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## TRAFFIC MANAGEMENT USING IMAGE PROCESSING

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**Abstract:** In the current situation of metropolitan cities of India, traffic congestion has become a major concern around peak times. One of the major reasons is the increase in the growth of the population which eventually ends up in an increase in vehicles. Since the roads have become narrower people generally face a lot of problems. The only option to have a free flow of traffic is to have a proper traffic management system since the infrastructure in India cannot be changed. Traffic congestion not only causes travelling delays but also causes environmental pollution and health-related issues. Traffic congestion generally focuses on signal failures and improper traffic management systems, so to overcome the lack of inefficient manual traffic systems we need to replace them with a proper traffic management system. This paper presents a traffic monitoring system using the Internet of Things following a suitable architecture that is easier to implement.

### I. INTRODUCTION

Transportation is a major sector of the Indian economy, with accordance to increase in the number of vehicles the road space has been reduced which in turn has resulted in traffic congestion. Traffic congestion has become a very basic activity within the city. One of the major problems in metropolitan cities like Mumbai, Bengaluru, Delhi, etc is that of the traffic management system and its surveillance. Since the present traffic management system is based on a fixed time management system the road networks generally end up in traffic congestion. [1] According to a recent survey in India, there is an annual loss of 70000 crores of fuel wastage which generally happens to traffic congestion. India is the 2nd most populated country in Asia after China. So with the increase in population, the number of vehicles also increase. One of the basic solutions to control traffic is developing adequate infrastructure for handling traffic. But in Indian cities like Mumbai, Bengaluru, Delhi etc one of the major problems is the existing infrastructure which generally cannot be expanded so the only available option is to build a proper traffic management system. Cities should be provided with cameras to detect traffic jumping and other activities in and around the city because safety has become a major concern for people. The traffic within the city will be continuously monitored for surveillance. With the increase in a vehicle around the cities, image processing vehicle detection has progressed significantly over the years. Eventually, vehicle detection has played a vital role in the area of traffic surveillance. The reality which inspired us to work on this project is, that in maximum cities the traffic control system is based on a timer. Admit that there is huge traffic at signal 1 and the opposite lane has less or no vehicles and that signal is green, the commuters in the signal 1 must wait until the timer of the opposite lane hits zero to switch the signal, this system is causing a time-loss for many commuters, bwaiting in the signal for a long time the commuters are getting late to their works, schools, and even hospital.

This paper detects the vehicle's density and then switches the signals. Admit that 1 signal which is green has no traffic but there is huge traffic in the opposite lane then our project will skip the signal which has more traffic. With this we can manage the traffic flow easily and even the time of the commuters will also be saved moreover we are using the cameras to detect the density of the vehicles and we can also use the same webcams for the safety purpose also we can control the anomalous situations easily and we can take immediate actions to overcome this kind of situations, we are also trying to addon few safety precautions like if any commuters violate the traffic rules then the image of that vehicle will be captured and it will be sent directly to traffic control department and certain actions against that vehicle can be taken easily.

Although much research has been done on this project and many methods have been implemented to maintain the traffic congestion, there is still an area for improvement. So with the increase in one's annual income, they tend to buy a new vehicle which may be a 2 wheeler or a 4 wheeler, with the increase in vehicles the generally becomes narrower and leads to traffic congestion. To overcome this situation we have built a traffic management system using image processing for smooth traffic flow around the cities.

In this paper, an IoT-based system for traffic monitoring system has been reported following a suitable architecture that is feasible from the implementation point of view.

## II. LITREATURE REVIEW

[2] proposes a system that examines various types of detectors in traffic-related applications, advances in vision-based image processing techniques that are considered reliable and cost-effective for intelligent traffic regulation, and image processing- based traffic monitoring combined with machine learning that has a lot of potential in traffic management.

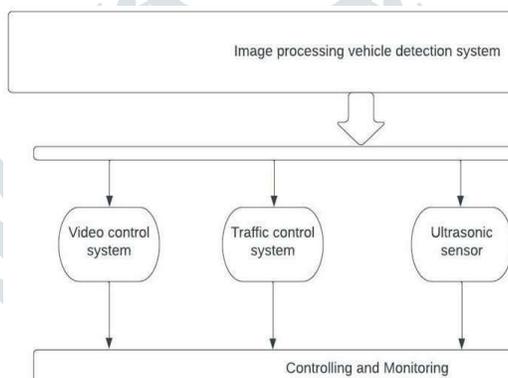
[3]presented a photo or video-capturing software. It has been customised to be used in the future to regulate traffic signal signs by allowing enough time for each sign, based on the quantity of automobiles travelling in each direction.

[4] is a Matlab-based project that tries to alleviate excessive traffic congestion. They employed the image processing technology to complete this job. To begin, a camera captures the film of Lane. In a traffic lane, a web camera is put to capture photos of the route on which we want to manage traffic. The photos are then analysed to determine the traffic density. The controller will send a command to the traffic LEDs to show a specific time on the signal to manage traffic based on the processed data from mat lab.

[5] developed a model for a traffic control system based on data from video camera photos of roadways and image processing techniques for reducing traffic congestion on roads.

## III. PROPOSED SYSTEM

The components used are Arduino mega , raspberry pi .webcam , ultrasonic sensors , here the Arduino mega controls the traffic signals and the presence of the vehicles on the lane are detected by the ultrasonic sensors , these ultrasonic sensors will send the collected data to the arduino mega the arduino will control the switching of the traffic signals then the camera will capture the video recording and send it to raspberry pi and this raspberry will detect the density of the vehicles by creating an rectangular frames on the vehicles that can viewed in the monitor that is connected to the raspberry pi, depending on the more density the signals will switch accordingly if there are equal number of vehicles in each lanes then the traffic control system will works according to the timer, the ultrasonic sensors will create an ultrasonic waves these waves will go and hit the vehicles present in the lanes and then return back the time takes by the waves to travel is calculated and depending on the time taken by the waves the distance of the vehicles is calculated and the density of the vehicles on the lanes are detected by the raspberry pi using the camera sensors.



*Fig.1. Block*

Figure 1 depicts the suggested system. Image processing vehicle detection system involves vehicle detection control system, traffic light control system and ultrasonic sensor, all this helps in image processing vehicle detection. ultrasonic sensor which helps for vehicle detection and tells the signal to change the traffic signal light accordingly. With the help of Image processing vehicle detection system controlling and monitoring the traffic flow would become easy and any incident which take place on the road can easily monitored and immediate action can be taken accordingly.

## CIRCUIT DIAGRAM

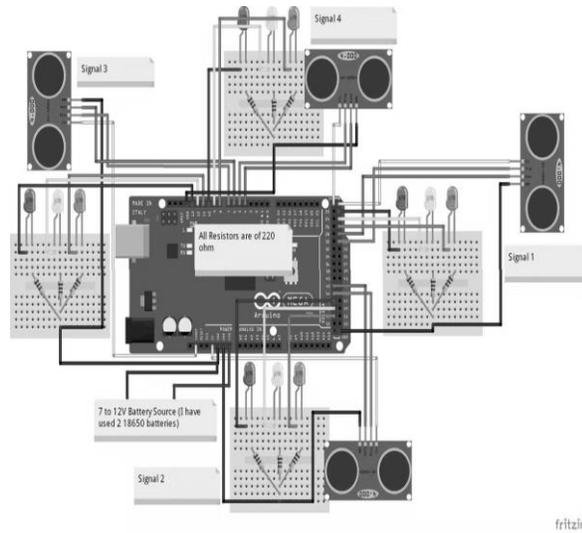


Fig.2 .Circuit

## IV. PROPOSED ALGORITHM

Step 1: Start

Step 2 : Ultrasonic sensors Step 3 : Detects the vehicle

Step 4 : if any vehicles are present in the signal then that signal turns green, else the signal remains red Step 5 :

Vehicles moves ahead

Step 6 : once the vehicles moves a head the process goes back to step2 the sensors again check for the presence of vehicles if no vehicles are detected the signal turn red Step7: the camera will be capturing the video continuously and sends it to the raspberry pi and the pi detects the density by creating an rectangular frames on the video

Step 7 : Stop

Step 8 : all the steps will be repeating continuously

## FLOW CHART

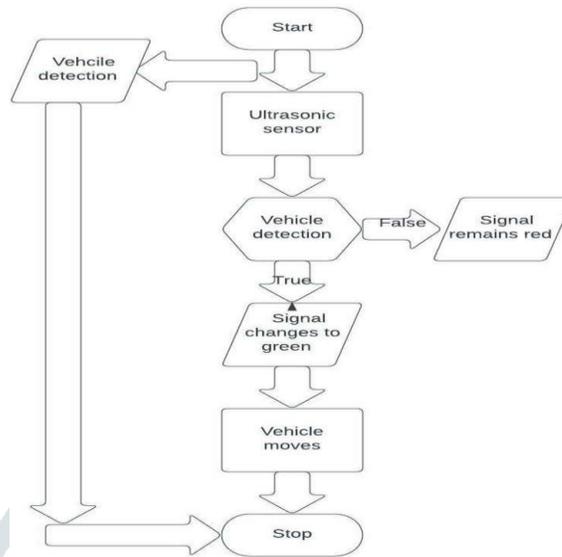


Fig.3. FLOW

Figure 3 explains the working of the system step by step, after the start of the ultrasonic sensor it starts for vehicle detection if the sensor detects the vehicle it turns the signal to green then vehicle moves on or else the signal stays red.

## V. SYSTEM OVERVIEW

### SOFTWARE REQUIREMENT

#### 1) ARDUINO IDE SOFTWARE:

The Arduino IDE is a piece of software that allows you to compile and upload C programmes to the Arduino board. It's designed to work with a variety of microcontrollers. After compiling and submitting the code, the required action is taken.

#### 2) PUTTY:

Putty is an open-source tool that uses network protocols like Telnet and rlogin in conjunction with an xterm terminal emulator for Windows and UNIX platforms. Putty uses all of the aforementioned protocols to enable a remote session on a computer via a network. It's a popular text-based communication tool, as well as a popular programme for connecting Linux servers to computers running Microsoft's operating system.

#### 3) VNC –

Virtual network computing (VNC): VNC is a remote control device used to control one system processor with another system using the internet connection, we need to drop the ip address of the connected system and then the VNC will connect over same connected ip address and then we can control the one system with another system.

#### 4) PYTHON:

Python is a programming language we are using python language to work with open cv, in our proposed system we are using the camera for the detection of the vehicles and these code has been written in the python programming language we using the raspberry pi to operate the raspberry pi we require the python programming language, the open cv code is also written in the python language.

## HARDWARE REQUIREMENT

1) Raspberry pi 3B+ - The first impression of Raspberry pi 3B+ is amazing just because of the experience and performance of it. Raspberry pi 3B+ is an incremental upgrade to the previous raspberry pi 3B. The system on the chip on the raspberry pi 3B+ has got a metal heat spreader on the top and this is for better thermal performance. Eventually, the whole board is designed for a better thermal performance than the previous Raspberry pi's so that the heat doesn't focus in the system on a chip. So the model Raspberry pi 3B+ works according to the Raspberry pi foundation with substantially more power than the previous Raspberry pi models. The maximum clock speed being at 1.4GHz instead of 1.2GHz brings a significant performance increase.

This model is highly recommended to those who are willing to experiment with Linux or simply want to stream some videos. This version is slightly more powerful than other previous models which additionally has the possibility of connecting to 5GHz wifi networks.

2) Arduino Mega - The Arduino Mega is a physically larger board with a larger ATmega2560 microcontroller and many more pins. Basically, Arduino mega is designed to perform complex projects. We have used Arduino mega because it gives us the flexibility to work with more pins which helped us to work with several sensors. It is programmed in Arduino IDE software like all other boards. As per our requirements, we can just plug and work with the LEDs and sensors as everything is built and made our job easier. We used Arduino mega as it required more number input and output pins. We can use either a USB cable to supply power to our board or we can supply power by using a Vin board or through a power jack.

The main difference between Arduino mega and uno is that it makes it easy to handle and has fewer pins and with less cost as well.

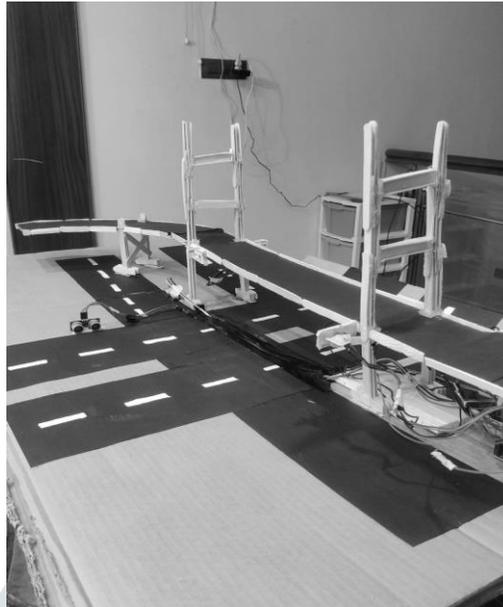
3) Ultrasonic sensors - Ultrasonic sensors detect or measure the distance between themselves and an object using ultrasonic waves. Ultrasonic sensors commonly feature two transducers, one for the transmitter and the other for the reception.

The transmitter sends out ultrasonic waves at a frequency of 40KHz, which travel through the air and are reflected and rebounded back to the sensor when they are obstructed by an object. These waves are absorbed by the sensor's receiver. The output of the sensor measures the overall time it takes for ultrasonic waves to travel from the sensor's transmitter to the item and back to the receiver

## VI. IMPLEMENTATION RESULTS



*Fig.4 view of vehicle detection system*



*Fig.5 Vehicle detection system using ultrasonic sensor*

In Figure 4 and 5 the ultrasonic sensors detect the presence of the vehicles in the lane if the ultrasonic sensors detects the vehicles then the signal turns green and if no vehicles are present in the lanes then the signals remain red , the system will skip the signals and move on to the next signal lanes if vehicles are present , and we have placed the camera sensors to detect the density of the vehicles by creating an rectangular frames on the monitors and ultrasonic sensors will check the presence of the vehicles and according to that the signals changes .



*Fig. 6 Image processing captured pics of vehicles*

The above figure shows the output of our implemented system and the signals will switch accordingly to presence of the vehicle detected and the camera module will also detect the density of the vehicles and then it will create an rectangular frames on the monitor and then the captured image is sent to raspberry pi.

## VII. CONCLUSION

Because traffic congestion has reached an all-time high, we have built a far more upgraded and smart infrastructure traffic network for our project. To maintain smooth and safe traffic, sophisticated management and coordination is used. We investigated the use of Arduino mega and ultrasonic sensors to optimise traffic light controllers in a city in this article. Traffic jams, unacceptable latency time of vehicle stoppage, emergency vehicles, or forcibly passing can all be solved with the Arduino-based traffic control system. The system offers various advantages, including a simple construction, strong real-time performance, and easy maintenance.

### VIII. ACKNOWLEDGEMENT

The most essential aspect of a project is not its completion, but rather the interaction of roles played by many persons in its successful completion. We'd want to use this occasion to extend our heartfelt gratitude to everyone who helped us finish the project successfully. We gratefully acknowledge and appreciate the guidance and support provided by Dr. M.N Nachappa, Head, School of Computer Science & IT, Jain (Deemed-to-be) University, Bangalore, and Dr. Anantha Charan Ojha, Associate Professor, Department of BCA for their interest and motivation in seeing this project through. For his assistance, we are grateful to Akhil Arun Menon, Asst. Professor, Department of BCA, Jain University, Bangalore.

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- [4] <https://www.iosrjournals.org/iosr-jce/papers/Vol22-issue6/Series-2/E2206022630.pdf> Smart Traffic Control System by Using Image Processing Prof. A.J. Shakadwipi<sup>1</sup>, Miss. Manashree P. Agarkar<sup>2</sup>, Mr. Anand M. Ahluwalia<sup>3</sup>, Mr. Shajal P. Jain<sup>4</sup>, Mr. Akshay Parakh<sup>5</sup>, Department Of Computer Engineering, Snjb's Late Sau. K. B. Jain College of Engineering Neminagar, Chandwad 423101
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