DIGITAL TRAFFIC CONTROL SYSTEM USING ATMEGA328P MICROCONTROLLER

Prof. Anuprita Linge[1], Prof. Sayali Bawankar[2], Satyendra P. Kushawaha[3], Harshal B. Dohe[4], Shraddha P. Gurnule[5], Kalyani R. Mahalle[6], Vishal W. Warhade[7]

[1]*Professor, E&TC Engg, S.S.P.A.C.E, Maharashtra, India, anupritalinge@gmail.com*
[2]*Professor, E&TC Engg, S.S.P.A.C.E, Maharashtra, India, sayalibawankar3@gmail.com*
[3]*Student, E&TC Engg, S.S.P.A.C.E, Maharashtra, India, kushawahasatyendra397@gmail.com*
[4]*Student, E&TC Engg, S.S.P.A.C.E, Maharashtra, India, harshaldohe2@gmail.com*
[5]*Student, E&TC Engg, S.S.P.A.C.E, Maharashtra, India, shraddhagurnule18@gmail.com*
[6]*Student, E&TC Engg, S.S.P.A.C.E, Maharashtra, India, kalyanimahalle13@gmail.com*
[7]*Student, E&TC Engg, S.S.P.A.C.E, Maharashtra, India, vishal.warhade7@gmail.com*

Abstract

Traffic Congestion is major problems in the urban area. Traffic congestion at the junction reduces travel speed that's why more people late for work. The vehicles engine emit hazardous gases due to traffic congestion, Hence there is a lot of air pollution in the urban area. Traffic light is basic element in control traffic flow through specify waiting and going time. Fixed traffic light time system is bad control way in urban area because no. of vehicles is not consistency with each traffic light signal. We use the IR proximity sensor, ATMEGA328P Microcontroller and Digital Timer to increase the traffic light time for controlling the traffic. Our project is increase the time sequence, decrease the traffic on roads which side traffic is more and Detecting the air pollution in traffic area.

Index Terms: IR Sensor, ATMEGA328P Microcontroller, Digital Timer, LED light, 16x2 LCD Display Module and air pollution sensor.

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1. INTRODUCTION

Traffic lights are signalling devices that are conceived to control the traffic flows at road intersections, pedestrian crossing, rail train and other locations. Traffic lights consists of three universal coloured lights: the green light allows traffic to proceed in the indicated direction, the yellow light warms vehicles to prepare for short stop and the red signal prohibits any traffic from proceeding.

In modern life we have to face with many problems one of which is traffic congestion becoming more serious day after day. It is said that the high volume of vehicles, the inadequate infrastructure and the irrational distribution of the development are main reasons for increasing traffic jam. The major cause leading to traffic congestion is the high number of vehicles which was caused by the population and the development of economy. Traffic congestion is a condition on road networks that occurs as use increases and is characterized by slower speeds, longer trip times and increased vehicular queuing.

The conventional traffic system needs to be upgraded to solve the severe traffic congestion, alleviate transportation troubles, reduce traffic volume and waiting time, minimize overall travel time, optimize cars safety and efficiency and expand the benefits in health, economic and environmental sector. This paper proposes a simple, low-cost and real time digital traffic light control system. In the simplest sense digital traffic light control system adjust the timing of their green light cycles to match current traffic conditions on the road. They are constantly collecting data about approaching vehicles in front of IR sensor device and software creating new timing sequence to match them by using timer IC. This sensor is mounted both side on the road at the particular distance from an intersection point.

Traffic congestion is now considered to be one of the biggest problems will be also much more widely increasing as an expected result of the growing number of transportation means and current low-quality infrastructure of the roads. In addition, many studies and statistics were generated in developing countries that proved that most of the road accidents are because of the very narrow roads and because of the destructive increase in the transportation means. The vehicles engine emitted an environmental hazardous gases due to heavy traffic congestion at the traffic signal. We use the air pollution detector sensor to detect the daily average pollution in percentage and it is display on the digital display.

2. HARDWARE COMPONENT

2.1 IR sensor

An Infrared sensor or IR sensor is an electronic device implemented to obstacle sensing, colour detection, fire detection or to differentiate between objects depending on its feature. The sensor provides a digital output. The IR sensor emits or receives the infrared radiations (430 THz – 300 GHz) that are invisible for the human eye. The sensor outputs a logic one (+5V) at the digital output when an obstacle is come in front of the sensor and a logic zero (0V), when there is no obstacle in front of the sensor. LED is used to indicate the presence of an object.
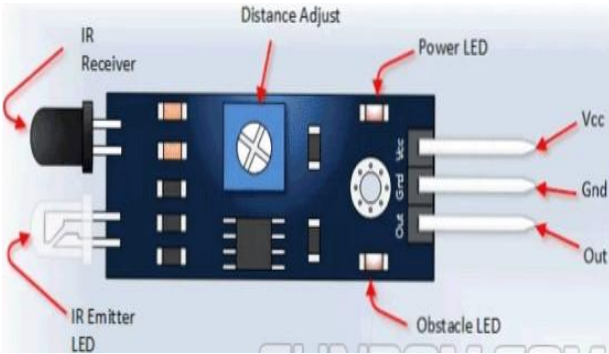
Fig.(a): IR sensor

2.2 ATmega328P Microcontroller

The ATmega328 is a single-chip microcontroller created by Atmel in the mega AVR family (later Microchip Technology acquired Atmel in 2016). It is an 8-bit and 28 pins AVR Microcontroller and has a flash type program memory of 32KB. It has an EEPROM memory of 1KB and its SRAM memory is of 2KB. It has 8 pin for ADC operations, which all combines to form Port A (PA0 – PA7). It has 14 digital I/O pins, of which 6 can be used as PWM outputs and 6 analog input pins. These I/O pins account for 20 of the pins. The pinout for the Atmega328 is shown below
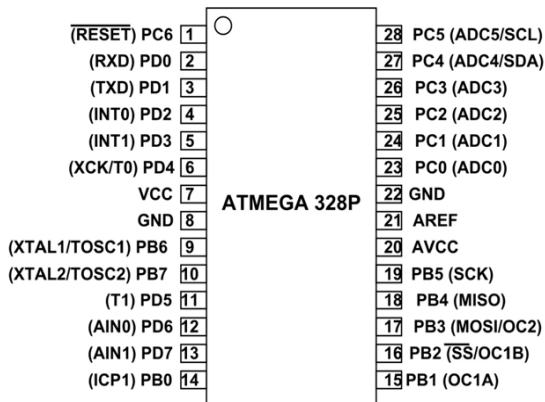

Fig.(b): Pin configuration of the ATmega328P Microcontroller

2.3 16x2 LCD Display Module

An LCD is an electronic display module which uses liquid crystal to produce a visible images. The 16x2 LCD display is a very basic module commonly used in DIYs and circuits. The 16x2 translates 0 a display 16 characters per line in 2 such lines.
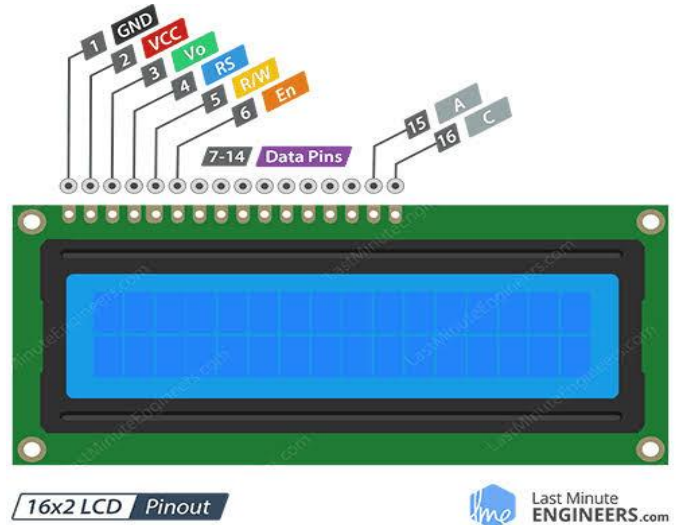

Fig.(c): 16x2 LCD Display Module

2.4 Air pollution sensor

Air pollution sensors are devices that monitor the presence of air pollution in the surrounding area. They can be used for both indoor and outdoor environments. Although there are various types of air pollution sensor. We used MQ135 Gas Sensor module for Air Quality having digital as well as analog output. Sensitive material of MQ135 gas sensor is SnO2, which with lower conductivity in clean air. When the target combustible gas exist, The sensors conductivity is more higher along with the gas concentration rising. MQ135 gas sensor has high sensitivity to ammonia, sulphide and benze steam, also sensitive to smoke and other harmful gases.

Fig.(d): MQ135 Gas Sensor

It is with low cost and suitable for different application. At best, low-cost air quality sensors can provide air quality monitoring of specific pollutants.

3. BLOCK DAIGRAM OF TRAFFIC SIGNAL

In Traffic control system , When any vehicles comes in front of IR sensor transmitter send the signal to the receiver than Receiver send the signal to the microcontroller for delaying the timing sequence of the traffic light system when the traffic is more. We have used serial to parallel converter shift register it is convert single input to the multiple output. LCD screen display the every timing sequence and average air pollution due to the traffic in urban areas. Crystal oscillator generate the 16M Hz frequency continues.
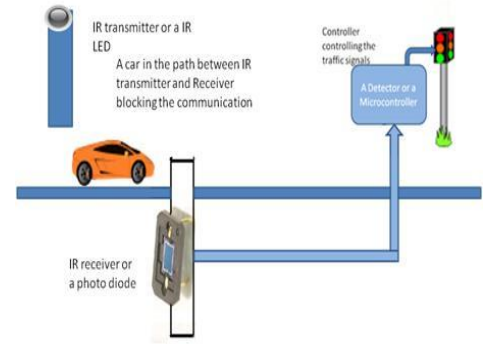

Fig.(e): Block diagram of traffic signal

4. WORKING

A digital traffic control system can be made using IR sensors along with micro controller and LED's which can prove a worth for the real time application controlling traffic signals based on the congestion of traffic. IR sensor placed in the entire intersecting road at fixed distance from the signal placed in the junction the time delay in the traffic signal is set based on the congestion of vehicles on the road.

The IR sensor is used to change the number of vehicles in the road according to the IR count, microcontroller takes appropriate decisions as to which road is to be given the highest priority and the longest time delay for the corresponding traffic light. We will be implement IR sensor in the range of 50m's to 100m's range in real time implementation.

The system consist of the following three hardware components: Display, Detector & Controller. We used three type of LED's Red, Yellow & Green each side of junction. Detector sense the presence of vehicles in front of sensor and send the signal to the microcontroller for increasing the new time sequence.

Fig.(f): Working of IR sensor

We used MQ135 gas sensor module to sense air pollution due to density of traffic at the traffic signal in urban area. Display the daily average percentage of air pollution in the traffic areas.
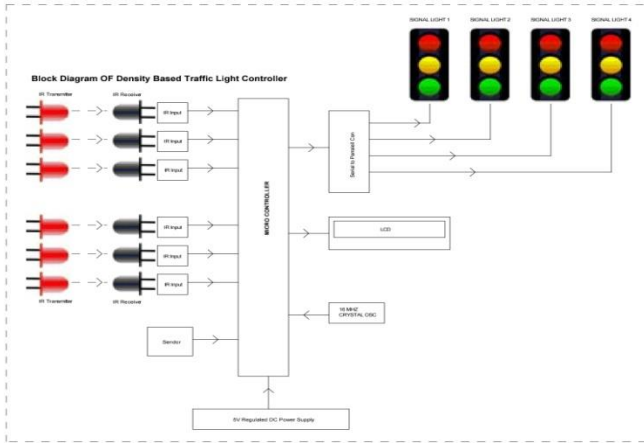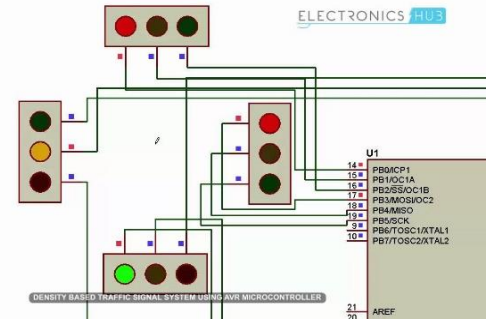

Fig.(g): Overall view of traffic signal

5. ADVANTAGES AND APPLICATION

Digital traffic control reduce traffic congestion and time spend on the road to Improve efficiency. Make the road safer and reducing the chance of accidence. It provide data to further improve transportation. It reduce the possibilities of traffic jams caused by traffic lights an extend and decreases pollution by reducing congestion.

This Traffic Control system is very efficiently used in metro cities. It will help us to reduce traffic problems in urban areas. It is used to reduce the rout of traffic.
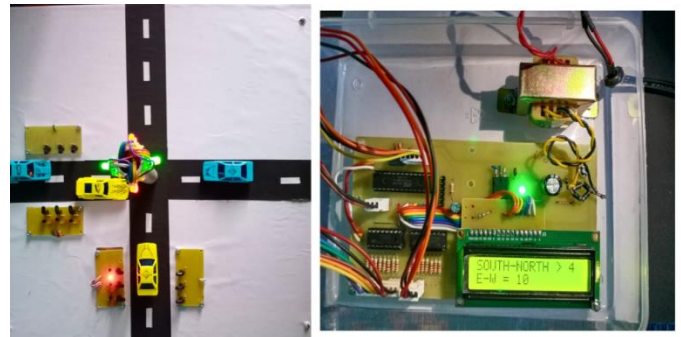
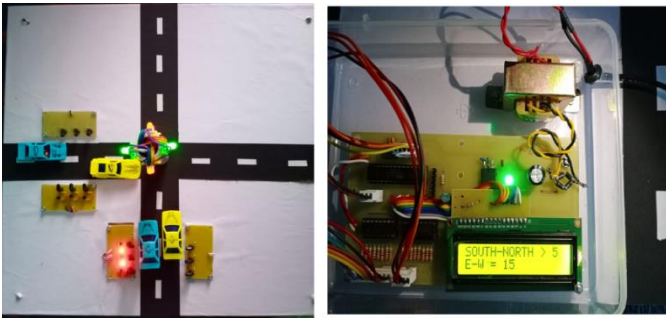## 6. RESULT

Fig.(h): When first IR Sensor will blocked.

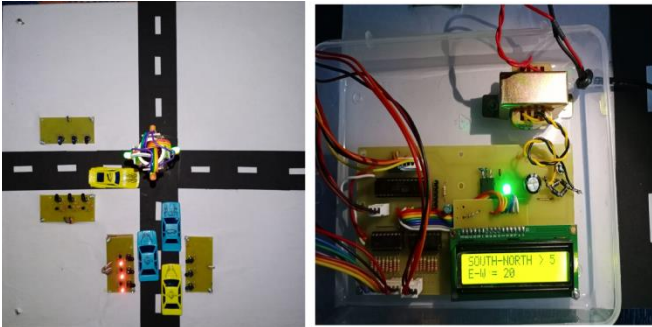**Fig.(i): When first and second IR Sensor will blocked.**

Fig.(j): When all IR Sensors will blocked.

7. CONCLUSION AND FUTURE SCOPE

In this paper we have studied the optimization of traffic controller in cities using IR sensors and microcontroller. Since the IR sensor costs less the project costs less. Presently in the general system usage the important vehicles like ambulance, fire engines, government vehicles, etc. those can't be stop for longer duration. Whenever there is high density traffic on one side then controller given the green colour for more time on that side. Once the traffic density is cleared on all side the general timing is followed.

In future this system can be used to inform people about different places traffic condition. We can used GSM module to track location of vehicles.

8. REFERENCES

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