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# Reduce waiting time of a vehicle based on vehicle counts in traffic

**Trapti Singh, Prateek Jaiswal, Vaibhav Jaiswal**

Galgotias University, Greater Noida, Uttar Pradesh, India

## Abstract :

The control of traffic signals is one of the most difficult issues right now. In such circumstances, every light is given 60 seconds of road time at regular intervals, even when there is considerable traffic on the particular road. The TMS (Traffic Monitoring Signal) timing was created using a range of IOT hardware features in accordance with the previously recommended methodology. Utilising the IOT platform, different lengths of time are efficiently allocated to each traffic light depending on the quantity of vehicles on the route. A new problem that prohibits TMS from accomplishing its objective surfaced during TMS installation. The possibility that the signal with the fewest vehicles will open and repeat frequently increases when the signal. The signal with the most vehicles will probably wait for more than 60 seconds before opening and repeating while the signal with the fewest vehicles does so. To solve this issue, we employ IOT-based methodologies and technology. The technology's main benefit is that it can reduce the amount of time that cars have to wait before passing a signal. To evaluate the efficacy of the new proposed model, traffic networks and real-time traffic sub-networks are organised as case studies for this system.

## Introduction :

Cities need an intelligent traffic management system (ITS), which operates on the principle of traffic concentration on distinct lanes, in a world with an increasing population and increasing transportation needs. This system will be developed to shorten lane wait times and enable faster transit for citizens to their homes, workplaces, schools and other destinations.

There is no developed live traffic monitoring system that allows the public to view the state of the traffic from anywhere. This method seeks to give consumers the ability to view the actual traffic density and status, such as whether there is no traffic, light traffic, or very strong traffic, via a website or app. This will assist the people in choosing their course from wherever they are currently located. They can use this to get to their destinations faster by avoiding or navigating through light traffic.

The goal of this system is to create a solid cardboard three-dimensional prototype model of a traffic light system. At each intersection of a four lane road, there is a set of LEDs that represent traffic signal lights. IR sensors are positioned on the
dividers that are situated next to each lane. The Control Centre (microcontroller), which is situated close to the road and operates the traffic lights (LEDs) accordingly, receives data from the sensors. Users can get real-time traffic data via the Control Centre website to track it. In case of an emergency, the designated person may change the green signal.

The quantity of green or red flashing at the traffic lights should vary depending on the amount of traffic in the area. When there is significant traffic moving in one way of the loan, green lights should be on for a longer duration of time; in contrast, red signals should stay on for a longer period of time.

This method is applied to reduce traffic congestion, pollution, and inefficiencies at crossings.

## Literature Review :

All web enabled devices that use already existing, sensors, processors and components of the Internet of Things (IoT), also known as the Internet of Everything (IoE).
communication hardware to acquire, send, and act on data from their surroundings are These devices, which are frequently called "connected" or "smart" devices, can occasionally interact with other devices that are similar to them through a procedure known as machine-to-machine (M2M) communication and act on the information they exchange.

The best way to explain the Internet of Things is as "an open and comprehensive network of intelligent objects that have the capacity to auto-organize, share information, data, and resources, reacting and acting in face of situations and changes in the environment" (source). One gadget can communicate with several different other devices thanks to sensors.

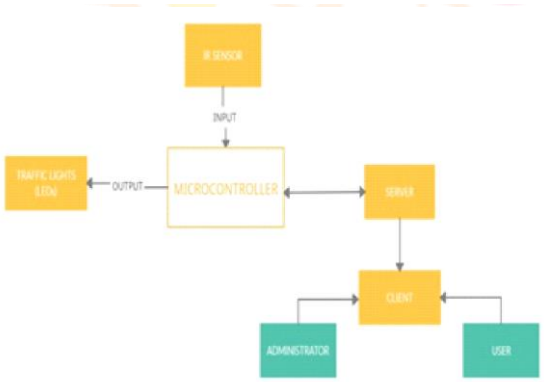


*Fig.1: IR Sensors gives input to Microcontroller for the output to traffic led lights.*

The previously proposed model works on KNN Algorithm and traffic control is controlled on the principle that traffic light turns green for the lane with dense traffic and then the next lane will be operated, which will result in increase of time with the less traffic lane which will make some of the lane wait more so to reduce this we will be operating with new models.
Our newly proposed system mainly consists of two modules: the first one is traffic density and second for time analysis and decision making where the first one estimates the traffic density on each road stretch to determine the ideal timing for a signal, and the second one analyses real-time traffic data to identify emergency vehicles. The best signal timing is decided by the first module as it captures the density of vehicles on road so that the sensor could detect the count of vehicles. We will set up CCTV cameras at traffic lights and other strategic sites to collect real-time traffic data.
Then, in order to facilitate faster calculations, this real-time traffic data is processed using cloud based server and the Raspberry Pi . The traffic signal is then Processed using the Raspberry Pi and a cloud-based server.

*Fig.2: Raspberry Pi chip Model*

For additional in-depth analysis and future traffic predictions, a variety of machine learning algorithms will be utilised to comprehend traffic patterns. Traffic light scheduling can be done using the round robin technique which schedules the opening of lane that is the traffic light goes green through which the scheduled lane process.

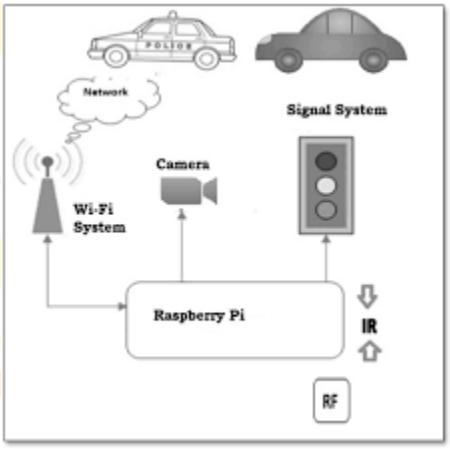


*Fig.3:Traces the traffic through sensors,and camera and provide signals to main control.*

After analysing the traffic pattern, each junction will be given a threshold(fixed) time. Following that, the density will be determined; if it is less than the threshold density, the traffic signal will be released; if it is greater than the threshold density, more time will be allotted to the relevant signal. Identification and classification of vehicles make up the second segment. Thus, the module will aid in calculating density since we won't be able to count density without being able to identify vehicles. We'll utilise the HAAR cascade technique (a feature based object detection algorithm to detect objects from images) it detects the face and eyes of humans too, to identify and validate automobiles. In addition to having complex calculations, HAAR cascade is more effective than calculations, HAAR cascade is more effective than canny edge detection in a number of ways and can handle real-time data. The HAAR classifier will be taught using a large number of vehicle photos, enabling it to quickly recognise emergency vehicles like ambulances and police cars. This will be useful in case of an emergency.

## Operations of the Project:

The project is an application-based project with three key phases.

Control of automated traffic: Based on three degrees of traffic concentrations—zero, medium, and high—this system is based on traffic concentrations.

These three fall into the following main categories:

**Low:** The absolute no traffic or zero traffic on road lanes is known as Low traffic zone.
**Medium:** The middle level traffic, i.e. the kind of traffic that ranges from one to five kilometres on road which can be captured by the camera is known as medium traffic.

**High:** The area range higher than five kilometres come under high level traffic.

**Operations performed for A four lane intersection road lanes.**

**Case 1: When there's Low level traffic, Medium Level traffic or High Level traffic on every road.**

In this scenario, the signal will operate for the customary fixed operational time of sixty seconds. Within twenty seconds of the vehicle entering any lane, a green second will appear.

**Case 2: When there is Low Level traffic on lane A & C and Medium Level traffic on Lane B & D**

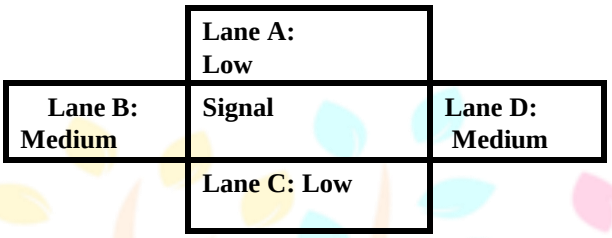


*Fig.4: Traffic with Low density on two lanes and with medium on other two lanes.*

In this scenario, the lane B and lane C signals will operate in accordance with the 60-second rule, but the lane A and lane C signals will remain red until medium traffic develops on these lanes. The green signal will only be displayed on lane C after lane B converts from medium to low, leaving lanes A and C unchanged. In the meantime, if medium traffic develops on either lane A or C or on both, all medium lanes will operate according to the sixty-second rule until any of them reaches low traffic.

**Case 3: When there is Low traffic on lane A, Medium traffic on Lane B & lane C, High.**

In this scenario, Lane A will display a red signal until level 2 traffic is reached. The green light will appear in lanes B, C, and D in a set order of 60 seconds. If level 3 traffic builds up in lane C, the traffic signal will also flash a green light every 60 seconds for lanes B, C, and D. If lane A experiences level 2 traffic, all four lanes will display a green signal after 60 seconds.

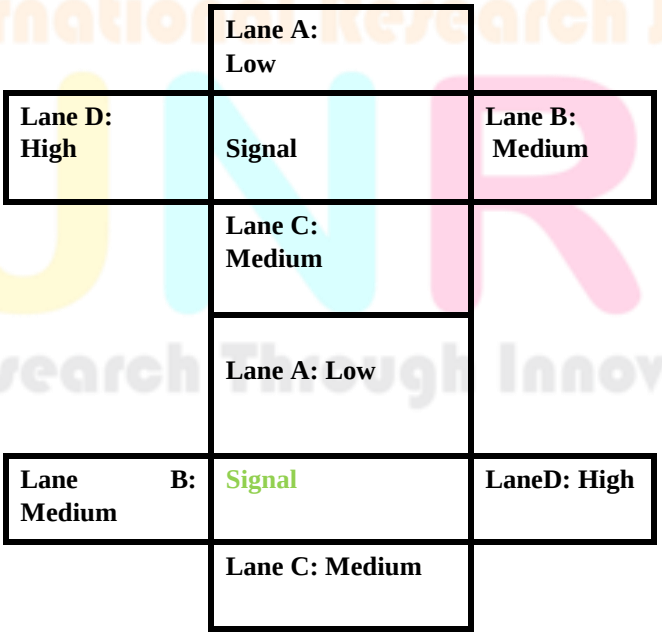


*Fig.5: Traffic with Low, High and medium density traffic in all lanes and traffic with all density.*

**Live Traffic Monitoring**

The user with internet access can visit a website to see the traffic conditions at a selected location chosen by the user. The user will be able to monitor the different traffic levels in an area of there respective interest, such as where the traffic is High ,Medium and Low.
So that the user for the website can get to know from where they need to travel through the lane which consumes less waiting time for the driver.


**Authorized Manual Control**

*Fig.6: Live monitoring*

The Traffic Management authority or any other authorised person who have permissions for the website will be able to login to the website. The server will not launch the control panel on the website page and will display an error message to the individual if any unauthorised or restricted person tries to connect using a fake username or password. The website will launch the control panel and give control to the authorised user in the event of a single authorised login. Regardless of the volume of traffic present, the authorised person will be able to open any particular lane, i.e., turn on the green light for any one of the four lanes on a four-lane intersecting road. Only for emergencies is this control area being built.


*Fig.7: Authorized Login page*


*Fig.8: Click on login to control*
*Data input will be validated against a database, and only those with valid logins will be permitted access.*

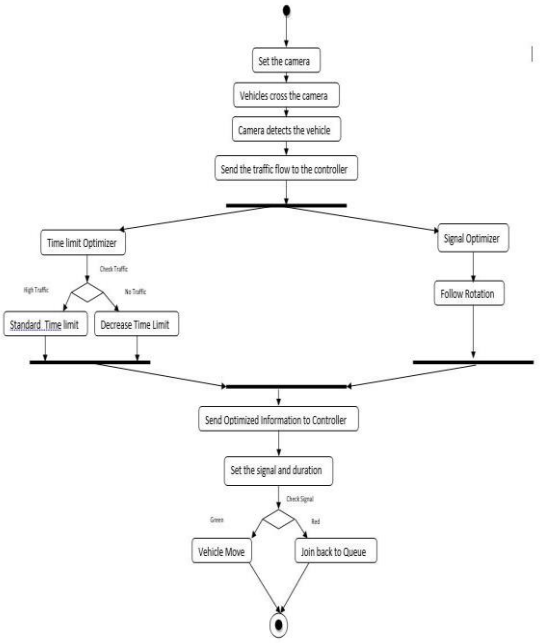


Fig.1 Activity diagram of proposed system

*Fig 9:Flowchart of working*

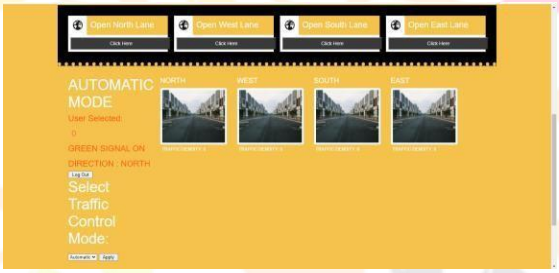


*Fig.10: Authorised login will show this screen*

*manually operate the traffic.*

## Conclusion:

The efficient algorithms are used to design the modules. The proposed system will be a smart and intelligent that will monitor, analyze, and will take decisions according to the steps mentioned. It will minimize the time for vehicle delay and will help the society in various methods. It will consume minimum power.

One of the largest infrastructure challenges that emerging nations like India currently confront is traffic management. Our nation urgently needs an effective traffic management system because practically every Indian loses valuable time to traffic jams. An advanced technique is created in this project to lessen the traffic congestion and unneeded time delays. By allocating time periods according to the merit of the vehicle load in specific lanes of multi junction crossings, the frustrating chaos of traffic can be efficiently channelled with the help of field application of IOT technology. We successfully applied the prototype at laboratory scale, and the results were astounding.

With this initiative, the concept of adjusting green traffic lights to the type of traffic concentration is expanded; this will spare the general public's time and prevent various health problems, such as headaches caused by the noises made on the roads when stopped in traffic. People never stop honking the horns of their cars and other vehicles. This study highlights the significance of IoT-based congestion control, real-time traffic monitoring, and manual traffic control.

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