TRAFFIC LIGHT CONTROL SYSTEM

1.INTRODUCTION

Traffic lights are used to control the vehicular traffic. In the modern era, everyone has different types of vehicles resulting in rise to the numbers of vehicles. That's why traffic lights are mandatory to avoid the traffic jams and accidents. There are three lights in the traffic signal, having different message for the drivers. Red light asks the driver to yield at the intersection, green light gives the driver free license to drive through the inter section whereas yellow light alerts the driver to wait if the next light is red one or get ready to go / turn the engine ON if the green light is next

The basic idea behind the design is to avoid the collision of vehicles by providing appropriate signals to different directions for a limited time slot, after which the next waiting drivers will be given same treatment. In this way, a cycle will be established which will control the traffic.

Traffic control devices are markers, signs and signal devices used to inform guide and control traffic, including pedestrians, motor vehicle drivers and bicyclists. These devices are usually placed adjacent, over or along the highways, roads, traffic facilities and other public areas that required traffic control. Traffic management is one of the most critical issues faced by any cities with growing purchasing capacity of citizens and for the luxury that it offers, the number of vehicle increasing exponentially. Traffic management is one of the most critical issues faced by any cities with growing purchasing capacity of citizens and for the luxury that it offers, the number of vehicles is increasing exponentially. The number of vehicles newly registered in India in the year 1951 was 306, in the year 1975 it was 2472, in the year 2000 it was 48857, while in the year 2011 it rise to 141866 .Thus it can be seen that the increase in the number of vehicles has been exponential.

Traffic signals are used to control the flow of vehicles. In the recent years, the need of transportation has gain immense importance for logistics as well as for common human. This has given rise to the number of vehicles on the road. Due to this reason, traffic jams and road accidents are a common sight in any busy city. Traffic signals provide an easy, cheap, automatic and justified solution to the road points where the vehicles may turn to their direction e.g. round abouts, culverts etc.

In India Transportation via road is the most widely used mode of transport throughout the country. Annually there large amount of increment in vehicles and it corresponds in increased number of road users. Metro cities like Guwahati are facing the problems like road jams and the problems like congestions are needed to be sort out and this is impossible by normal traffic lights. Unfortunately these traffic controlling using lights which is currently exist have outlived their purpose and as a result it is unable to handle number of vehicles on roads and also results in congestion which exists in most of the part of the cities in our country. But there are many other ways to improve the currently existing system one of them is by introducing automatic traffic control methods to control roadside vehicles and infrastructure as the number of road users are increasing rapidly.

1.2 Motivation

The motivation for developing Traffic control system come from many reasons but the

biggest motivation behind Automatic Traffic Light Control system is the convenience. Convenience is really another way of saying "time saver" and in today's world where everything moving faster, every second has value. Most of the technology we use today is based of convenience, for example phones get us information from other people faster. The main aspiration of the designed system is to compute total traffic density at targeted area which is then further used to reduce the traffic congestion caused by vehicles. During the busy hours of a day, the traffic is at its peak and there are various problems related to traffic congestion. One such problem is fuel consumption.
Traffic lights are a very important. This project will be very useful and will be widely used. It can be implemented where ever necessary.

1.3 Theoretical Background

The increase in urbanization and traffic congestion create an urgent need to operate our transportation system with maximum efficiency. Real-time traffic signal control is an integral part of modern urban traffic control systems aimed at achieving optional utilization of the road network. Providing effective real time traffic signal control for a large complex traffic network is an extremely challenging distributed control problem. Signal system operation is further complicated by the recent trend that views traffic signal system as a small component of an integrated multi model transportation System. Optimization of traffic signals and other control devices for the efficient movement of traffic on streets and high ways constitutes a challenging part of the traffic management ports of programmable peripheral interface 8255. so the traffic light can be automatically switched ON/OFF in desired sequence.

1.3.2 Automatic Traffic Light Control

On 10 December 1868, the first traffic light were installed outside the British House of Parliament in London, by the railway engineer J.P. Knight . They resembled railway signals of the time ,with semaphore arms and red and green gas lamps for night use. The gas lantern was turned with a lever at its base so that the appropriate light faced traffic. Unfortunately, it exploited on 2 January 1869, injuring the policeman who was operating it[1]
The modern electric traffic light is an American invention. As early as1912 in Salt Lake City, Utah, policeman Lester Wire invented the first red-green electric traffic light . 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 Cleveland, Ohio .
It had two colours, red and green and a buzzer, based on the design of James Hoge, to provide a warning for colour changes. The design by James Hoge allowed police and fire station 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 . In 1923,Garrett Morgan patented a traffic signal device. It was Morgan's experience while driving along the street of Cleveland that led to his invention of a traffic signal device. Ashville, Ohio claims to be the location of the oldest working traffic light in the United states, used at an intersection of public roads until1982 when it was moved to a local museum.

1.4 Statement of the Problem

Traffic congestion is an increasing problem in cities and sub urban spend more of their time commuting to work, school, shopping, and social event as well as dealing with traffic light jams and accidents. Traffic became heavy in all directions, more to and from cities as well as between sub urban locations. Sub urban business locations require huge parking lots because employees have to drive; there were few buses or trains or trolleys to carry scatter workers to their work place. The hope of reduced congestion in sub urban had not been realized; long commutes and traffic jams could be found

The first step is to design a circuit which is a switching based traffic light control circuit. This circuit needs a man power to operate the traffic light. Hence we need to design an automatic traffic light system, in which to Counter based circuit can make the automation of the traffic light system. In this counter based traffic light control system controlling can be done automatically without man power. While using counter based circuit we can use many ICs like IC555 and IC4017 and hence if there is some fault we will be unable to detect those faults and due to this we can go for a microprocessor based system, because if there is some problem in the circuit we can configure it by simply changing the program or correcting the program. Further we can modify the microprocessor based traffic light control system by replacing microprocessor with a Microcontroller based traffic light control system because, in microprocessor chip ROM ,RAM and I/O ports are not present in a single chip but in microcontroller all the above mentioned things are embedded in a single IC. So in Microcontroller based traffic light control system the power consumption and the cost will also be less.

1.5 Aims and Objective

Designing and analysis of different Automatic Traffic control system is the main concern here. Automatic traffic light control system can provides travel opportunities and additional travel choices for more people in more ways, wherever they live, work and play, regardless of age or disability.
The aims of this project work are:
* To design and implement an automatic traffic control system.
* To develop a suitable algorithm to implement the design.
* To simulate the automatic traffic control.
The first objective is to make each of the traffic lights or semaphores smart. That is, aware of the time of day, basic turn red , green or yellow rules and perhaps what traffic

looks like in all directions based upon locally mounted signals . In achieving these aims, the following objectives will also be followed:
* To design a simple system that is easily adaptable to the existing traffic conditions at the junction, involving a minimum of physical changes in the intersection.
* To reduce the stress of the traffic warder.
* To reduce the occurrence of possible accident.

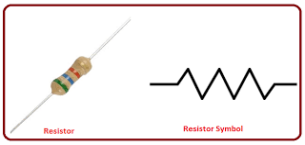
2 Designing Of Switching Based Circuit

2.1 Introduction

The main objective of this switching based traffic light control system is to provide sophisticated control and coordination to confirm that traffic moves as smoothly and safely as possible. This project makes use of Led lights for indication purpose and switch is used for changing of signals.

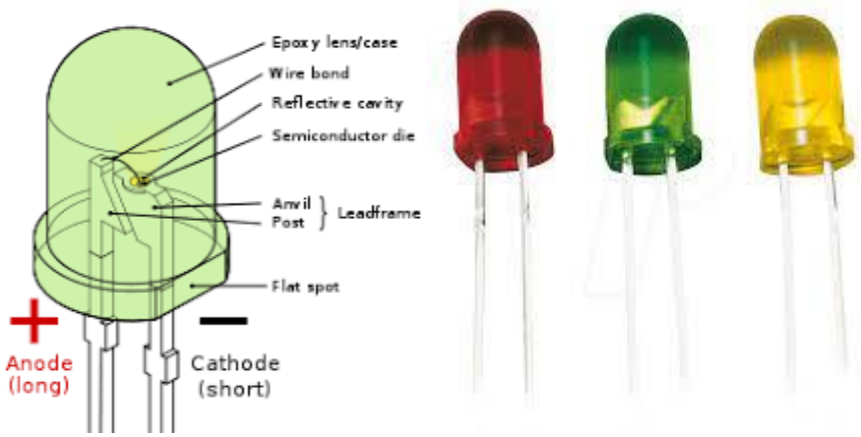
2.2.1 Resistor

Resistor restricts the flow of electric current for example a resistor is placed in series with a Led to limit the current passing through the Led.
We have used twelve Resistors in this switching circuit project; their work is to deliver required current to the components and to limit the current flow in the circuit. Figure



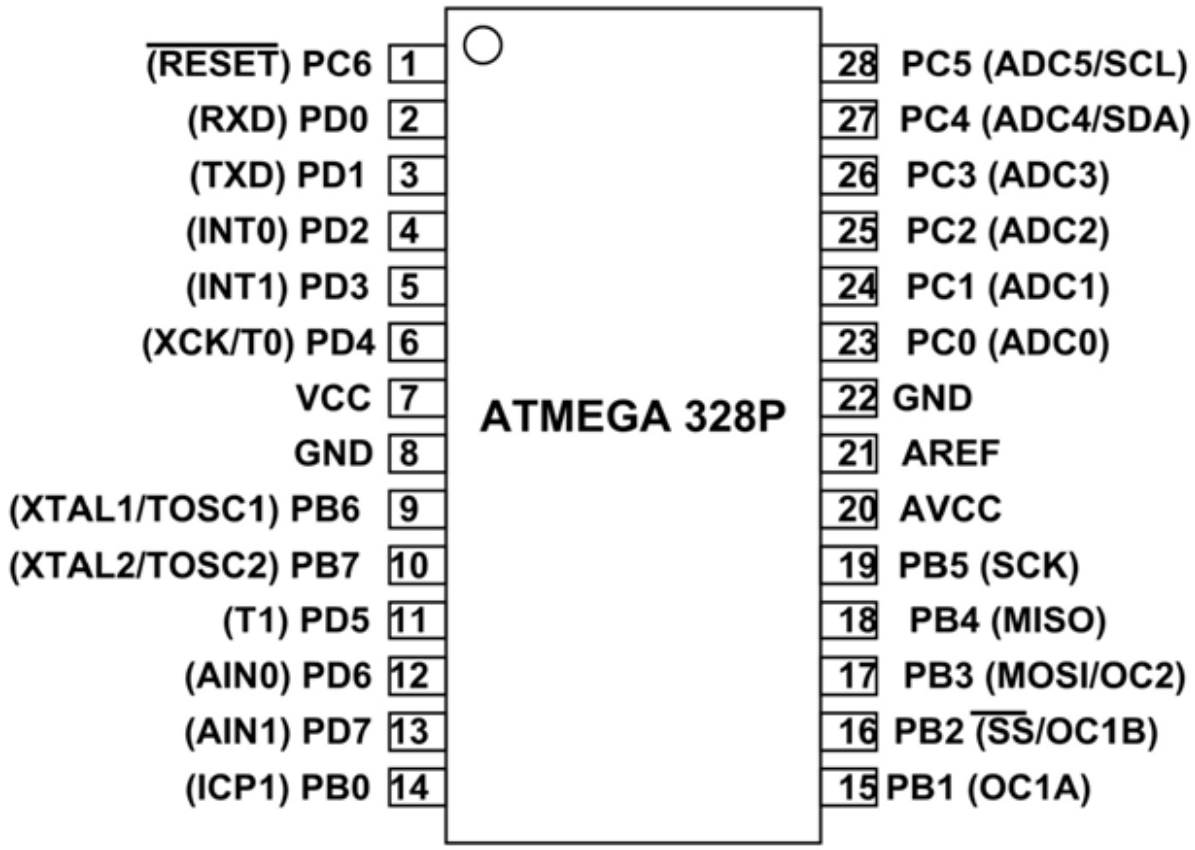
2.2.2 Light Emitting Diodes

LEDs are semiconductor devices like transistor and other diodes. LEDs are made out of silicon. What makes an LED give off light there are the small amount of chemical impurities that are added to the silicon such as gallium, arsenide, indium and nitride. When current passes through the LED, it emits photons as a by product. Normal light bulbs produce light by heating a metal filament until its while hot. Because LEDs produce photons directly and not via heat, they are far more efficient than incandescent bulbs.
LEDs emit light when an electric current pass through them [7]. Figure2.3 shows the circuit symbol for LED,
When a light emitting diode is forward biased electrons are able to recombine with electron holes within the device, releasing energy in the form of photons. This effect is called electroluminescence. Electroluminescence is an optical and electrical phenomenon in which a material emits light in response to the passage of an electric current or to a strong electric field.



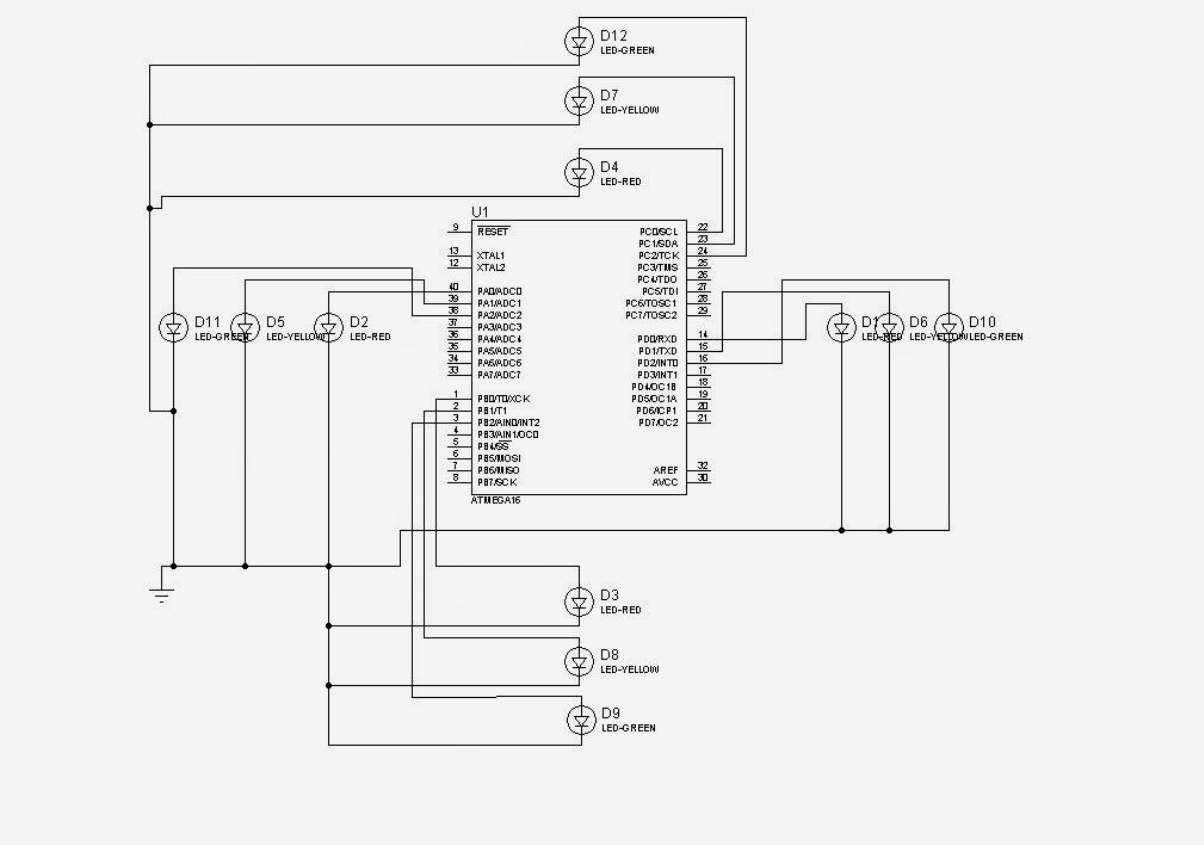
2.2.3 ATmega398p

The Atmel ATmega328/P is a low-power CMOS 8-bit microcontroller based on the AVR® enhanced RISC architecture. By executing powerful instructions in a single clock cycle, the ATmega328/P achieves throughputs close to 1MIPS per MHz. This empowers system designer to optimize the device for power consumption versus processing speed.
The ATmega328/P provides the following features: 32Kbytes of In-System Programmable Flash with Read-While-Write capabilities, 1Kbytes EEPROM, 2Kbytes SRAM, 23 general purpose I/O lines, 32 general purpose working registers, Real Time Counter (RTC), three flexible Timer/Counters with compare modes and PWM, 1 serial programmable USARTs , 1 byte-oriented 2-wire Serial Interface (I2C), a 6- channel 10-bit ADC (8 channels in TQFP and QFN/MLF packages) , a programmable Watchdog Timer with internal Oscillator, an SPI serial port, and six software selectable power saving modes. The Idle mode stops the CPU while allowing the SRAM, Timer/Counters, SPI port, and interrupt system to continue functioning. The Power-down mode saves the register contents but freezes the Oscillator, disabling all other chip functions until the next interrupt or hardware reset. In Power-save mode, the asynchronous timer continues to run, allowing the user to maintain a timer base while the rest of the device is sleeping. The ADC Noise Reduction mode stops the CPU and all I/O modules except asynchronous timer and ADC to minimize switching noise during ADC conversions. In Standby mode, the crystal/resonator oscillator is running while the rest of the device is sleeping. This allows very fast start-up combined with low power consumption. In Extended Standby mode, both the main oscillator and the asynchronous timer continue to run. Atmel offers the library for embedding capacitive touch buttons, sliders and wheels functionality into AVR microcontrollers. The patented charge-transfer signal acquisition offers robust sensing and includes fully debounced reporting of touch keys and includes Adjacent Key Suppression® (AKS™) technology for unambiguous detection of key events. The easy-to-use Suite toolchain allows you to explore, develop and debug your own touch applications. The device is manufactured using Atmel's high density non-volatile memory technology. The On-chip ISP Flash allows the program memory to be reprogrammed In-System through an SPI serial interface, by a conventional non-volatile memory programmer, or by an On-chip Boot program running on the AVR core. The Boot program can use any interface to download the application program in the Application Flash memory. Software in the Boot Flash section will continue to run while the Application Flash section is updated, providing true Read-While-Write operation. By combining an 8-bit RISC CPU with In-System Self-Programmable Flash on a monolithic chip, the Atmel ATmega328/P is a powerful microcontroller that provides a highly flexible and cost effective solution to many embedded control applications. The ATmega328/P is supported with a full suite of program and system development tools including: C Compilers, Macro Assemblers, Program Debugger/Simulators, In-Circuit Emulators, and Evaluation kits.



2.3 Switching Circuit Of Traffic Light Control System

circuit of switching based Traffic Light control system.
First of all we have connected all the negative terminal of the LED's in a common point. Then we have connected the positive terminal of Red LED's in the North and South position to a single point and in that point we have connected the Green LED's in the East and West positions. Similarly the Red LEDs of East and west and Green LED's of North and South have connected in a single point. Above connections are done because we have to glow the Red light which are in face to face each other and to glow the green lights in the opposite directions. Such as when the Red lights of east and west are glowing then the Green lights of the North and South should be glow. Similarly when the Red lights of the North and South are glowing then the Green lights of the East and West should glow. We have connected the positive terminal of Yellow LEDs to a single



3.1 Advantages

It will reduce the normal recurring. Significantly it will enhance operational tools congestion to effectively manage traffic incidents. It will improve Public Transport service.
Reduce the emergency response times and safer travel. similarly it will improve traffic guidance and traffic flow and reduce fuel consumption

3.2 Limitation Of The Study

Traffic Congestion is a serious problem despite costly effort to create an integrated method of traffic control system. The number of private automobiles used mainly by people with middle class for income, has increased faster than any form of transportation in India and this has increased a demand of expansion of roads , parking space and improved automatic traffic light control system

3.3 Conclusion

In this project I have implemented switching based, counter based. Traffic Light control

system. The hardware equipment is tested and result is obtained. This project is cost effective. Implementation of this project in present day will effectively solve the traffic congestion which is a severe problem in many modern cities all over the world. Automatic Traffic control system is based on a very effective way of optimizing traffic, with redefinition of threshold values for a real time application. This works to control traffic on four way roads according to traffic control barricades which is functioned by ICs. This proposed system will be able to build a developed country with less traffic jams and it will also help the emergency vehicle to reach in time to the destination. So, this intelligent system will help us to control traffic in more autonomous way.
In practice presently in India we are following time based control on traffic signals and we are experiencing a heavy traffic jams all over which in turn consumes lot of time and fuel. We hope this method will be adopted as soon as possible so that the limitations we are experiencing with present method can be overcome.

3.4 Future Scope

As the systems take care of few drawbacks of the existing system, there is scope for further improvement and expansion of this work. The system can be expanded with smart traffic light control and congestion avoidance system during emergencies emergency cars such as fire engines and ambulance and have priority over other traffic. This system gives highest priority to emergency vehicle to pass them.