Density Based Traffic Control System with Priority for Emergency Vehicles

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Abstract— In recent years there has been rapid increase in the population of the vehicles, especially in metro cities. Traditional traffic control systems failed in efficient time management. In this paper we propose a traffic system based on the density of the vehicles and provide override for the emergency vehicles. The system proposes different time slots allotted to each road according to the density on it and therefore provide efficient time management. The system also provide signal override control in case of emergency vehicles such as fire brigade, ambulance, etc using sound sensors. The system 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 system contains IR sensors 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. If high density traffic condition is detected, then more time is provided to the road with high traffic density. If low traffic density is detected, less time is provided to that particular road.

Keywords: Low Traffic Density, High Traffic Density, Emergency Override, Sound Sensors

I. INTRODUCTION

Nowadays the major problem faced in metro cities is traffic congestion. Getting stranded in between traffic is a headache for the person driving the vehicle and also the police controlling the traffic. Previously a traffic police was deployed at each junction to control the traffic by hand signals. This was found to be quite cumbersome and then came the need for the traffic Control signals. This conventional traffic played important role in major cities but as time passed, with increase in the density of vehicles, this system became inefficient in time management. So the density based traffic control system is proposed where in different time is allocated to each road depending on the density on it. The project also aims at providing override for emergency vehicles like ambulance, etc. through the usage of sound sensors. It happens when there is an emergency vehicle stuck in heavy traffic. The proposed project is therefore happens to be the perfect solution in high population cities.

II. LITERATURE SURVEY

The author in [1], developed an adaptive traffic control system based on a traffic infrastructure using wireless sensor network to control the flow of traffic. They also developed an intelligent traffic controller to control the operation of the traffic infrastructure supported by WSN. It senses the traffic and dynamically changes the traffic lights through wireless transmission. It only adds convenience to already existing traffic light system and not safety.

In Journal [2], traffic density was tracked at junctions using Road Side Units and was used to control traffic signals. The method also provides priority for emergency vehicles. Vehicular Act HOC Network (VANET) was used which provides safety and comfort for passengers on road.

In Journal [3], the emergency vehicles like ambulance and so on are detected through a surveillance camera. The captured image is processed in Arduino for clearing the traffic.

III. BLOCK DIAGRAM

The proposed system consists of the following hardware components:

- IR sensors
- Arduino Mega
- LEDs
- LCD display
- Sound sensors

The proposed system uses Arduino IDE and Embedded C as software components.

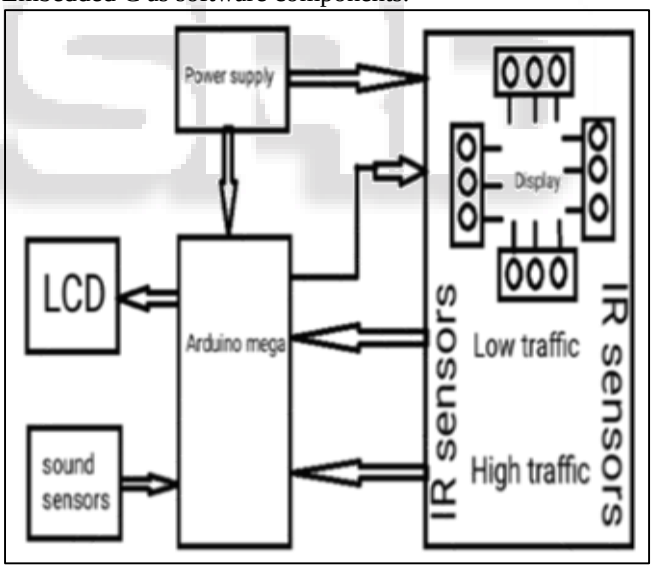

Fig. 3.1: Block diagram of proposed system

IV. METHODOLOGY

The proposed 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 vehicles on the road. According to the IR Output, Arduino Mega takes appropriate decisions as to which road is to be given the highest priority and the longest time delay for the corresponding traffic light.

The emergency vehicles are detected using sound sensors placed at each road. The road at which the emergency vehicle like ambulance arrives, that particular road is provided with green light in order to provide override. Priority is preferred for emergency vehicles even though there is heavy traffic density.

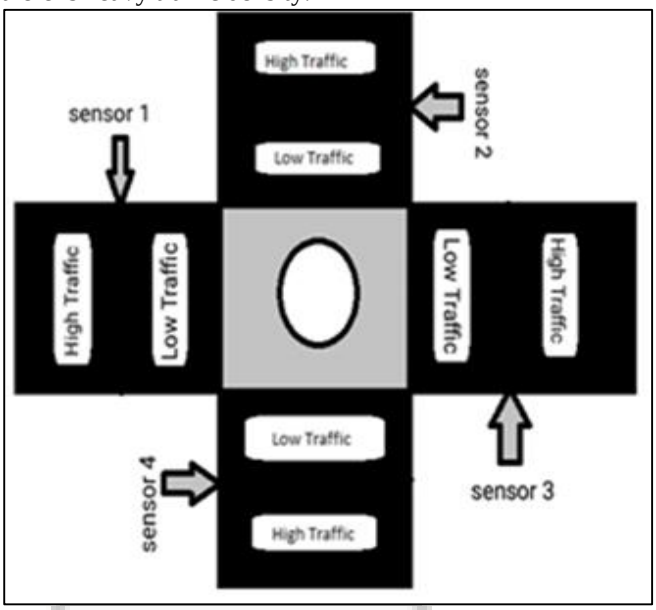

Fig. 4.1: Overview of proposed system

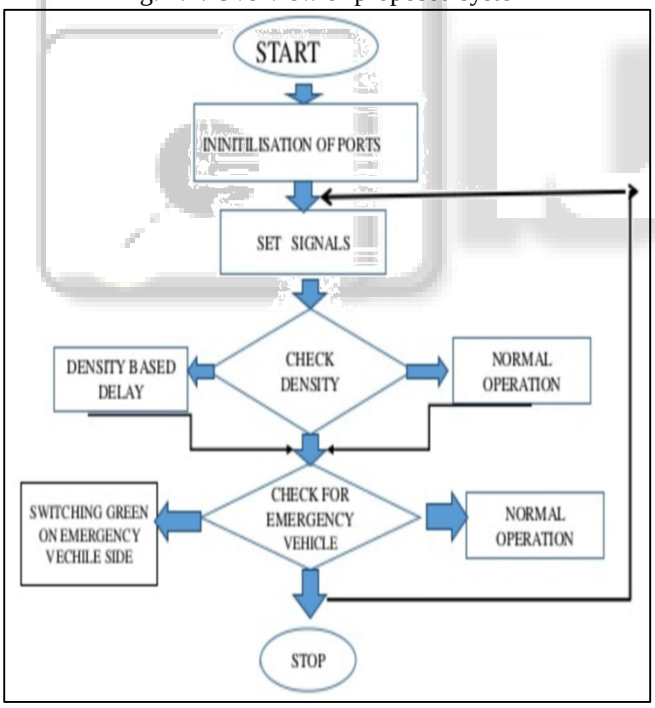

Fig. 4.2: Flow chart for proposed system

A. Case1: Measurement of Low traffic density[1]

When there is no output from the IR sensor then the Arduino Mega takes the input as low traffic density. Hence less time (1s) is allotted for the roads having low traffic density.

B. Case2: Measurement of High traffic density[2]

Measurement of high traffic density is done by IR sensor placed in all four roads. When there is output count from the IR sensors, count from all the IR sensors placed in all four roads are compared. More time is allotted for that particular road which has more count. Therefore, 3sec is allotted for the road with high traffic density.

Fig. 4.3: Green signal provided to road 4 for more time due to high traffic

C. Case3: Emergency Override[3]

We use sound sensors to sense the emergency vehicle. When an emergency vehicle arrives at a particular road, the sound sensor[4] senses the vehicle and sends the output to Arduino mega which is programmed in such a way that the traffic signal at road in which the emergency vehicle is arriving is turned green irrespective of traffic density in any of the roads. The green signal is on until the emergency vehicle passes the traffic signal. Later when the emergency vehicle passes the traffic signal the traffic control system returns to normal condition.

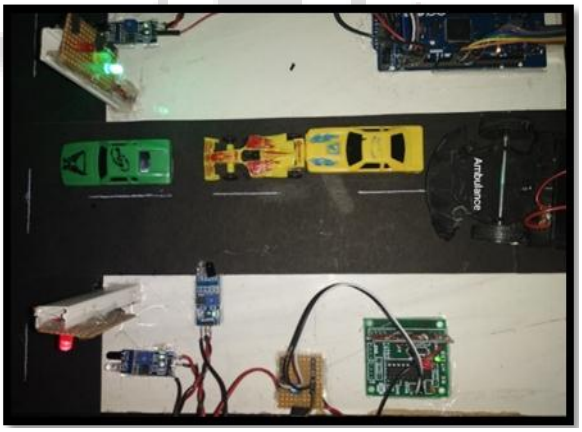

Fig. 4.4: Emergency condition

D. LCD in the Next Junction:

If there is heavy traffic in the junction 1, this condition is displayed on LCD in junction 2. This is to notify the people in the next junction about the traffic in the first junction so that they can divert to other routes if there is high traffic density in first junction. Even the emergency condition is displayed on the LCD.

V. RESULT

The program coded for traffic system are compiled using Arduino IDE using C language. The output from the IR sensors are fed as input to the computing block of statements

in the code. The code then allots time to roads based on the output. If emergency vehicle is detected through sound sensors module then the microcontroller provides override for that particular road.

SL No	Traffic condition	Output
1	Low Traffic	Greenlight on for 1sec
2	High Traffic	Greenlight on for 3sec

Table 1: Traffic conditions and corresponding Outputs

VI. ADVANTAGES

- Avoids wastage of time due to the traffic
- Fully automatic
- Low power consumption
- It provides the easy access in the traffic light
- Low cost to design the circuit, maintenance of the circuit is good
- By using this Arduino Mega we can create many more control to the appliances
- Easy convenience to handle.

VII. CONCLUSION

The above proposed system provides efficient time management which is advantageous compared to the conventional traffic control signals. When there is low traffic, Green light is ON for 1sec. When there is high traffic density, Green light is ON for 3sec based on comparison with other roads. This system would reduce the human intervention. It is inexpensive and does not require any external device in the vehicle making it more practical than the existing system.

REFERENCES

[1] 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.
[2] Shweta N Pable, "Implementation on Priority based signal management in traffic system", International Journal of Engineering Research and Technology (IJERT),Volume: 03, Issue: 05, May 2014.
[3] Mr.M.Nithyakumar, P.Aswin, D. Bharathi Shree, M.P.Dharmeesh, M.Kalaivani, "Traffic clearance for emergency vehicles using priority mode", International Research Journal of Engineering and Technology (IRJET) Volume: 04, Issue: 03, March 2017.
[4] Veeravenkatesh, Nazneensyed, "smart traffic control system for emergency vehicle clearance" International journal of innovative Research in Computer and communication engineering-Vol3, issue 8, August 2015.
[5] G.Monika, N.Kalpana, Dr.P.Gnanasundari, "An Intelligent Automatic Traffic Light Controller using Embedded Systems", International Journal of Innovative Research in Science, Engineering and Technology, Vol. 4, April 2015.
[6] K.Vidhya, A.Bazila Banu, "Density Based Traffic Signal System", International Journal of Innovative Research in Science, Engineering and Technology, Vol. 3, April 2014.
[7] Koushik Mandal, Arindam Sen, Abhijnan Chakraborty, SiuliRoy, Suvadip Batabyal, Somprakash Bandyopadhyay ,"Road Traffic Congestion Monitoring and Measurement using Active RFID and GSM Technology" ,14th International IEEE Conference, October 2011.
[8] 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 Engineers, 2016.
[9] 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.
[10] Malik Tubaishatr, Ti Shang and Hongchi Shi "Adaptive Traffic Light Control with Wireless Sensor Networks". Article, January 2007.

