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Sensor Based Traffic Light Controller Using Arduino

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ABSTRACT:

The main objective of this paper is designing a Sensor Based Traffic Signal System where the timing of signal will change automatically on sensing the traffic density at any junction. Traffic congestion is a severe problem in most cities across the world and therefore it is time to shift more manual mode or fixed timer mode to an automated system with decision making capabilities. Present day traffic signalling system is fixed time based which may render inefficient if one lane is operational than the others. To optimize this problem we have made a framework for traffic control system. This is achieved by using PIR(proximity Infrared sensors). Once the vehicle count is calculated, automatically the glowing time of green light is assigned by the help of the Arduino UNO. And along with these RF transmitter and receiver are used to detect the frequency of emergency vehicles. By using this we can reduce time for waiting when there is less traffic. Thus, optimization of traffic light switching increases road capacity and traffic flow and can prevent traffic congestions.

KEYWORDS: Arduino UNO, IR sensors, LED's, RF Transmitter and Receiver, LCD.

1.INTRODUCTION:

Traffic has become a major problem in our day to day life. Micro processors and micro controllers are the major parts of Traffic Light Controller (TLC).Functioning of TLC is completely based upon the software used and it does not have the flexibility of modification of the program on real time basis[1]. Due to the fixed time intervals of the lights used to control the traffic the waiting time is more and automobiles uses more fuel. In earlier method, Fuel consumption is used for switching of LED'S at junctions[3]. But because of large capacity vehicles at smaller densities, LED will allow the particular junction. Sometimes higher traffic density at one side of the junction demands longer green time as compared to standard allotted time. We, therefore propose here a mechanism in which the time period of green light and red light is assigned on the basis of the vehicle count of the traffic present at that time.

To make traffic light controlling more efficient, there is a new technique called as "Sensor based Traffic Light Controller using Arduino UNO". This new technique makes use of sensor networks along with embedded technology. Once the density is calculated, the glowing time of green light is assigned by the help of the microcontroller (Arduino). The timings of

all the lights at each crossing of the roads will be intelligently decided based on the total traffic in all the adjacent road. In subsequent sections, we have elaborated the procedure of this framework to control traffic congestions like in most of the time the traffic will at least for 100meters.In this distance the traffics police can't hear the siren form the ambulance. so he ignores this .Then the ambulance has to wait till the traffic is left. Some times to leave the traffic it takes at least 30 minutes .So by this time anything can happen to the patient .So this paper can avoid these disadvantages. According to this paper if any ambulance comes near to any traffic post then the ambulance will have highest priority and the traffic signals automatically give red signal to remaining routes to stop the traffic and give green signal for this ambulance side[5].

2. METHODOLOGY:

In this method, we are replacing all components like MYDAQ, MAX232, ADC by using ARDUINO UNO. It has inbuilt memory. We are using IR sensors to count the vehicle count by continuously transmitting IR rays. We are developing a system which will automatically change the traffic signal based on traffic density and RF transmitter and receiver are used to detect the frequency of emergency vehicles. By using this we can reduce time for waiting when there is less traffic.

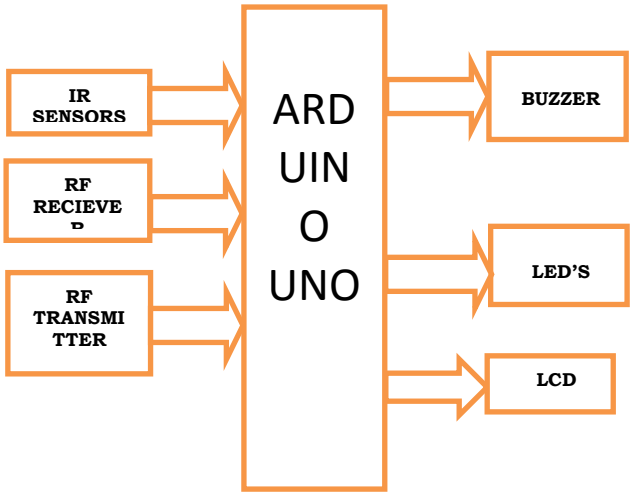


Fig.1 Block Diagram

3. IMPLEMENTATION OF HARDWARE:

The problem with the traffic system is that for every minute the vehicles at the 4-way road will be heavy and the traffic lights shall be changed to each side for some fixed time. Even though there are no vehicles at particular side, the traffic signals will glow for given fixed time. Due to that there is time waste process. Due to this other side vehicles have to wait for the time to complete the process. So to reduce the wastage of time, we can implement the system that controls the traffic based on the heavy flow of vehicles at any particular side. With this system, we shall count the number of vehicles at each side at the junction and give the path to the particular side which has heavy flow of vehicles and keep remaining stop position. So that for this to count the number of vehicles at side of the junction, we shall use IR technology. The IR sensors which are present on sides of the road will detect the presence of the vehicles and count the vehicles .These will sends the analog information to the microcontroller where it

will decide how long a flank will be open and set the timer on the basis of vehicle count to change over the signal lights.

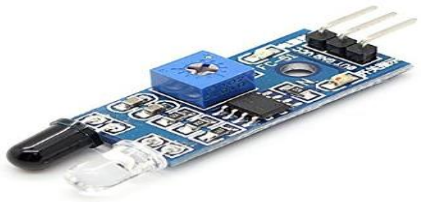


Fig.2 IR Sensor

Once the information received to arduino, then on the basis of IDE program the following conditions can be implemented. It can converts digital through ADC which is present in Arduino. There is a wireless Intelligent Traffic light control system for ambulance. This project works as normal traffic light system and when a ambulance comes within a 20 meters range of traffic signal, then all the signals are changed to RED. So the ambulance can cross the signal easily.

An RF transmitter is fitted inside the ambulance, and when the RF signal is received by the receiver at the traffic light signal. It changes all signals to red. Once the ambulance passed out from the signal, then the signal control comes normal.

Fig:3.RF Transmitter and Receiver

The Arduino UNO is a microcontroller board based on the ATmega328. It is made of 14 digital input output pins in which 6 can be used as PWM outputs. And also it has 6 analog inputs, a 16 Mhz ceramic resonator, a USB]connection, a power pack ,and a reset button. It has everything needed to support the microcontroller. It is so simple that it is to be connected to computer with a USB cable or power it with a AC- to DC adaptor or battery to get started.

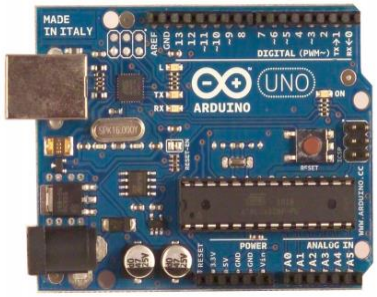
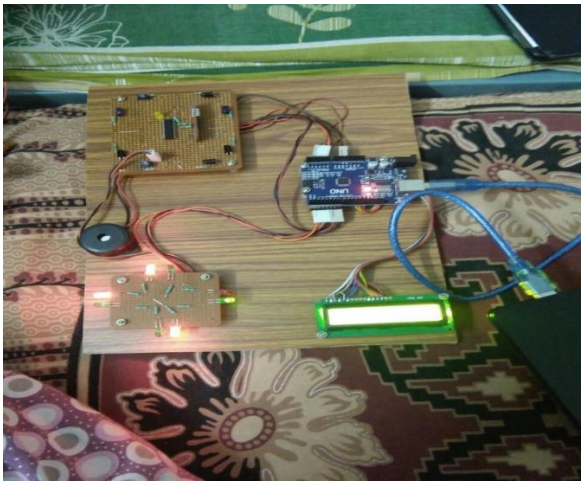
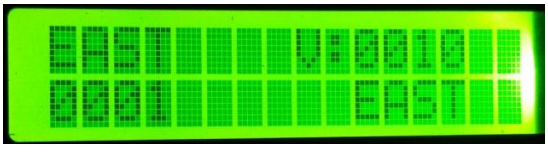


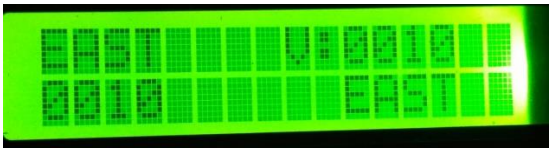
Fig.4 Arduino UNO

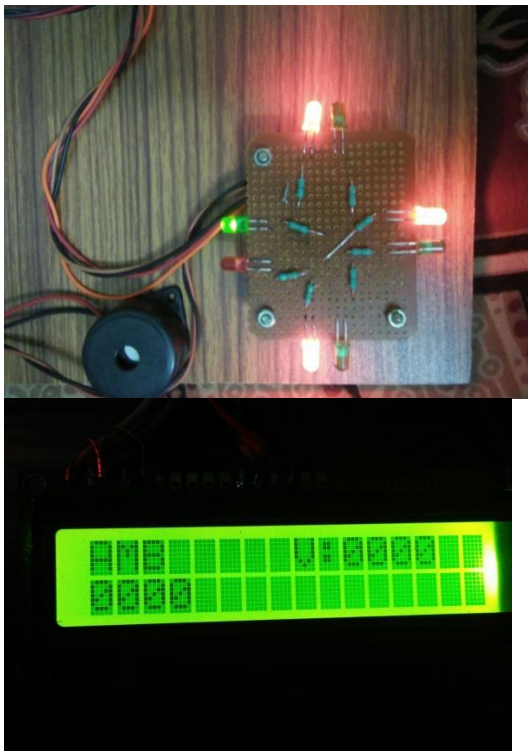
4. RESULT:

By using this technique the desired result is observed in the below fig.









5. CONCLUSION:

This paper may help in the future to be free from traffic problems. As the components used in the system is less cost and efficiency is more because the IR sensors are used for counting the number of vehicles at each way of the junction. The Arduino UNO used is a simple prototype model which works more efficiently.

6. FUTURE SCOPE:

The increasing number of mega cities and the population growth in developed and developing countries has increased the importance of deploying an intelligent transport system (ITS). ITS system constitutes both, road transport and an efficient metro/underground rail system. ITS involves the revamp of overall technological aspects such as GPS, Carrier Access for Land Mobiles (CALM), Dedicated Short Range Communication (DSRC) etc.

Globally, the concerned government departments understand the importance of implementing an efficient ITS system, which is an important driving factor for the market growth. Therefore, these departments are formulating specific programs and taking initiatives to implement the system. For example, the U.S. Department of Transport (DOT) is focusing on intelligent infrastructure, intelligent vehicles and integration of these two factors.

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