure system. Nowadays, PIC microcontroller is used for a few kilobytes requirements of device control instead for a few kilobytes requirements of device control instead of personal computer. PIC microcontroller is very useful in the application areas of communication, transportation, product manufacturing and automatic control etc [2] [3]. Microcontrollers have traditionally been programmed using the assembly language of the target device. Although the assembly language is fast, it has several disadvantages. An assembly program consists of mnemonics and it is difficult to learn and maintain a program written using the assembly language.

High level language has the advantage that it is much easier to learn a high level language than the assembly. Also, very large and complex program can easily be developed by using a high level language.

## III. MICROCONTROLLER

Circumstances that we find ourselves today in the field of microcontrollers had their beginnings in the development of technology of integrated circuits. This development had made it possible to store hundreds of thousands of transistors into one chip. That was a prerequisite for production of microcontrollers, and adding external peripherals such as memory, input- output lines, timers and other made the first computers. Further increasing of the volume of the package resulted in creation of integrated circuits.

These integrated circuits contained both processor and peripherals. That is how the first chip containing a microcomputer, or what would later be known as a microcontroller came out.

### Microcontroller versus microprocessors

Microcontroller differs from a microprocessor in many ways. First and the most important is its functionality. In order for a microprocessor to be used, other components such as memory, or components for receiving and sending data must be added to it. In sort, it means that microprocessor is the very heart of the computer. On the other hand, microcontroller is designed to be all of that in one. No other external components are needed for its

application because all necessary peripherals are already built in to it. Thus, we save the time and space needed to construct devices [5] [7].

### General features of PIC 16F877A

General features of PIC16F877A are RISC (Reduced instruction Set Computer). The PIC 16F877A microcontroller is the midrange microcontroller from the Microchip technology Inc [1]. It has the following features:

- 40 pins devices (33 input / output pins)
- 8192\*14 flash program memory
- 368 bytes of RAM
- 256 bytes of EEPROM
- 8 multiplexed A/D converters with 10 bits resolution
- 3 timers, analogue capture and comparator circuit, USART and internal and external interrupt facilities
- 10000 erase/write cycles
- 1 K word of program
- timer and interrupt functions

## IV. HARDWARE COMPONENTS

This system includes three major hardware components: the controller implemented to the system, the LDR sensors which detect the presence of vehicles, the light emitting diodes (LED) which act as the actuator and the countdown timers [6] ,12V and 5V power supply and the 555 timer used as a timer in alarm generating circuit is also discussed.

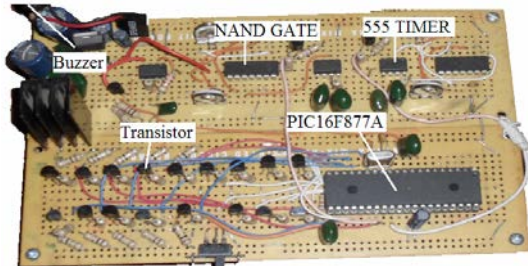
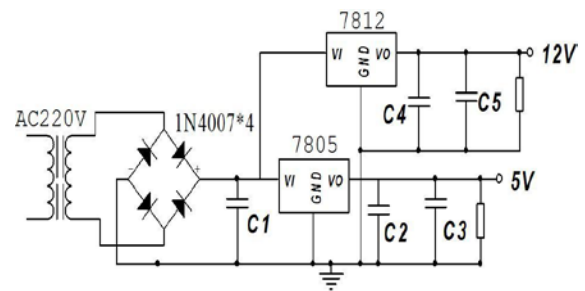


Figure 1. 16F877A Microcontroller  
12V and 5V Power Supply

A power supply is an essential part of each electronic system from the simplest to the most complex. The DC power supply converts the standard 220v, 50Hz AC into a constant DC voltage. The DC voltage produced from a power supply is used to power all types of electronic circuits. In this system, full wave bridge rectifier uses four diodes. Diodes are used in circuits as rectifiers that convert AC voltage to DC voltage as shown in Figure 2.



C1...22µF 50V C2,C4...10 µF50V  
R1...,R2....1KΩ C3,C5...0.1µF

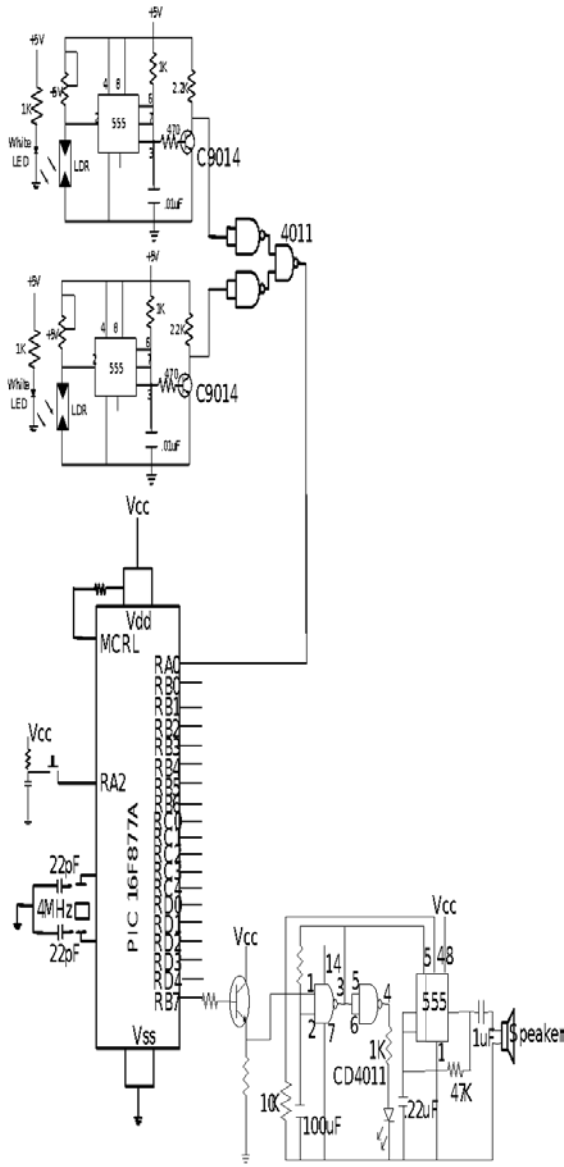
Figure 2. 12V and 5V Power Supply Circuit

### 555 Timer-monostable and astable

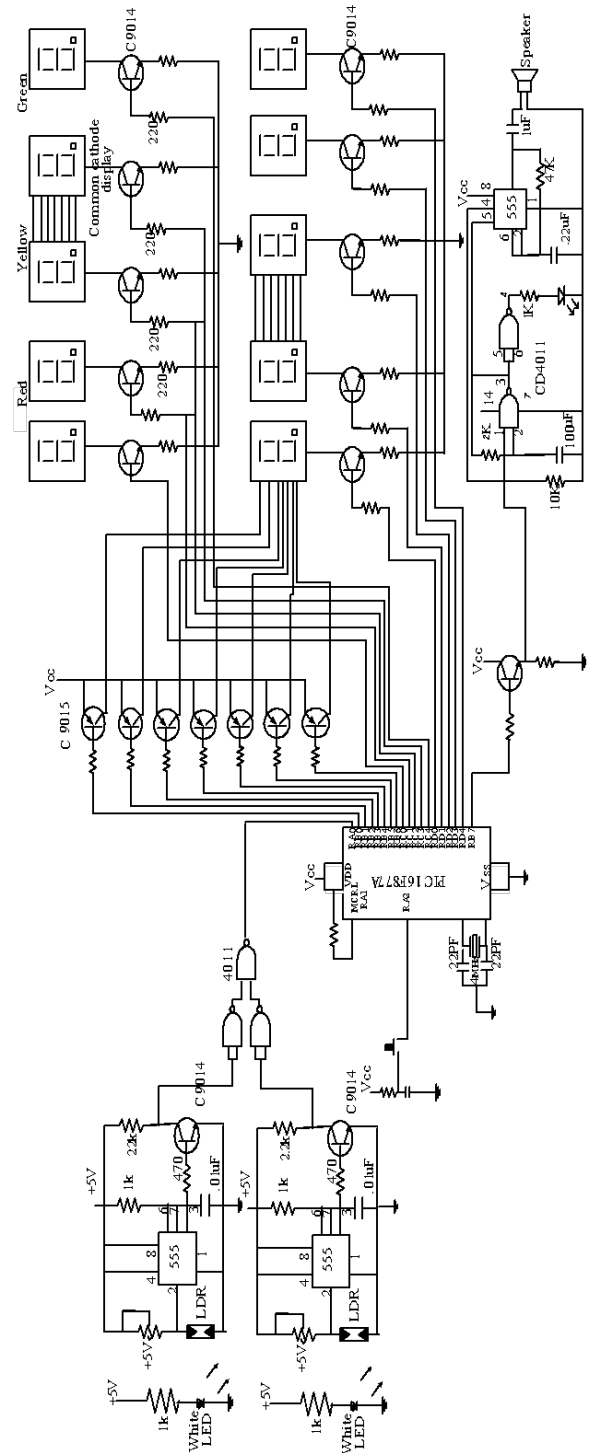
The 8-pin 555 timer is one of the most useful chips ever made and it is used in many projects. With just a few external components it can be used to build many circuits, not all of them involve timing. So, it is a versatile and widely used device. It can be configured in two different modes as either a monostable multivibrator (one-shot) or as an astable multivibrator (oscillator), an astable multivibrator has no stable states and therefore changes back and forth (oscillates) between two unstable states without any external triggering. There are several reliable timers but the 555 timer is the most common whether you are putting together an alarm or a circuit to activate a computer a timer is the common component [4].

## V. SYSTEM DESIGN AND IMPLEMENTATION

This system intends to develop sensor based on traffic light security alarm control system using PIC16F877A microcontroller. The (figure 5) is a diagram of the perfect circuit in traffic light alarm control system. This system applies both the monostable and astable of 555-timer, then controls PORT RA0,RA1 of PIC 16F877A. Sensor is used for alarm system, and buzzer device is controlled in PORT RB7 to broadcast alarm. Alarm device connected to PORT RB7 will broadcast if any passer-by or vehicle crosses the road at the red signal. To display countdown timer connected to transistor, both PORT RA0, RB0, RB1, RB3, RB4, RB5, RB6, RC0, RC1, RC2, RC3, RC4, and RD0, RD1, RD2, RD3, RD4, of PIC 16F877A control the 7-segment display.



**Figure 3.** Circuit Diagram of Security Alarm System Using PIC16F877A Control



**Figure 4.** Complete Circuit Diagram

## VI. EXPERIMENTAL RESULTS

In order to implement the traffic light control system, it needs to set up and assemble the hardware components and write a program to control the traffic light control [6]. The layout of the traffic light control is displayed in (figure 6).

The sensor based traffic light control system is made of microcontroller. There are three signals –such as yellow, red, green – in this system under the law of traffic light. The traffic

light signal operation will start with the traffic light illuminating in red for 25 seconds in all directions. It will start operating in the North lane [6], the East lane, South lane, the West lane and then goes back to the North lane. Firstly, simulator will check the north lane condition. It will check whether the sensors are triggered or not.

The total number of the sensors triggered will be used in the mathematical function to calculate the appropriate timing for the green signal to illuminate. After the green signal finishes the illumination of timing, the yellow signal will illuminate for 3 seconds, and finally the red signal will illuminate [6]. The yellow signal means that vehicles and passers-by are standby.

The red signal means to wait for the countdown and the green, to cross the road safely. Of course, if a vehicle or man on the road at the red signal crosses the road, and then sensor device will receive the object and alarm control will broadcast. This system will save the waiting time of vehicles to cross the road.

Since the waiting time of the vehicles for the true signal is optimal, the emission of carbon monoxide from the vehicles can be reduced. This will also save a positive effect to the green house effect towards the environment [6]. This system will save the motorists' time .It will help reducing the traffic congestion. Moreover, in crossing the road at the wrong signal, alarm control will help to broadcast. So, any vehicle and passer-by can cross the road safely and sound at the green signal.

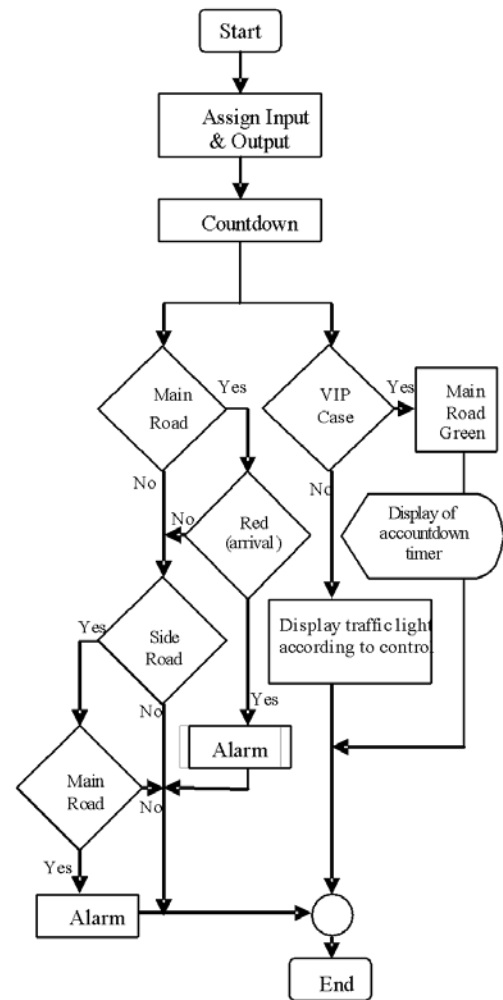


Figure 5. Flow Diagram of Proposed System

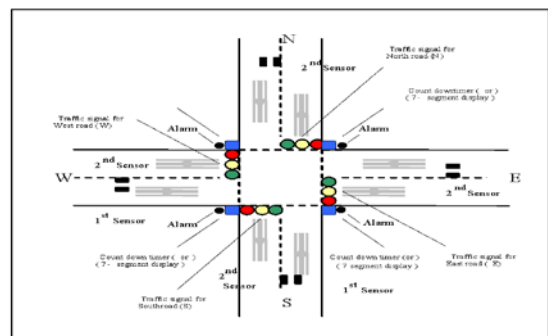
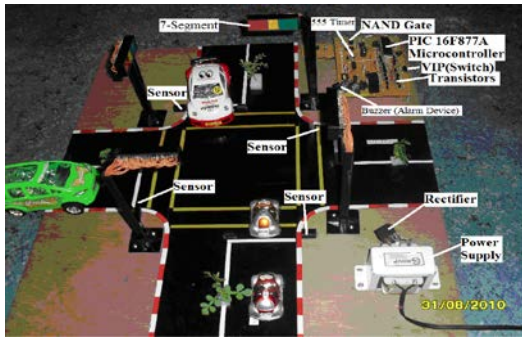


Figure 6. Traffic light security alarm simulator layout



**Figure 7. Model of the traffic light security alarm control system**

## VII. CONCLUSION

This traffic light control system develops more than normal one. For, the system had successfully been designed under the control of the sensor. The sensors are interfaced with Lab VIEW integrate system [6]. This interface is synchronized with the whole process of the traffic system. It is this prototype (figure 7) in the real life situation.

The sensors will detect the presence or absence of vehicles or passers-by [6]. Crossing the road at the wrong signal which is that there is a vehicle or passer-by on the road at the red signal,

alarm control will help to broadcast. And, the system consists of the sensors to detect in all directions so that it has a wide range of detection capabilities, which can be enhanced and ventured into a perfect traffic system [6].

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