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# Real Time Intelligent Traffic Light and Density Controller – A Literature Review

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***Abstract*: Effective traffic management is the keys to smart city management Aspects. Traffic flow can be effectively handled by pre-estimating the number of vehicles to travel through a busy intersection at any time interval. This assumption presents a work that is capable of counting the vehicle periodically and generating an alarm when large vehicles arrive at the junction. In addition, the monitored detail can be sent to a remote area control center located anywhere in town through internet use, recognition of number plate for theft vehicle identification using ALPR and if ambulance is passing by, it could change the signal to Green using LORA Trans-receiver module.**

***Keywords*: LoRa, OpenCV, Node-MCU, Arduino IDE.**

## 1. Introduction

The Indian city management system is a mixture of many interconnected systems that play an important role in management of traffic. It is also an important element of a smart city. Excessive vehicular traffic causes stressed and angry commuters to miss day to day activities, more usage of gasoline, damage of vehicles and life of travelers Furthermore, an increasing population directly contributes to an increase in traffic-related factors such as over-speed, collisions, and many more. Smart traffic management has therefore developed as a mandatory necessity for a prosperous civilization. Intelligent and flexible traffic management systems are currently favored over specified time schemes in most developed countries. This form of traffic management is primarily monitored by centralized systems/servers. In light of this, the IoT, which now has proven useful in almost every aspect of our everyday lives, can be viewed as a forum for central server traffic management. The number of cars going through a road a several distances before the currently active traffic jam locations can be transmitted to the existing traffic flow control center.

The timely data collected for the city's traffic jam nodes can be conveyed via internet and cloud to handle car entry. For real-time vehicle counting, image processing tools are used in OpenCV. The proposed work is cost effective with minimal infrastructure. The proposed framework for urban settings collects real-time video images, then separated into frames, and the count is measured using the suggested car counting technique after binary transformation, and noise reduction. The further image analysis and statistical interpretation of data can also be helpful in real-time traffic management.

With population growth the number of vehicles has increased significantly over recent decades. In recent years the density of vehicles moving on roads is fast increasing leading to human life disturbances like enormous vehicle congestion, sound pollution, vehicle theft, accidents, etc. and hence effective traffic management control is very necessary. Due to this traffic congestion, ambulance and emergency vehicles movement are deeply affected, hence there is a need to integrate wireless sensors in these vehicles which can provide free flow through traffic congestion.

## 2. Literature Review

Vishnu and team [1] propose a system that performs image processing integrated digital signature-based controller used for theft vehicle irrespective of its altered vehicle number plate and color using ATmega-328p.

Rami and Subhash [2] performs vehicle detection using video sensing. This paper focuses on natural images as per color recognition under multiple illumination conditions.

Himanshu Chaudhary et al., [3] proposes an automated vehicle security system using ALPR and face detection. The criteria is to build real time model that acknowledges registration plate number and the drivers face through surveillance cameras and verifies them in the database for XXXXX.

Divya and Anuradha et al., [4] proposes IoT based intelligent traffic light control system using LoRa for emergency vehicles. In this system, the emergency vehicle is priority sensed by using IOT based smart objects onto the traffic lane in which space is given to the approaching emergency vehicle.

Vandini and team [5] performs optical character recognition and template matching by using an automatic license plate recognition (ALPR)on yellow color license plate. This paper also proposes vehicle authorization from the database.

Sakshi Pandey et al., [6] uses IR sensors to evaluate the density of the vehicles which are parked in a time interval before allowing them to move further.

M. R. Usikalu, et al., [7] proposes a design and construction of density based traffic control system which uses IR sensors.

E. Shanthini and Sreeja G [8] proposes improved overall

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traffic control system for stolen vehicle detection and emergency vehicle clearance using RFID sensors, GSM and GPS systems.

A. K. Ikiriwatte, et al. [9] proposes a traffic control using convolutional neural network in a four way junction using IR sensor and cameras.

Akanksha Singh et al. [10] proposes density-based traffic controller with defaulter identification using IOT, node MCU for traffic signal preemption, Quantum QHM 495LM, web camera, Arduino uno.

R Bhargavi Devi et al. [11] proposes traffic signal density system using Arduino uno, LED lights and IR sensors.

R Vani et.al. [12] uses camera, LED lights and IR sensors which detect sirens and allows to build an intelligent traffic control priority-based emergency vehicles.

Celil Ozkurt et al. [13] proposed a system that utilizes traffic surveillance by using neural networks.

The work of Ayushi Gupta et.al. [14] uses real time video monitoring and adaptive signal change using Raspberry pi.

Muzhir Shaban Al-Ani et.al. [15] have used image intensity measurement with respect to intelligent traffic light system.

K. Naveen Raj et al., [16] proposes Arduino and infrared sensor based on smart traffic light system. This paper uses sound as a medium to capture defaulters by implementing a punishing signal.

Cristina Vilarinho et al. [17] uses smart traffic lights as a green time period negotiation based on isolated intersection which including simultaneously signal plan design and timing optimization on the network dynamics.

Wei-Hsun Lee et.al. [18] proposes a working model of intelligent traffic light system for smart city applications.

Dinesh Rotake et.al. [19] propose a traffic signal control model using embedded system. This system deals genetic algorithm and wireless sensor network (IR) embedded at signal intersection.

R. Selvakumar et.al. [20] proposes an application of minimum spanning tree in traffic routing using Android. This work requires the vehicle owner to have an android-based phone with GPS functionalities that can also access internet which he should have at all times for the analysis to be accurate.

The work of Rijurekha Sen et al., [21] uses a traffic sensor to monitor onroad traffic queues. The idealogy is to propose a new mechanism to sense road occupancy using a variation in RF link characteristics.

## 3. Methodology

Image processing methods are used to achieve automatic counting of vehicles travelling through a specific road intersection. Vehicle Counting is done using camera and preprocessed using image processing. The movement of picture work in order to obtain the number of cars that travel through an area of interest.

The methodology proposed for this work is as follows:

- In the first step, individual frames are extracted from the video. The foreground frame was sent through a Gaussian filter to reduce noise. In addition, a morphological closing operation was applied to correctly embrace the image objects.
- The image was then converted to binary form with a predefined threshold using OTSU bimodal threshold method. Since object contours are easier to identify in this type of image, the binary threshold image is provided.

Data for a traffic management system is transmitted using WI FI. The internet connectivity mechanism between camera led management system and the end user database system is divided into 4 stages.

- Fetching rate per second Number of Vehicles info from Open CV: The mean value of vehicles present throughout each time period was obtained and stored in a variable that was modified after each set time period.
- The output of microprocessor is stored in the server to maintain the required database. Python-based IoT Cloud serve this purpose.
- IoT Connection: After interfacing, we needed to connect to our database. As a result, we built a new database on the IoT cloud. After that, use Python to import it into the database (API keys, End Point URL).
- Remotely submitting automobile count information to Real Time Cloud. After the data has been sent using the above steps, The procedure is repeated in every one second to provide the monitoring information of the capturing device continuously.

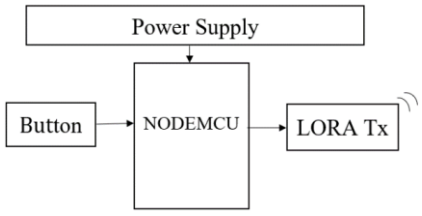


Fig. 1. Model of transmitter

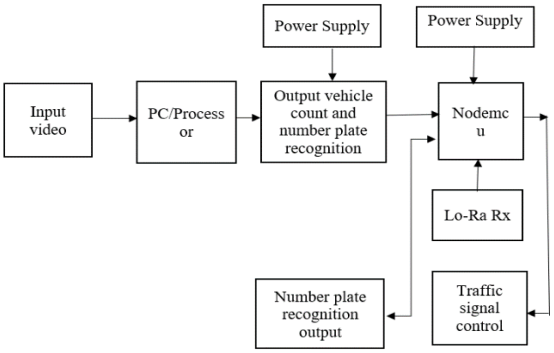


Fig. 2. Model of receiver

## 4. Conclusion

This work focuses on various integrated applications to the decongestion of the traffic density system with a LoRa based module for emergency vehicle detection and easy passage in any intersection. The paper proposes a cost-effective model for traffic management system and time management system for

easy flow of emergency vehicles.

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