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Efficient Caution-Light System for Unwarranted Stoppage of Automobiles

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***Abstract*: Traffic congestion and traffic monitoring is one of the important problems all over the world. Cities are the main poles of human and economic activity. They hold the potential to create synergies allowing great development opportunities to their inhabitants. However, they also generate a wide range of problems that can be difficult to tackle as they grow in size and complexity. The project is designed to develop a smart and intelligent traffic signal where the wait time and go time of the signal depends on the density of traffic on respective lanes. The ultrasonic sensors are used to read the density of the vehicles and process these data using Arduino mega 2560 microcontroller to make the traffic signal dynamic.**

***Keywords*: IoT, Arduino mega 2560, Congestion.**

1. Introduction

The concept of efficient caution light system is developed to handle the congestion using ultrasonic sensors and Arduino mega 2560 microcontroller which reads the automobile density and processes them to manage traffic in a way where there is unnecessary congestion. An Efficient management System can improve travel time, road safety and reduce traffic congestions.

The term IoT or Internet of Things, refers to the collective network of connected devices and technology that facilitates communication between devices and the cloud, as well as between the devices themselves. The Internet of Things (IoT) describes physical objects or group of such objects with sensors, processing ability, software, and other technologies that connect and exchange data with other devices and systems over the internet or other communication networks. Internet of things has been considered a misnomer because devices do not need to be connected to a network and be individually addressable.

With the increase in the vehicle's day by day, and also people trying to reach places on time. The number of vehicles increasing daily causes more and more congestion. There is a high time that is being wasted when in traffic congestion, there is a need for solution to this. In the current method of fixed duration for a traffic light the solution to the problem is not delivered and a new method is required.

In this paper we present a possible solution the problem by making the traffic signal smart. The density is detected by using sensors and then this data is transferred to the microcontroller where the data is processed and the duration of each traffic light is allotted. This duration is strictly based only on the density of the traffic on their respective lane. This makes the traffic light more dynamic and smarter hence with the aim of reducing the congestion.

2. Literature Review

The author Dr. Vikram Bali, Ms. Sonali Mathur et. al. [1] Developed system to find the proper working of infrared, display viewing, radar modulation of the congestion management. It comprises of RFI-D tag, tag tool scanner along with Arduino UNO also joining all this for proper function of the model. The tag will take the input and save data after getting data from the tag and notify it to main server which make use cloud technology. The method makes prominent all automobiles will reach the final location without having trouble in congestion.

A certain author Hua Wei et.al explained that at wherever four road section, there will be two variety in way of path: enter path and exit path. An enter path is way where automobiles will make a way to the cross-section road. An exit path works in making a way for exit of automobiles out of the criss-cross section [2]. The end outcome of congestion management looks to ease efficient along with proper running automobiles in junction.

Sabeen Javaid er.al proposed system to work on automobiles at road criss-cross, by getting information through sensors, and RFI-Ds which located and added adjacent on pathways [3]. It will process detected information at the first level and store in available storage server and finds number of automobiles so as make managing congestion according to number of the automobiles. It will also help the people to have knowledge on the number of vehicle in the so as to ensure particular road through analysis.

A specific author Anam Firdous, Indu, Vandana Niranjan designed model to work on the congestion signals based on the number of vehicles in that particular [4]. In this system, The Arduino Uno take input data from the IR detectors. Arduino will find the population of vehicles based on the information received from the detectors, according to the automobiles waiting in the lane to ensure it will control the way in which

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congestion signals recession of display lights are used for showing in the display. The infra detectors detect automobiles according the sense one of the way reflected through the detectors and actuators. These detectors opposite to the way and towards road to ensure congestion managing properly and effectively.

S. Sundara Mahalingam, S. Arockiaraj demonstrated a method which uses IR sensors along with Arduino. Detectors are IR which help calculate the population in specified lane. Infrared detectors will not work in some of the regular light and has some limitations. So amber light does not works in proper way [5]. Based on these sensors, controller detects the congestion and manage the congestion system accordingly. The managing of traffic light depends on number of automobiles available in the lane.

T. E. Somefun et. al proposed system which uses IR sensors to count and to calculate the congestion density in each lane. Detectors are connected to display with a connection with MC. The micro-controller (MC) used is the Arduino Mega along for 2560 chip for some of analysis of congestion. The system was developed to control unwarranted traffic. Outcome obtained that congestion control with infrared Detectors along with an Arduino Mega 2560 produced a good output and the duration took to manage unwanted stopping at a criss-cross was lessen notably by sixty percent time.[6]

L. F. P. Oliveira, L. T. Manera, P. D. G. Luz developed a traffic light controller electronic circuit, with centralized control topology, able to communicate with other wireless network traffic lights. All characteristics of the designed circuit were evaluated by practical system control and monitoring tests. Finally, the electronic circuit proved to be viable in terms of smart cities applications [7].

Anurag Kanungo et. al focuses on the algorithm for switching the traffic lights according to vehicle density on road, thereby aiming at reducing the traffic congestion on roads which will help lower the number of accidents. In turn it will provide safe transit to people and reduce fuel consumption and waiting time. It will also provide significant data which will help in future road planning and analysis.

3. Design and Methodology

The congestion system is designed in such a way that ultrasonic sensors are placed at certain distance from the traffic light the sensor sends and transmits data. Figure 1 shows the general architecture of the system. Initially the horizontal distance of the road is known and if the reader shows the same distance as the empty road this means absence of any vehicles. If the distance read is less than the initial distance then it means presence of vehicles in that lane. In our model there are two sensors placed in two lanes respectively and one sensor in third lane.

If there are no vehicles the sensor reads and shows the horizontal distance of the road which is the default value. If there is presence of any vehicles a sensor returns the distance less than the default value. In roads having multiple sensors placed in horizontal manner. The sensor that reads distance less than the default marks the presence of vehicles. More the number of sensors reading data horizontally more the traffic present in the lane.

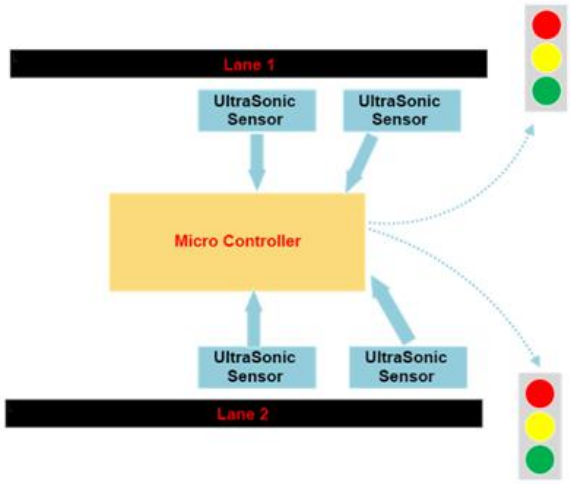

Fig. 1. General architecture of the system

The Microcontroller takes the command from the ultrasonic sensor and further processes the data and figures out the density of vehicles on each lane and it makes sure that particular lane is been given green signal or go sign for a longer time depending on the density of automobiles. Now if the traffic in all the lanes are equally distributed there is a default cycle that anyway follows.

Now another case to be considered is when any one of road has no vehicle at all then that particular lane is given less duration for green signal or the go signal and provides that duration to other road to avoid the traffic. Figure 2 shows the design of the Arduino mega 2560 with ultrasonic sensor.

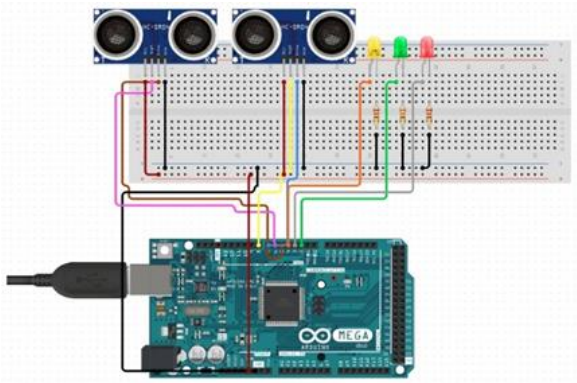

Fig. 2. Design of the Arduino mega 2560 with ultrasonic sensor

The project deals with controlling or managing the traffic in cities and how to handle traffic in a smarter way. It can even be controlled by Human in case of any emergency or breakdown of the circuit. All the data is being transmitted by the ultrasonic and been processed by the microcontroller. All the waves transmitted will be received by the ultrasonic sensor and then we use the speed of the wave to calculate the distance of the obstacle (in our case it is the vehicles). The formula to calculate the distance of the obstacle is given by

$$\text{Distance travelled} = (\text{time taken} * 0.034)/2 \quad (1)$$

But here we see that the time taken by the wave is twice because the waves after hitting the obstacle reflects back and follows the same path but in opposite direction.

The figure 3 shows the flowchart of how the system works. It checks if all the sensor are working and helps in taking appropriate decisions for managing the congestion.

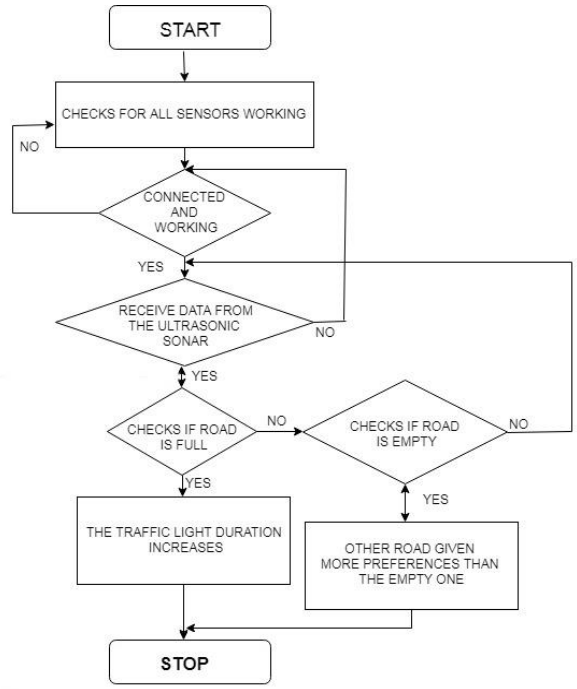

Fig. 3. Flowchart representing the principle of working

Table 1
Analysis of density of automobiles based on sensor values

	Sensor 1	Sensor 2	Output
Lane 1	NO	NO	No traffic
	YES	NO	Medium traffic
	YES	YES	High traffic
Lane 2	NO	NO	No traffic
	YES	NO	Medium traffic
	YES	YES	High traffic
Lane 3	YES	--	Medium traffic
	NO	--	No traffic

4. Results

The results from the real time model are demonstrated below. The different scenarios with various density are analyzed and presented.

Initially, when there are no vehicles on any of the lanes there is a short duration of go time. In this case the distance values are as shown below. Fig. 4 shows the real time model with no traffic. Fig. 5 shows the log values when there is no traffic.

When there is medium traffic on any of the lane or all of the lane the go time is minimal. Fig. 6 shows the real time model with medium traffic. Fig. 7 shows the log values when there is medium traffic.

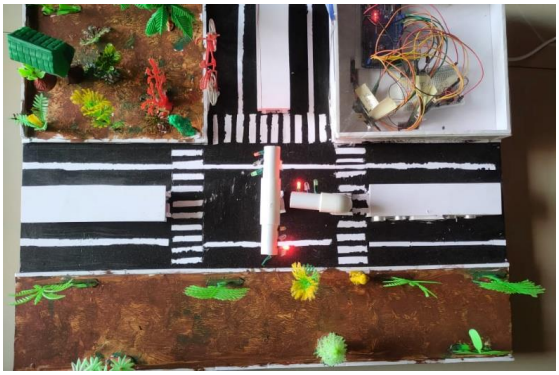

Fig. 4. Model with no traffic

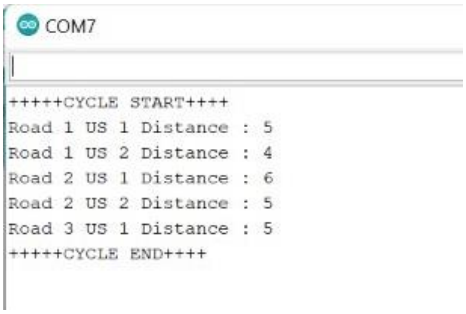

Fig. 5. Log values when no traffic

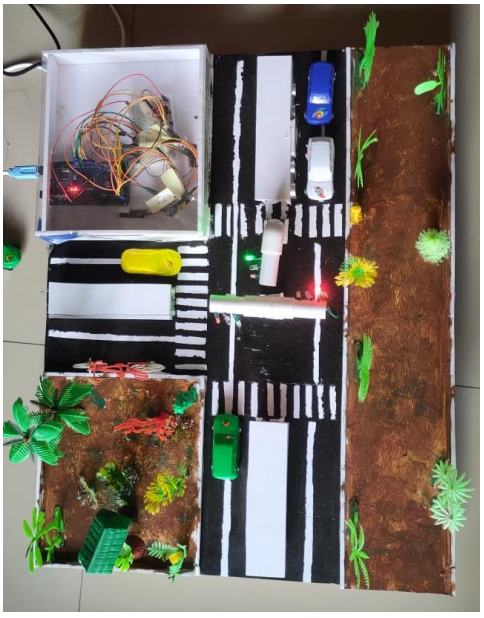

Fig. 6. Model with medium traffic

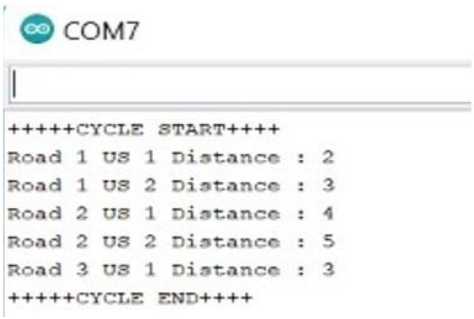

Fig. 7. Log values when medium traffic

If there is heavy traffic on any of the lane or all of the lanes will be given high duration time. Fig. 8 shows the real time model with high traffic. Fig. 9 shows the log values when there is high traffic.

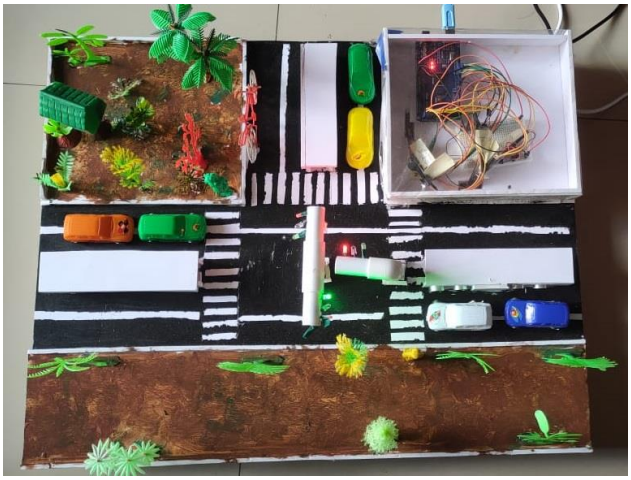

Fig. 8. Model with high traffic

Fig. 9. Log values when high traffic

5. Conclusion

Our project methodology aims to overcome traffic congestion caused by ineffective traffic management systems that are outdated and work on a predefined countdown. These traditional systems allot timings irrespective of the actual density in traffic on a specific road thereby causing large red-light delays. The system we propose ensures traffic lights respond to real time values of traffic, thereby allowing proper management of time and resource. We are hoping to do more research and improvement on our current project in the future

The efficient caution light system for unwarranted stoppage of automobiles can be proven boon to the society by decreasing the pollution and wastage of many kinds of energy. It in turn also helps us to develop a smart city.

References

[1] Vikram Bali, Sonali Mathur, Vishnu Sharma, Dev Gaur, “Smart Traffic Management System using IoT Enabled Technology”, 2020 2nd International Conference on Advances in Computing, Communication Control and Networking (ICACCCN), 2020 IEEE.

[2] Hua Wei, Guanjie Zheng, Vikash Gayah, Zhenhui Li, “A Survey on Traffic Signal Control Methods”, July 2019.

[3] Sabeen Javaid, Ali Sufian, Saima Pervaiz, Mehak Tanveer, “Smart traffic management system using Internet of Things”, International Conference on Advanced Communications Technology (ICACT), ICACT 2018 February 11-14, 2018.

[4] Anam Firdous, Indu, Vandana Niranjan “Smart Density Based Traffic Light System”, 2020 8th International Conference on Reliability, Infocom Technologies and Optimization (Trends and Future Directions) (ICRITO), 2020 IEEE.

[5] S. Sundara Mahalingam, S. Arockiaraj, “Density Based Traffic Light Control Using Arduino”, IJARIIE, vol. 4, no. 5 2018.

[6] T.E Somefun1, C.O.A. Awosope, A. Abdulkareem, E. Okpon, A.S. Alayande, C.T. Somefun “Design and Implementation of Density-Based Traffic Management System”, International Journal of Engineering Research and Technology, Volume 13, Number 9 (2020), pp. 2157-2164

[7] Luiz Fernando Pinto de Oliveira, Leandro Tiago Manera, Paulo Denis Garcez da Luz, “Development of a Smart Traffic Light Control System with Real-Time Monitoring”, Journal of Latex Class Files, vol. 14, no. 8, August 2015.

[8] L. F. P. Oliveira, L. T. Manera, P. D. G. Luz, “Smart Traffic Light Controller System”, 2019 Sixth International Conference on Internet of Things: Systems, Management and Security (IOTSMS).

[9] Hanaa Abohashima, Mohamed Gheith, Amr Eltawi, “A proposed IoT based Smart traffic lights control system within a V2X framework”, Proceedings of NILES2020: 2nd Novel Intelligent and Leading Emerging Sciences Conference.

[10] M. Yogheshwaran, D. Praveenkumar, S. Pravin, P. M. Manikandan, S. Saravanan, “IoT Based Intelligent Traffic Control System”, vol. 4, no. 4, April 2020.

[11] Md. Khurram Monir Rabby, Muhammad Mobaidul Islam, Salman Monowar, “A review of IoT Application in a Smart Traffic Management System”, Proceedings of the 2019 5th International Conference on Advances in Electrical Engineering (ICAEE) 26-28 September, Dhaka, Bangladesh.

[12] Anurag Kanungo, Ayush Sharma, Chetan Singla, “Smart Traffic Lights Switching and Traffic Density Calculation using Video Processing”, Proceedings of 2014 RAECS UIET Panjab University Chandigarh, 06 – 08 March, 2014.