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RFID BASED SMART TRAFFIC MANAGEMENT AND GREEN CORRIDOR FOR EMERGENCY VEHICLES

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Abstract - *Transportation has become a global crisis. In the current generation, we have a huge rise in the population. This rise has increased facilities to soothe the needs of human beings. Each family has at least one vehicle, to travel to their destination. With such an increase in the vehicular count, we don't have the infrastructure to meet these rising demands. Not only the adequate infrastructure but also the right management of the vehicles is important. Such is the below-proposed system where a smart IOT based traffic management system is designed. Also, an automatic high-tech green corridor creation mechanism is proposed for the smooth movement of emergency vehicles*

Key Words: IoT, RFID, Traffic Management, Green Corridor, Emergency Vehicle.

1. INTRODUCTION

Digital India is an upcoming trend in recent times. To match up with these Trends, we need smart technologies. We need more automated systems to manage various aspects. One such aspect where automation is needed is traffic, which is a big issue coming in recent times. As the population is increasing, the number of vehicles is increasing so we need smart systems that can handle traffic efficiently.

1.1 Need of Project

Traffic management has become a worldwide issue, with the increase in population. People often prefer at least two vehicles per family, thus increasing the amount of vehicular count on the road. To manage such an increase, the manual system of traffic management is becoming weak. Hence, we propose the below system for efficient and smart management of traffic management.

1.2 Overview

In the proposed system, we have tried to use the Digitalization parameter at its best. We have made use of images captured through cameras fitted at the signal junction. Further capturing the images, we have used LBP, HOG, and SVM to find the density of traffic at that junction. The green signal is managed as per the density. For green corridor purposes, we have used the GSM module and linked it with the traffic system. This will create a route for the emergency vehicle and the RFID fit on the vehicle will recognize it and control the signal

1.3 Motivation

- An increase in population has given a drastic increase in transportation.
- This has also increased the cost of accommodation near the companies.
- We have a large number of vehicles accommodating over limited roads and infrastructure.
- To deal with this, most cities have just widened the road.

However, the need for the hour is-

"SMART STREETS INSTEAD OF BIGGER STREETS"

2. LITERATURE SURVEY

Sheena and Shobha used a combination of techniques like inductive loops, ultrasonic sensors, video/image processing techniques, IR sensors, and a fuzzy logic system to calculate the density of the traffic at the signal junction. The disadvantage is that sensors might damage and will result in less accurate results. [1] Sabeen Javaid, Ali Sufian, Saima Pervaiz, and Mehak Tanveer had governed the traffic by using cameras and sensors. They have also made use of RFID tags for density calculation. The problem was that the sensors weren't giving accuracy.[2]A. Chattaraj, Sadhna Ajay Nee Bansal, and Aniruddha Chandra have made use of Ultrasonic sensors. These sensors have limited testing distance and inflexible scanning methods.[3]A. Chattaraj, Sadhna Ajay Nee Bansal, and Aniruddha Chandra made use of RFID tags for calculating density and guiding traffic. The system is not able to make a green corridor for emergency vehicles.[4]

Priyanka Nalawade, Prajakta Waghere, Nisha Vanare, Prajakta Kalbhor, A. J. Jadhav has used RFID as a source to manipulate the green signal using a microcontroller. They have used special RFIDs for emergency vehicles, which when detected makes the signal green thus allowing the vehicle to pass. But they have not made any provisions for the traffic between two traffic signals.[5]Tejas Naik, Roopalakshmi R, Divya Ravi N, Pawdhan Jain, Sowmya BH, and Manichandra have used RFID for density calculation. They have also included additional points wherein they send RFID information to the server for future use. If an

emergency vehicle is detected, the signal changes to green and an emergency message is displayed. Again, we do not see any passage for the emergency vehicle. [6] Biru Rajak, Shrabani Mallick, and Dharmender Singh Kushwaha have used RFID to make green corridors for emergency vehicles. Also, they have used the GSM module wherein the route from source to destination is -sent to emergency vehicles and the same is sent to the traffic server, who in turn makes all the signals in that route green. Once a vehicle with a particular RFID (emergency vehicle) passes the signal, it starts resuming its normal operations. This system is efficient, and we have made our system somewhere based on their implementation with some additional features like density calculations and displaying using screens.[7]Devashish Prasad, Kshitij Kapadni, Ayan Gadpal, Manish Visave, Kavita Sultanpure have used MUL Junction 2 videos to create data sets and applied Local Binary Patterns (LBP), Histogram of Oriented Gradients (HOG), and Support Vector Machine (SVM) based approach for traffic density estimation. They calculated the density of traffic and using this result we can adjust the (timer) of the signal accurately.[8] Rashid, Niluthpol Chowdhury, Mithun, Bhadhan Roy Joy, S. M. Mahbubur Rahman has used TSI (Time Spatial Image) for density calculation. They did a detection and classification method that shows an analysis of TSI obtained from frames of a video. They have classified the vehicle into different classes and the method used is a bit time-consuming.[9]Guohui Zhang, Ryan P. Avery, and Yinhai Wang have used video-based vehicle detection for reliable traffic management. They have developed vehicle detection techniques where they can collect data from trucks. In our system, we need to classify multiple vehicles, not only trucks, and they have used C#, which is not very comfortable for many people.[10]

Table -1: Literature Survey

Sr. No.	Paper Name	Research
1	Smart Traffic Management System with Real-Time Analysis (2019)	We have implemented a density calculation mechanism for the same purpose
2	Smart Traffic Management System Using the Internet of Things (2018)	The sensors weren't giving accuracy.
3	Density-Based Smart Traffic System with Real-Time Data Analysis Using IoT (2018)	These sensors have limited testing distance and inflexible scanning methods
4	An intelligent traffic control system using RFID (2014)	The system isn't able to make a green corridor for emergency vehicles.
5	Dynamic Traffic Control System using RFID Technology A Systematic Review (2017)	The system isn't able to make a green corridor for emergency vehicles
6	RFID-Based Smart Traffic Control Framework (2018)	The system isn't able to make a green corridor for emergency vehicles
7	An Efficient Emergency Vehicle Clearance Mechanism for Smart Cities (2019)	We have created this system as our base and also included additional parameters
8	HOG, LBP and SVM based Traffic Density Estimation at Intersection (2019)	Using the results, we can adjust the timer of the signal accurately.

3. IMPLEMENTATION

3.1 Objectives

The basic objectives of this system are to provide an optimized, efficient, less time-consuming system for traffic management. Also, the green corridor for emergency vehicles reduces its time to reach the destination. With smart traffic implementation, the manual work of the police officers will be reduced to a larger extent, thus moving towards a 'Digital Age'.

- Traffic signals are operated as per volume.
- Different priorities can be given to vehicles- Special priority to emergency…..etc.
- Saves time of travel against the previous system of manual control.

3.2 Proposed Idea

This project has 3 basic modules-

- Density calculation using HOG, LBP, and SVM
- Green corridor for emergency vehicles
- Displaying 'E' on the LED counter screen when an emergency vehicle is arriving

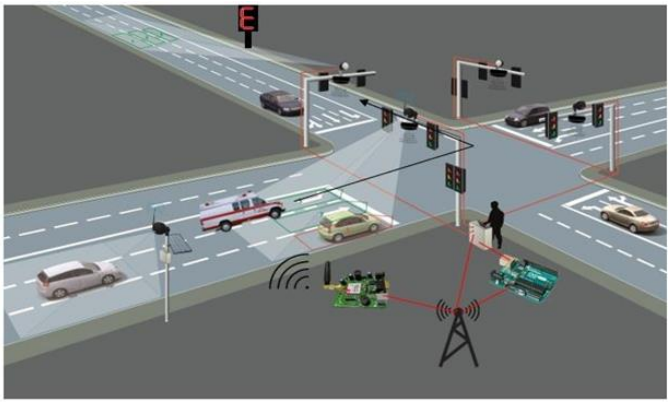

Fig. 1- System Architecture

Fig.1 depicts the system architecture of our proposed system. Initially, when the traffic signal is red. When the camera captures an image of vehicles at the traffic signal. Initially, we select the region of interest (ROI) for that image. Then we divide that ROI into the grid with cells to identify whether the portion contains traffic or not. Then LBP extracts features from that image and using that features, we will give input to the trained SVM model to classify into traffic or not. We have trained that model using a QMUL dataset. According to the output of the model, we set a timer of signals of that intersection. This is the normal operation for each signal.

For the Green corridor, the emergency vehicle will initially request the route through the GSM system to the traffic system control system. Once the route is received, the vehicle is ready to travel through the source and destination.

Now the traffic system control unit receives the route. It will set all the signals on that route to the green. When the RFID reader on signal readers RFID tag from the vehicle, it turns the green signal to red for that lane and the signal resumes normal operation.

The traffic system control unit will display “E” on displays connected to that route for directing people on the road to give way to an emergency vehicle.

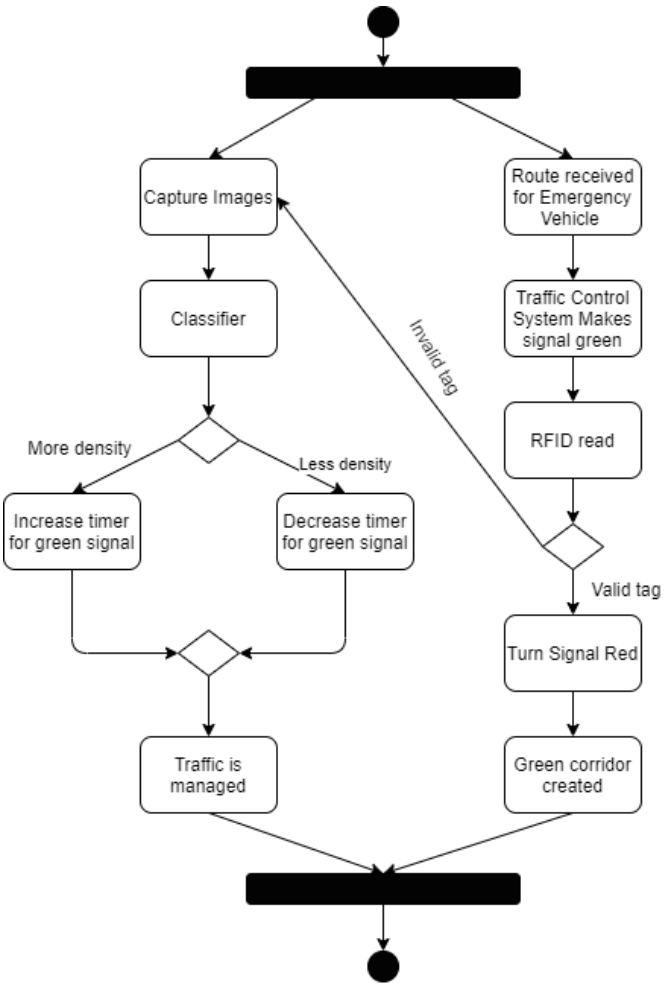

Fig. 2- FlowChart

The above diagram shows the flow of the system. The camera captures an image of a lane at the traffic signal. The captured image goes as input to the classifier. Classifier processes that image and give it as input to the model. According to the output of that model whether it is traffic or not, the system will set the timer of the signal.

If the traffic system control unit receives a request from an emergency vehicle, it will generate a route using GSM. Then the traffic system control unit will turn all the signals to green on that route. When the RFID reader on the signal will read the RFID tag of that emergency vehicle, that signal will turn red and resume its normal operation.

4. FUTURE ENHANCEMENT

Some other features that can be incorporated into the system are as follows:

- If one of the readers in any path fails, the system can still work. In such cases, when the other reader in that path tracks a vehicle, the CDPS checks whether it has just

crossed the readers in another path converging at the crossing or not.

- The two readers in each path are placed on opposite sides. If any road needs to be broadened or any other maintenance work needs to be done, then one of the readers can be temporarily removed and the system made to work on a single reader in that road.
- If the tags are mass-produced and employed on a large scale, the initial setup cost would come down. However, this would in turn demand more constrained and general-purpose tag design. The tags should be durable, impact-resistant, waterproof as well as the internal batteries (for active tags) should have at least a lifespan of 10 years or more. Advanced security techniques are to be developed to detect intentional tag removal or, to ensure the tag's authenticity in case of tag cloning, spoofing, copying, duplicating, vandalism, etc.

5. CONCLUSION

The traffic scenario in the country is getting worse day by day. With digitization and automated systems coming into use, the proposed system is beneficial for use. It provides optimized and efficient outcomes when deployed. The green corridor method will surely reduce the time needed for the emergency vehicle to reach its destination

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