SSRG International Journal of Electronics and Communication Engineering
ISSN: 2348 – 8549 /doi:10.14445/23488549/IJECE-V7I4P101
Volume 7 Issue 4, 1-4, April 2020

Investigation of Intelligent Traffic Congestion Control Using IOT

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Received Date: 02 March 2020
Revised Date: 02 April 2020
Accepted Date: 06 April 2020

Abstract

In today's life, many vehicles were affected due to traffic jams. Transportation becomes a major problem in any country, the main reason for traffic jam is a mechanical fault in the engine, population increases and accidence. Now it can be overcome by the following methods. Here we use a sensor to detect the traffic jam that will reduce the time people spend waiting at a signal for hours. The system's main advantage is to avoid the human source or help and clearing the traffic jam automatically. Here automatic traffic jam avoidance method is used that has higher efficiency than the manual method. In this system, we propose a context-aware approach to find the current state and density of the traffic and dynamic management of traffic signals and environmental conditions. This system can be utilized the smart IOT technology and transmission of information to provide an efficient and accurate estimation of traffic density. Traffic jam is not only frustrating the people but also increase the air pollution and accidence.

Keywords – *Context-aware Approach, IOT technology, traffic signal controllers.*

I. INTRODUCTION

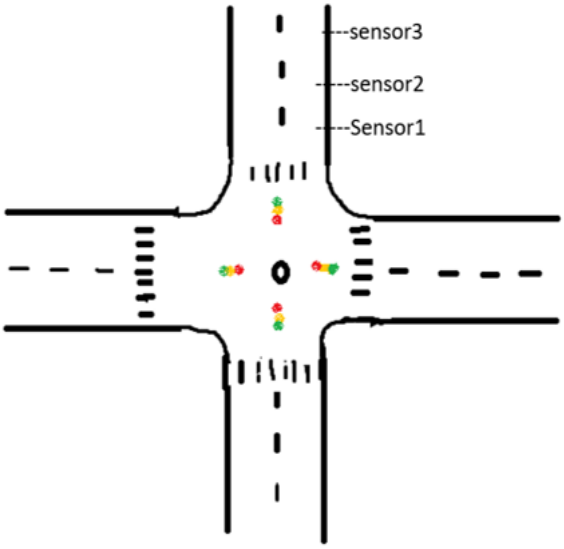
In the developing world, urban traffic congestion has been an intractable problem over the last decades. With the progress of global urbanization, the sharp rise in traffic demand in urban areas has led to increased drivers' traveling time, waste of fuel consumption, and the consistent rising of carbon dioxide emissions. Besides, The chance of collisions is also increasing due to tight spacing and frequent accelerations and breaking; the Internet of things is a system of interrelated computing devices with networks that are provided with unique identifiers. It can transfer and receive information between the devices without needing any help from a human source. Modern embedded systems are often used based on microcontrollers. The device can be accessed effectively from a large distance of around kilometers by using IOT. As of now, we all know that India is the second-largest populated country in the world. If we design a proper way of control system to detect traffic congestion, it could be solved. Using the IOT concept, the device can be accessed from a far place to detect traffic congestion and accidence. This is a way to reduce the traffic jam and accidence. There is currently no mechanism available for the traffic jam clearance if any emergency happened. The government has tried to reduce the traffic demand by imposing parking restrictions, adapting road pricing policies, and encouraging people to use public resources. The main goal of traffic congestion control by using IOT is to clear the traffic and allow a separate way for the emergency vehicle by allotting an own lane.

II. OBJECTIVES

The objective is to overcome traffic jams' complications due to the rapid increase of vehicles in the modern world. We are using the algorithm of switching the traffic lights according to vehicle density on the road, but that is not effective. In this project, the message could be sent to a police station, near hospitals and ambulance by using smart IOT technology; if any emergency or accidence happened, The consumption of fuel would be reduced by this method, and the information could be updated to the police station or control room according to the density of the vehicles on traffic by using Wi-Fi modules. It is very useful to reduce the number of accidences and save precious time for all the driving or traveling employees on any important occasion.

III. METHODOLOGY

The main component of this system is microcontroller and IR sensors. It is responsible for all monitoring and generating the inputs and outputs. The output of the system will be displayed on LCD about the message arrival status.



The above picture shows the design of the system, which consists of four lanes. Each lane has several IR sensors fixed in any part of the road with a particular distance. The sensor receives the reflected IR rays and sends the information to Arduino. Arduino uses the data which is sent by the sensors to alert a message. The Arduino is a mini-computer that can be used as a development tool for software and hardware-based projects. It is a microcontroller board to simplify an electronic design, prototyping, and experimenting for artists, hackers, hobbyists, and many professional works. The Arduino can be connected to the computer via USB, where you can program in a simple language.

Arduino can be run with a USB link back to the computer or stand alone without it. An infrared sensor is an electronic device that is used for sensing certain characteristics of its surroundings. It can be done by either emitting or detecting infrared radiation; Passive infrared sensors are used for motion detection systems, and LDR sensors are used for outer lighting systems. It is mainly used as an analog system as well as a digital system.

Liquid Crystal Display or LCD is a panel display or other electronically modulated optical device that uses the light-modulating properties of liquid crystals combined with polarizers. Liquid crystals do not emit light directly, instead of using a backlight or reflector to produce images in color or monochrome.

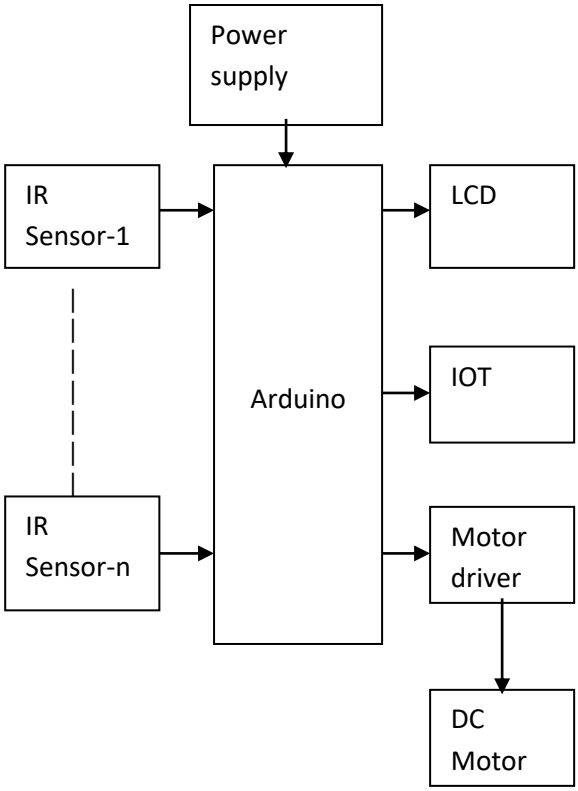
A buzzer or beeper is an audio signaling device, a mechanical, electro-mechanical, or piezoelectric device. Typical uses of buzzers and beepers include alarm devices and timers and confirmation of user input such as a mouse click or keystroke.

A divider is used for dividing the lines and measuring a partition between two areas. This system is used to block the road if a traffic jam or any accident happened and display the scenario's information. If any obstacles nearby the divider, it uses a buzzer sound to announce the process.

IV. EXISTING SYSTEM

In the Existing System, the traffic jam is cleared with the use of a police source. However, it has lower efficiency. In the olden days, it traffic jam has occurred it could not be rectified until the police's arrival. The next level of congestion control is traffic light signals. Using the LED red, yellow, and green lights, the traffic will be rectified by giving the people signals. But, that system also not efficient so far due to the rapid increase of vehicles.

V. PROPOSED SYSTEM



In this system, we use the Infrared Sensor to detect the vehicle and avoid traffic jams and accidence on the road. Here, multiple numbers of sensors are used for each lane and any part of the roadways. An automatic movable divider is used in this system to block the road if any accident or heavy traffic jam has happened. It has higher efficiency compared to an older system. A microcontroller is used for high performance. Our system's main advantage is the SMS could be sent to the near police station, hospitals, and ambulance by using IOT technology if any emergency happened. Everyday traffic congestion bigger issues are a daily basis. So automation systems are currently not available in

India. We need IOT to utilize in the traffic signal and to control it in an advanced controlling system. Any system is designed to act as higher control features for all four side-way traffic. The road towards heavy traffics of vehicles in higher counts. We need to define the priority level of traffic in our TMS which least or highest priority.

Traffic management system- TMS key applications to control over traffic as per population of vehicles ID that that particular area. This proposed system depends on vehicles' count from the road lane IR data; we allocate a higher time rate for that signal.

This system model uses many IR sensors, for automation control of the microcontroller, with Bluetooth controller, Android mobile device, and finally PC-server. Any of these sensors surround by an IR transmitter &receiver for placing in both directions of the road lane.

VI. OPERATION OF THE SYSTEM

The density of traffic is categorized into three categories. The levels of traffic jams are low, medium, and high. Each road uses the data from the three IR sensors to evaluate the level of traffic. If the sensors receive reflected rays of IR, the output from that sensor is taken as '1'; otherwise, the output is considered as '0'. An output of '1' specifies that a vehicle is present at that place, whereas '0' specifies that the lane is empty at that location. The traffic signal lights are ON based on the following conditions:

LOW: (IR sensor1=1, IR sensor2=0, IR sensor3=0) or (IR sensor1=0, IR sensor2=0, IR sensor3=0)

MEDIUM: (IR sensor1=1,IR sensor2=1,IR sensor3=0)

HIGH: (IR sensor1=1,IR sensor2=1,IR sensor3=1)

Considered the levels of a traffic timer is fixed for each level in the program code.
The timer is set as Low: 3 secs
Medium: 50 secs
High: 1 min

VII. ALGORITHM

The code for this system was written in Arduino using embedded C. The system's process flow is displayed as an endless loop where each lane is activated either serially or according to the priority conditions. The collected data of the IR sensor is used to generate vehicle density. The information regarding the density is sent to the server from time to time using a Wi-Fi module. We provide a heuristic method for calculating weights, where the potential impacts of the roads on the congestion propagation are implied. The weight of the link (j, m) is given by

$$\text{Cj}, m(k) = \delta j, m(k) \cdot \gamma\, j, m(k) + 1.$$

Where, $\delta j, m(k)$ is an indicator reflecting the possibility of spill caused by link (j, m). It is a 0-1 variable given by

$$\delta j, m(k) = 1, \text{ if } f j, m(k) < \Theta j, m$$

$$\delta j, m(k) = 0, \text{ if } f j, m(k) >= \Theta j, m$$

VIII. SCOPE OF FUTURE WORK

The future work can include the modification in the existing traffic jam control system by having a high range of sensors and microcontrollers for more compatibility.

IX. CONCLUSION

By using the microcontroller 328, the efficiency always remains high to the traffic jam avoidance. So in this way, apart from operating the signal manually or by keeping them constant, the signal can be monitored, and traffic can be controlled using the sensors and measuring traffic density. Even instead of clearing the traffic by the traffic police, the green will be signaled automatically to give way for the ambulance by clicking the button provided. We can count the vehicle that passes through that lane by evaluating the number of times the IR rays have been obstructed. In this system, we have used IR sensors, but instead of some other efficient sensors that can be used for the more effective working of the system. The well-efficient sensors can differ from one obstacle to another obstacle. This will be used to create many ideas about traffic jam congestion control in the upcoming days.

REFERENCES

Journal Papers:

[1] D. I. Robertson, " 'TRANSYT' method for area traffic control," Traffic Eng. Control, vol.8, no. 8, pp. 276-281, 1969.

[2] Suni Pegu, Dr. Thuleswar Nath "A review on modelling and simulation of vehicular traffic at signalized intersection", International Journal of Engineering Trends and Technology (IJETT), V48(5),237-241 June 2017.

[3] Pavan Talluri , Anil Kumar M. "Intelligent Traffic System Which Respond To Emergencies". International Journal of Engineering Trends and Technology (IJETT). V4(4):1132-1133 Apr 2013. ISSN:2231-5381. www.ijettjournal.org. published by seventh sense research group.

Books:

[4] P.E. Warren Tighe, *traffic control systems*(Westhampton Beach, Dunn Engineering Associates, 2005).

Chapters in Books:

[5] David Gibson, Traffic control systems, in Westhampton, Handbook of traffic jam control, 4 (New York: West Hampton, 2005) 06-006.

Thesis:

[6] P.B. Hunt, scoot-*A Traffic responsive method coordinating signals*, Transport Res.Lab, Crowthorne, U.K.,1981.

Proceedings Papers:

[7] S. Lin, Fast model predictive control for urban road networks via MILP, Proc. 12th IEEE Conf. on Trans. Intel. Transp. System , 2011,846-856