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## **Microprocessor and Assembly Language Programming Group Project Documentation**

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## ABSTRACT

This paper is aimed at creating prototype traffic light model using LED (Light Emitting Diode) since LEDs consume 80-90 percent less energy and generally last 5-7 years or longer compared to just a year for a incandescent light signal. LED are brighter, the LED arrays fill the entire "hole" and have equal brightness across the entire surface, making them brighter overall. It will also involves the use of a digital logic gate, multivibrator, IC (Integrated Circuit), timer for the design and circuit simulation to analysis the system efficiency. This design has for long outweighed the older system in many ways it is more efficient and effective as well, as it can enhance the transportation system of the country saving many hours usually lost in traffic problems. Accidents may also be prevented and lives can be saved and It can be used effectively by implementing in heavily congested areas. his project aims to create a traffic light system using an Atmega32 microcontroller. The system will be able to control the traffic lights at an intersection, allowing for efficient and safe passage of vehicles. The system will be programmed to cycle through the different light states, such as red, yellow, and green. It will also be able to detect when a vehicle is present at the intersection and adjust the light cycle accordingly. Additionally, the system will have safety features such as emergency stop buttons and sensors that can detect when a vehicle is stopped too close to the intersection. This project will provide a reliable and efficient way of controlling traffic at intersections.

## INTRODUCTION

Traffic light which is one of the vital public facilities that plays an important role to the road users. Traffic lights were first installed in 1868 in London, United Kingdom, outside the British Houses of Parliament in London, by the railway engineer J. P. Knight and constructed by the railway signal engineers of Saxby & Farmer. The design combined three semaphore arms with red and green gas lamps for night-time use, on a pillar, operated by a police constable. The gas lantern was turned with a lever at its base so that the appropriate light faced traffic. Although it was said to be successful at controlling traffic, its operational life was brief. It exploded on 2 January 1869, as a result of a leak in one of the gas lines underneath the pavement, injuring and killing the policeman who was operating it. With doubts about its safety, the concept was abandoned until electric signals became available. The first electric traffic light was developed in 1912 by Lester Wire, an American policeman of Salt Lake City, Utah, who also used red-green lights. Mary Bellis (5 February 1952).On 5 August 1914, the American Traffic Signal Company installed a traffic signal system on the corner of East 105th Street and Euclid Avenue in Ohio. It had two colors, red and green, and a buzzer, (based on the design of James Hoge) to provide a warning for color changes. The design by James Hoge allowed police and fire stations to control the signals in case of emergency. The first four-way, three-color traffic light was created by police officer William Potts in Detroit, Michigan in 1920. Moyer, Sheldon (March 1947). In 1922, T.E. Hayes patented his "Combination traffic guide and traffic regulating signal" . Ashville, Ohio claims to be the location of the oldest working traffic light in the United States, used at an intersection of public roads until 1982 when it was moved to a local museum (Neato Stuff at the Ashville Museum).The traffic lights consist of a set of three coloured lights: red, yellow and green.( In a typical cycle, Illumination of the green light allows traffic to proceed in the direction denoted, Illumination of the amber/yellow light denoting, if safe to do so, prepare to stop short of the intersection, and Illumination of the red signal prohibits any traffic from proceeding).

## **HISTORY AND EVOLUTION OF TRAFFIC LIGHT SYSTEM**

Traffic light system consists of two parts, first part is traffic light and the second part is controller unit. Traffic light which is one of vital public facilities plays an important role to the road user, which is used to control traffic flows at the busy intersection. The world's first traffic light came into being before the automobile was in use, and traffic consisted only of pedestrians, buggies, and wagons. Installed at an intersection in London in 1868, it was a revolving lantern with red and green signals. Red meant stop and green meant caution. The lantern, illuminated by gas, was turned by means of a lever at its base so that the appropriate light faced traffic. On January 2, 1869, this crude traffic light exploded, injuring the policeman who was operating it.

And with the coming of automobiles, the situation got even worse. Police officer William Potts of Detroit, Michigan, decided to do something about the problem. What he had in mind was figuring

out a way to adapt railroad signals for street use. The railroads were already utilizing automatic controls. But railroad traffic travelled along parallel lines. Street traffic travelled at right angles. Potts used red, amber, and green railroad lights and about thirty-seven dollars' worth of wire and electrical controls to make the world's first 4-way three color traffic light. It was installed in 1920 on the corner of Woodward and Michigan Avenues in Detroit. Within a year, Detroit had installed a total of fifteen of the new automatic lights. At about the same time, Garrett Morgan of the United States realized the need to control the flow of traffic. A gifted inventor and reportedly the first African American to own an automobile in Cleveland, Ohio, he invented the electric automatic traffic light. Though it looked more like the semaphore signals you see at train crossings today, it provided the concept on which modern four-way traffic lights are based. The First Four way traffic signal was originated by William Potts of the Detroit Police Department and he is generally credited as the originator of the red-yellow-green traffic signal as we know today. His signal, built of wood with metal shell, used four inch railroad lantern-style lenses. The signal, probably of the overhead suspension type, marked another pioneering venture for Detroit when it was installed. He instituted electrical interconnection of the signal of fifteen of Detroit's traffic towers so that they could be controlled by a police officer from a single location. However, Light Emitting Diodes (LEDs) Traffic Light which are the new traffic light designs are made out of arrays of light emitting diodes (LEDs). These are tiny, purely electronic lights that are extremely energy efficient and have a very long life. Each LED is about the size of a pencil eraser, so hundreds of them are used together in an array. The LEDs are replacing the old-style incandescent halogen bulbs rated at between 50 and 150 watts. LED bulbs save a lot of energy. The energy savings of LED lights can be huge. Assume that a traffic light uses 100-watt bulbs today. The light is on 24 hours a day, so it uses 2.4 kilowatt-hours per day. A big city has thousands of intersections, so it can cost millions of dollars just to power all the traffic lights. LED bulbs might consume 15 or 20 watts instead of 100, so the power consumption drops by a factor of five or six. A city can easily save a million dollars a year by replacing all of the bulbs with LED units. These low-energy bulbs also open the possibility of using solar panels instead of running an electrical line, which saves money in remote

### **Purpose of Traffic Light**

1. Safe and efficient traffic light flow.
2. Assign right of way to maximize capacity, minimize and reduce collision and conflict.

## Advantage of Traffic Light

- i. Minimize conflicting movement
- ii. Provide orderly movement of traffic
- iii. Provide driver confidence by engaging the right ways
- iv. Means of interrupting heavy traffic
- v. Coordinated for continuous vehicle movement

## Cross Road Traffic Light Control

Crossroads is where two or more roads cross each other and form an intersection. Design and Implementation of Crossroads of Four (4) way traffic light control types will be the main focus of this project. Crossroads vary from the very quiet residential areas to the hectic multi-lane systems in busy areas. Crossroads can cause confusion for not only learner drivers, Pedestrian but experienced fully licensed drivers are often unsure how to deal with them. Recently the traffic management is trying out new a new system of traffic lights based on the usual international standard. A synchronous digital circuit has to be design, which operates this new type of traffic light for cross road or road crossing.

Block Diagram of the Traffic light controller

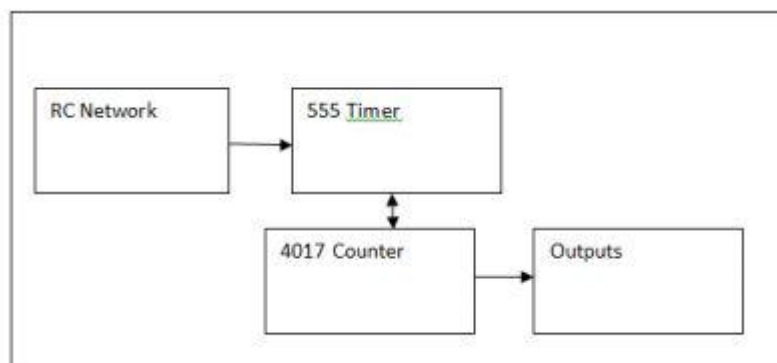


Fig.traffic light block diagram

## Devices used in the system

- Atmega32 microcontroller
- Traffic lights
- Wire
- 5 volt DC supply
- 7 segment MPX1 CA LED display

Coming to the working principle of Traffic Lights, the main IC is 4017 counter IC which is used to glow the Red, yellow and green LED respectively. 555 timer acts as a pulse generator providing an input to the 4017 counter IC. Timing of glow of certain lights totally depends upon the 555 timer's pulse, which we can control via the Potentiometer so if you want to change the time of glow, you can do so by varying the potentiometer, having the responsibility for the timing. LEDs are connected directly with atmega32 micro-controller, as the lights won't be stable. We have used the combination of micro-controller and the LEDs in order to get the appropriate output. Main drawback of this circuit is that you can never have an exact timing with this, however you will have best estimate

## Code Implementation in C

```
#define F_CPU 8000000UL
#include<avr/io.h>
#include<util/delay.h>

int main()
{
    unsigned int ch[]={0x90,0x80,0xF8,0x82,0x92,0x99,0xB0,0xA4,0xF9,0xC0};
    unsigned int i;
    DDRC=0xFF;
    DDRA=0xFF;
    DDRB=0xFF;
    DDRD=0xFF;
    PORTA=(1<<5);
    PORTB=(0<<5);
    PORTD=(0<<5);

    while(1)
    {
        for(i=0;i<10;i++)
        {
            PORTC=ch[i];
            _delay_ms(1000);
        }
        PORTA=(0<<5);
        PORTB=(0<<5);
        PORTD=(1<<5);

        for(i=6;i<10;i++)
        {
            PORTC=ch[i];
            _delay_ms(1000);
        }
        PORTA=(0<<5);
        PORTB=(1<<5);
        PORTD=(0<<5);
        for(i=0;i<10;i++)
        {
            PORTC=ch[i];
            _delay_ms(1000);
        }
        PORTA=(0<<5);
        PORTB=(0<<5);
        PORTD=(1<<5);
        for(i=6;i<10;i++)
        {
            PORTC=ch[i];
            _delay_ms(1000);
        }
        PORTA=(1<<5);
        PORTB=(0<<5);
        PORTD=(0<<5);
    }
}
```

## **CONCLUSION**

This project is intended for the design and implementation of prototype cross road traffic light control system. The design was achieved by taking up the challenges of making findings from library, internet and also interview from resourced persons about the essential facts of the design. The design proceeds to getting all necessary components to initialize and maintain the proper functions of the designed circuit.

The control circuit was properly designed and faults were corrected before mounting the circuit into the model. It is quite challenging mounting the components on the Vero board because of the fragility of the components and the total concentration and perfection required to achieve an accurate output or result. Proper functioning of the circuit and an error free connection was ensured. The circuit was finally put to test and automatic control of the traffic light was achieved by the decade counter

Four way traffic light system is useful equipment for controlling traffic flow at junctions. This method has for long outweighed<sup>1</sup> the older system in many ways it is more efficient and effective as well, as it can enhance the transportation system of the country saving many hours usually lost in traffic problems. Accidents may also be prevented and lives can be saved.

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