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Smart Traffic Control System – A Review

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***Abstract*: The rapid developments in communication and computing technologies promote several advanced traffic control strategies to deal with these problems. The traffic light control at road intersections and junctions is regarded as a major strategy to guarantee the safe crossing of vehicles and pedestrians and lead to efficient network operations. The major difference in most of the previous models lies in the type of system used and sensors used to calculate the density of traffic in a specific lane. This review has been made based on the ideas, which aim to overcome the disadvantage of the traditional system, and use various algorithms to implement a smarter system. The different sensors that has been widely used to find the traffic density of traffic include Inductive loop detectors, Piezoelectric sensors, Ultrasound sensors, Infrared sensors, Sound sensors, Acoustic sensors and Image processing algorithms based on live feed from the camera.**

***Keywords*: Sensors, Piezoelectric sensors, Ultrasound sensors, Image processing algorithms.**

1. Introduction

Urban mobility has become one of the key sectors of smart city development that has rapidly spread across India. With the growing number of vehicles in many countries, traffic congestion becomes a serious problem. It increases the fuel consumption and also the time taken to travel. Internet of Things (IoT) is the connectivity of physical devices such as sensors and actuators with a unique identifier to allow remote access to objects and automation in application domains like healthcare, transportation, surveillance and energy conservation. A wireless sensor terminal connected to a network will collect information about the surrounding environment. It is carried out in the ThinkSpeak Platform. The control signal given by the controller decides which lane to receive the required traffic signal. The work is intended to improve the existing traffic system by integrating better management and monitoring and also the alternate route provider with the use of IoT, sensors and micro controller fixed at the traffic signal and roads.

2. Literature review

[1] Q.Zang, et., al, studied the use and implementation of RFID in VANETs. RFID is embedded in each vehicle to make the vehicle identifiable and inventoriable by the computers as long as the tag is present in the vehicle. Even though RFID can be used for security and privacy issues, it has not been much recommended for the real time since it can cover and will detect only within a short distance.

[2] Chang Guo, et,. al, explored the factors of traffic and has proposed a mechanism for a particular district in Shanghai, based on distributed transportation system with RSUs which has lower computing complexity and less redundancy. They proposed a method of calculating the travelling speed from source to destination. TTE, is used for this and acts as time planning algorithm with TTE and information collected to avoid congestion. Here, the complexity and redundancy is verified via c#. This is done with the VanetMobiSim application. It uses the urban map of the Songjiang in Shanghai. This mechanism will only show the alternate path or shortest path, it is not effectively used for congestion purpose.

[3] Aditi Abhimane, et,. al, studied the monitoring of traffic and factors for traffic congestion. The project was done using IoT. This project design has been divided into two modules. One, equipment module and another programming module. In this, a camera is fixed to make count of the vehicles that pass through the signal. This may be used to make an analysis, but not for traffic management. This video analysis can sometimes fail to capture a clear video. There is no assurance of the life and clarity of the camera and the range will also be an important factor. Android application and MPLAB is used.

[4] N.B. Soni, et., al, studied the various sensor and technology to reduce the traffic congestion across the country. These study examined like Ultrasonic sensors, Adaptive Traffic Control System (ATCS), Inductive Loop Detector (ILD). Where these sensors are very costly and lack of reliability, with this approach is that it increases traffic on residential streets. Load cell is type of transducer which coverts electrical signal by the force of gravity of vehicles exerted on the cell load. It has a major drawback of lead wire which has to be digged too deep to implant the wire.

[5] Aman Dubey,et., al, studied the Image processing using Microcontroller (Beagle Bone Black) which is installed on the traffic light and four cameras will be installed and all are attached to single Microcontroller. The cameras captures the vehicles that passes through the Image processing counters the vehicles with two factors one as. Haar Cascade Algorithm and the other Background Subtraction. Algorithm, both uses OpenCV as a tool to implement. But the major drawbacks of this idea led to when in camera ditection range and quality. It needs to be trained for accurate results.

[6] J.Naga Harsha,et., al, studied the Density Based Traffic System using Microwave/Millimeter wave radar and Magnetic Detector (Magnetometer). In Microwave or Millimeter wave radar Single detector can cover multiple lanes, This EM wave is susceptible to the attenuations such as fog, snow or rain depending upon the frequency bands as shown in the figure-1 below. Hence mm wave is used for short distance communications. But they are less affected compare. While in MagneticDetector (Magnetometer) Magnetometers can be used as metal detectors. But these technology has various issues false detection due to multipath propagation and magnetic detectors will have to embedded in pavement which can requires multiple detectors to detect smaller vehicle.

[7] Liang Qi, et,. al, explored the cause for occurring traffic and proposed their idea in two levels of implementation. The first-level one is a ban signal to stop traffic flow and second-level is a warning signal to recommend to not to drive in some directions. Petrinets are used for the communication between traffic light and warning light. It is carried out using simulations in the grid network and the result would be route-changing for vehicles,operation time interval and traffic density of traffic network.

[8] Anna Merine George,et., al, studied the work uses IOT and Adaptive Neuro Fuzzy Inference System (ANFIS) to improve traffic conditions. An ANFIS traffic light controller with inputs as waiting time and vehicle density is developed using MATLAB simulink environment. A camera is used to capture the traffic scenes and this image is transferred to the cloud using Arduino UNO and ThingSpeak Platform The image is then analyzed in the server using ANFIS controller and appropriate control signals are sent to the traffic signals. This study has some drawbacks of since it is a simulation based technique it cannot be embedded in real time basis, where the simulation sometimes be occurred as probability, statistics and overview of what is happening computer model.

[9] Anthony Theodore,et al., studied the occurrences of traffic and have proposed a system via simulation. They used CFD's for solving the simple traffic flow models and implemented in traffic simulation codes. This traffic simulation system is capable of simulating freeway traffic flow in real time. The drawback is that, it is implemented and created only by considering the area of Minneapolis, MN.

3. Conclusion

In automatic traffic signal control based on the traffic density in the route, the manual effort on the part of the traffic policeman is saved. As the entire system is automated, it requires very less human intervention. Emergency vehicles like ambulance, fire trucks, need to reach their destinations at the earliest. If they spend a lot of time in traffic jams, precious lives of many people may be in danger. With emergency vehicle clearance, the traffic signal turns to green as long as the emergency vehicle is waiting in the traffic junction. The signal turns to red, only after the emergency vehicle passes through. Further enhancements can be done to the prototype by testing it with longer range Zigbee transmitters. Currently, we have implemented system by considering one road of the traffic junction. It can be improved by extending to all the roads in a multi- road junction.

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