Density based Traffic Control System with Ambulance Detection

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***Abstract*: Traffic congestion is a severe problem in most of the cities across the world and it has become a nightmare for the citizens. It is caused by delay in signal, inappropriate timing of traffic signalling etc. The delay of traffic light is hard coded and it does not depend on traffic. Therefore, for optimising traffic control, there is an increasing demand in systematic quick automatic system. This paper is designed to develop a density based dynamic traffic signal control. The signal timing changes automatically on sensing the traffic density at the junction. The microcontroller used in this project is ARDUINO. The system contains IR sensors (transmitter and receiver) which will be mounted on the either side of the road on poles. It gets activated and receives the signal as the vehicles passes close by it.**

***Key Words:* Traffic congestion, Ambulance, Intelligent traffic control system, Arduino, IR Sensor, Acoustic Sensor**

1. INTRODUCTION

Mostly cities, traffic is becoming a prime problem for day to day life. So, lots of techniques are taken into concern to subdue the traffic. We have also presented our technicality by designing the density-based traffic signal system using Arduino Uno AT Mega 328P. For the same at first, we have considered four IR sensors, eight LED's, eight 220 ohms resistors and one Arduino Uno which acts as the microcontroller. Here he IR sensors are used to measure the traffic density i.e., the number of vehicles are counted that are passing through the each IR sensor which is called as traffic density and the four IR sensors are interfaced with the Arduino Uno. The Arduino Uno has 28 pin configuration and also consist of 14 digital I/O pins (out of 14 pins, 6 can be used as PWM outputs), six Analog inputs, 16MHz crystal, USB connection, power jack, ICSP header, reset button. Here three different colour light emitting diode i.e. red, yellow and green are applied, according to the traffic conditions.

1.1 BLOCK DIAGRAM

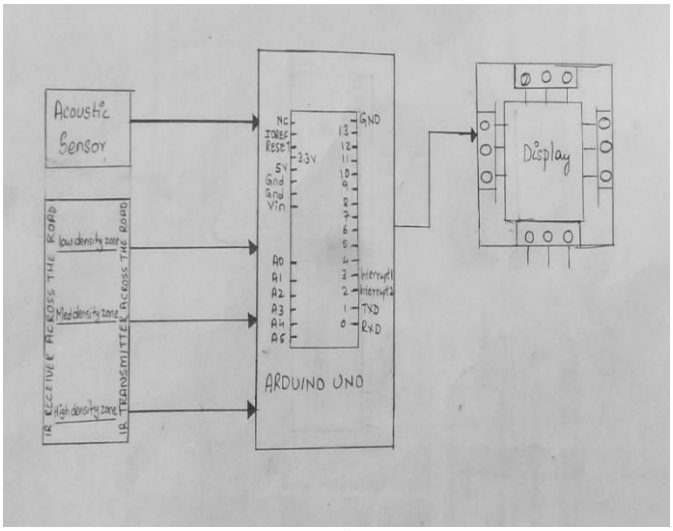

Fig -1: Block diagram of the proposed system

The basic block diagram of the density-based traffic control system is as shown in figure 1. It consists of four roads, IR Sensors, Acoustic Sensor, a microcontroller unit and signal lights (LED's).

The components required are as follows:

1. IR Sensor
2. Light emitting diode
3. Arduino UNO
4. Acoustic Sensor

1.1.1 IR Sensor

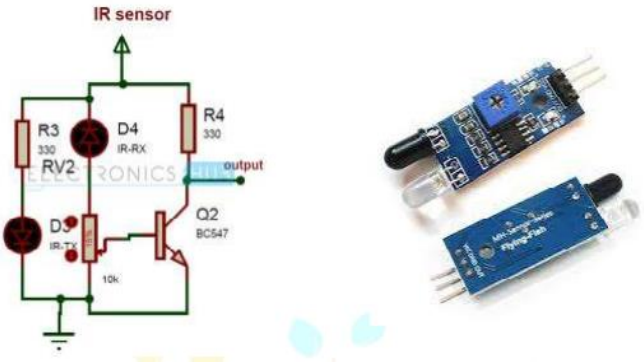

Fig -2: IR Sensor

An IR (Infrared) sensor is an electronic device which can be used to sense certain parameters of its surroundings by either emitting or detecting radiations. It can also measure heat of

an object and detect motion. It uses the infrared light to sense objects in front of them and map or guess their distance. This system consists of 8 IR sensors as a detector of 4 junctions. IR transmitter looks like an LED. This IR transmitter always emits IR rays from it. The operating voltage of this IR transmitter is 2 to 3v. These IR (infra-red) rays are invisible to the human eye. But we can see these IR radiations through camera. IR transmitter transmits IR rays that are received by IR receiver. Generally, IR receiver has high resistance in the order of mega ohms but when it is receiving IR rays the resistance is very low. The operating voltage of IR receiver also 2 to 3V. We have to place these IR pair in such a way that when we place an obstacle in front of this IR pair, IR receiver should be able to receive the IR rays. When power is supplied, the transmitted IR rays hit the object and reflect back to the IR receiver.

1.1.2 Light Emitting Diode

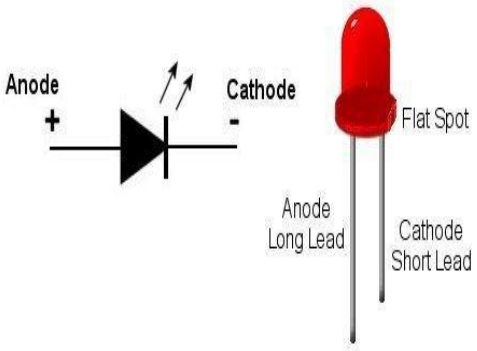

Fig -3: Symbol of LED

A light-emitting diode (LED) is a two-lead semiconductor light source. It is a p–n junction diode, which emits light when activated. When a suitable voltage is applied to the leads, electrons are able to recombine with electron holes within the device, releasing energy in the form of photons. This effect is called electroluminescence, and the colour of the light (corresponding to the energy of the photon) is determined by the energy band gap of the semiconductor. LED's are typically small (less than 1 mm2) and integrated optical components may be used to shape the radiation pattern.

1.1.3 Arduino Uno

Arduino/Genuine Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button.It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

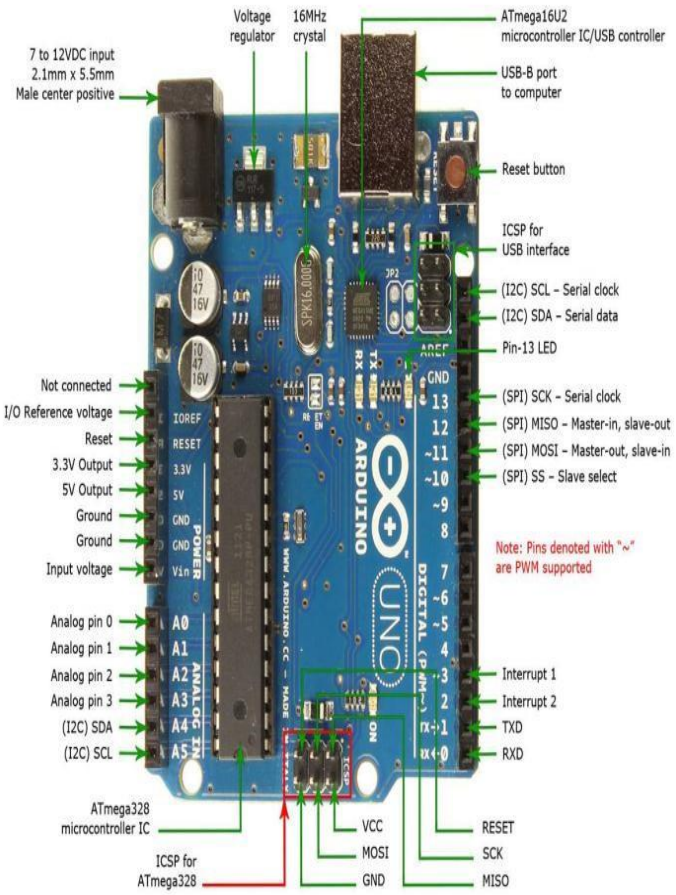

Fig -4: Arduino UNO

1.1.4 Acoustic Sensor

Fig -5: Acoustic Sensor

The Acoustic sensor module is a simple microphone based on a op-amp LM358 to amplify the sound strength of the environment like door knocks and etc loud enough to be picked up by a microcontroller's Analog to Digital converter. The value of output can be adjusted by the potentiometer.

2. CIRCUIT DIAGRAM

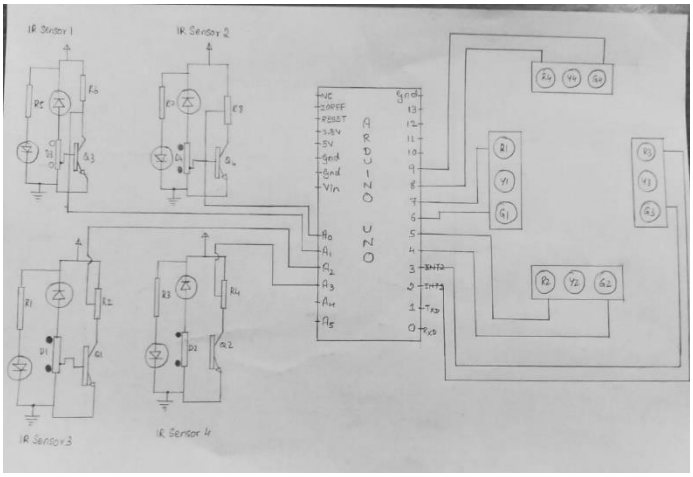

Fig -6: Circuit diagram of the proposed system

The model works on the principle of changing delay of Traffic signals based on the number of cars passing through an assigned section of the road. There are four sensors placed at four sides of a four-way road which counts the number of cars passing by the area covered by the sensors. Here we are using IR sensors replacing traffic control system to design a density-based traffic signal system. IR sensor contains IR transmitter IR receiver (photodiode) in itself. These IR transmitter and IR receiver will be mounted on same sides of the road at a particular distance. As the vehicle passes through these IR sensors, the IR sensor will detect the vehicle & will send the information to the microcontroller.The microcontroller will count the number of vehicles, and provide the glowing time to LED according to the density of vehicles. The lane or road which has the higher density, then the LED will glow for higher time than average or vice versa. The traffic lights are initially running at a fixed delay of 1000 milliseconds, which in turn produces a delay of 1000+1 milliseconds in the entire process. This entire embedded system is placed at that junction. Microcontroller is interfaced with LED's and IR sensors. The total number of IR sensors required are 4 and LED's are 8. Therefore, these are connected to any two ports of the Arduino.IR sensor module consists of IR transmitter and IR receiver.

3.HARDWARE OF THE PROPOSED SYSTEM 0

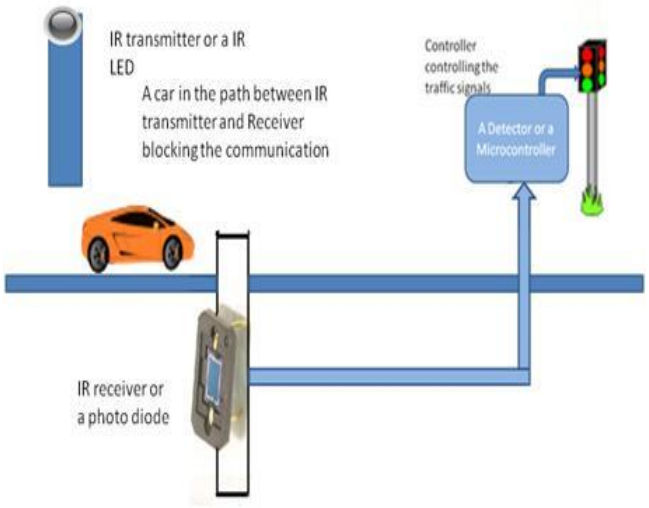

Fig-7: Hardware of the proposed system

Our project density-based traffic light control is an automated way of controlling signals in accordance to the density of traffic in the roads. IR sensors are placed in the entire intersecting road at fixed distances from the signal placed in the junction. The time delay in the traffic signal is set based on the density of vehicles on the roads. The IR sensors are used to sense the number of vehicles on 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

4.AMBULANCE DETECTION

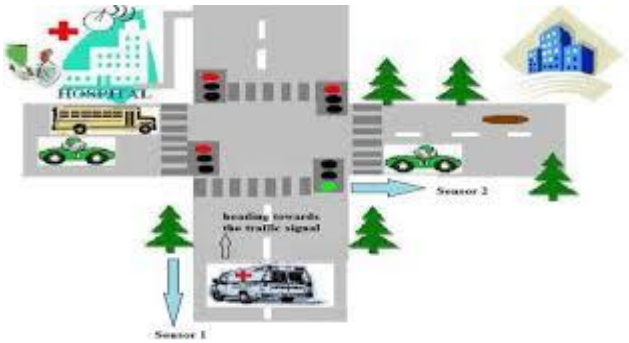

Fig-9: Ambulance detection with acoustic sensors

The acoustic sensors collect the siren signals and forward them to the Road Side Unit. The Road Side Unit includes a frequency measuring controller (Arduino UNO) to detect the emergency vehicles. The RSU collects the siren signals from the acoustic sensors and forwards them to the frequency measuring controller. The controller detects the emergency vehicle by its siren frequencies. The controller measures the frequencies of siren signals and computes the average of measured frequencies. The frequency measuring controller sends the alert signal to the traffic signal controller (Arduino Uno), if the frequency is between the range of yelp or wail. The traffic signal controller stops the fixed sequence and light length algorithm and executes the emergency vehicle

dispatching algorithm on receipt of arriving emergency vehicle information. The data collection module gathers the data from all the RSU's and forwards it to Traffic Signal Control Module The controller executes the proposed algorithm and sends its decision to traffic lights. After the passage of an emergency vehicle(ambulance), the system resumes its normal operation, i.e. Fixed sequence and light length algorithm.

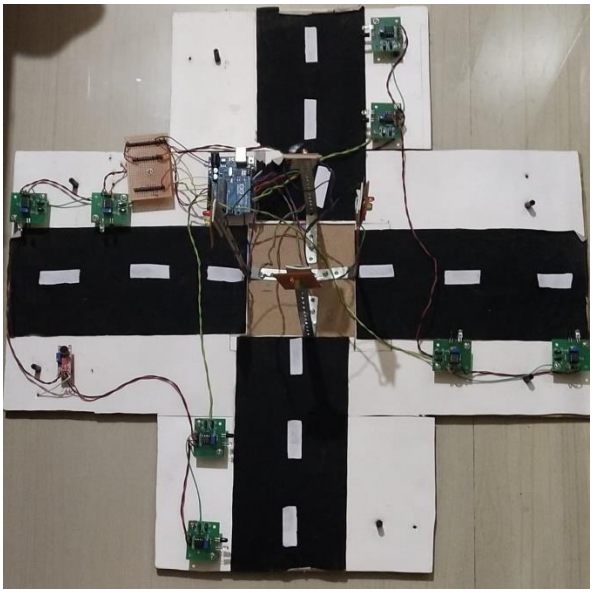

Fig-10: Demonstration Board

5.CONCLUSION

In this paper we have studied the optimization of traffic light controller in a city using Arduino and IR sensors. A traffic light system has been designed and developed with proper integration of both the hardware and the software. This interface is synchronized with the whole process of the traffic system. Automatically, this project could be programmed in any way to control the traffic light model and will be useful for planning proper road system.

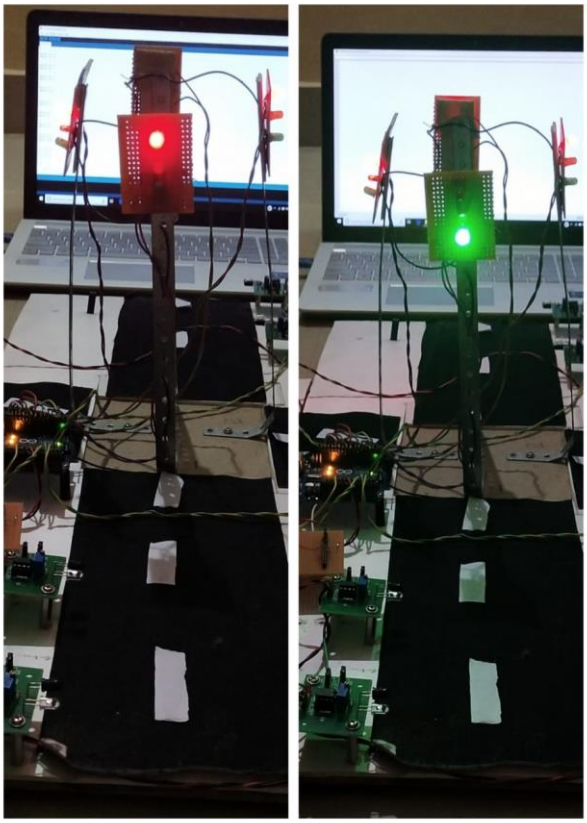

Fig-11: Result of the Density Based Traffic Control System

REFERENCES

[1] M. A.A. Parkhi, Mr. A.A. Peshattiwar, Mr. K.G. Pande "Intelligent Traffic System Using Vehicle Density". Yeshwantrao Chavan College of Engg., Nagpur. International Journal of Electrical and Electronic Engoneers, 2016.

[2] Bilal Ghazal, Khaled ElKhatib "Smart Traffic Light Control System". Conference Paper- April 2016.

[3] Dinesh Rotake, Prof. Swapnil Karmore "Intelligent Traffic Signal Control System Using Embedded System". G.H Raisoni College of Engineering, Nagpur. Innovative Systems Design and Engineering, 2012.

[4] Malik Tubaishatr, Ti Shang and Hongchi Shi "Adaptive Traffic Light Control with Wireless Sensor Networks". Article January 2007.

[5] Nang Hom Kham, Chaw Myat New "Implementation of Modern Traffic Light Control System". Department of Electronic Engineering, Mandalay Technological University, Myanmar. International Journal of Scientific and Research Publications, June 2014.

[6] Khalil M. Yousef, Jamal N. Al-Karaki, Ali M. Shatnawi "Intelligent Traffic Light Flow Control System Using Wireless Sensors Networks". Journal of Information Science and Engineering, May 2010

[7] Shilpa S. Chavan, Dr. R. S. Deshpande & J. G. Rana (2009) "Design of Intelligent Traffic Light Controller Using Embedded System" Second International Conference on Emerging Trends in Engineering and Technology