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A REVIEW ON RESOLVING TRAFFIC CONGESTION USING IMAGE PROCESSING TECHNIQUES AND DEVELOPMENT OF AN ANDROID APPLICATION

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***Abstract*—** Our current situation makes this a severe issue. Traffic congestion on both major and minor routes is constant. A strong traffic control system is necessary in order to address these problems. Human and material resources are lost as a result of poor traffic management.

Due to these recurring issues, interest is growing in finding new ways to address the congestion issue. Inadequate capacity, unrestrained demand, and protracted delays caused by traffic signals are only a few of the factors that contribute to traffic congestion. Magnetic loop detectors, infrared sensors, wireless sensor networks, and other devices are all used in modern technology. As opposed to

These frequently occurring problems are generating interest in solving the congestion problem through various methods and methods. Traffic congestion occurs for a variety of reasons, including insufficient capacity, unrestricted demand, and long delays due to traffic signals. Modern technology uses wireless sensor network systems, magnetic loop detectors, infrared sensors and more. On the other hand, video and image processing methods offer many advantages over traditional systems. This article summarizes an overview of all available existing methods compared to those used in this field of research.

We summarize all the various research papers based on different methods for the development of intelligent traffic detection systems using image and video processing methods. A comparison and overview of all methods is presented in this overview document.

***Keywords*—** Image processing, Video Processing, Traffic congestion.

I. INTRODUCTION

Traffic congestion has been a major problem in this scenario and has persisted in recent years, resulting in poor traffic management. From small roads to highways, traffic jams often waste time and manpower.

The main reason behind the increase of traffic congestion is due to the increase of population and increase of vehicles in larger metro cities. This paper reviews different techniques of traffic density calculation and intelligent detection systems using sensors, wireless networks, microcontrollers which were used earlier and thus a review of all the techniques and hence advantages of image processing over the different techniques have been discussed. Some approaches go over how to use image processing to calculate the traffic density on highways in a real-time context. Using cameras placed at traffic intersections to record real-time recordings of the state of the roads, all image processing algorithms require cameras. In order to determine the amount of traffic using a specific lane at a specific moment, frames from those videos are recorded and further analysed.

All the five methods can be summed up into four general modules – Image acquisition, Preprocessing, Density calculation and Traffic control. Since image processing is gaining a lot of popularity in terms of tracking and detection of the vehicles the area of proposed research work makes use of cameras that shoot the videos or capture images on which motion and vehicle detection algorithms would be applied to get a count of the vehicles. Based on the count of the vehicle a user interface will be established via an android application that helps the user to get an idea of the density of the traffic at any particular location which helps in diverting the route and avoiding traffic jams.

II. Literature survey

Traffic system is at the heart of the civilized world and development in many aspects of life is totally relying on it. Excessive number of traffic on the road and improper traffic management systems has led to hampering or stagnating routine lives of civilians.Therefore, an automatic traffic analysis system

is required for smooth and safe operation of the road system. When automated traffic systems are implemented, they provide better traffic control, correct control signal distribution, and improved traffic control systems.

[1] Georgios Vigos, Markos Papageorgioua, Yibing Wangb proposed An infrared sensor, an AVR-32 microcontroller with configurable flash memory, and an integrated 8-channel analogue to digital converter are used in the system that has been presented. The microcontroller is set up so that it will give a red light to all lanes but the one with the emergency vehicle when an infrared sensor detects a car that needs to be stopped. This system's fundamental flaw or restriction is that it relies on infrared sensors, which must be stored safely because they are impacted by changing weather and climatic conditions. Due to the limitation of this system it makes it a slightly lesser reliable technique to achieve the desired results.

[2] Ahmed S. Salama, Bahaa K. Saleh, Mohamad M.Eassa introduced a new model using a wireless sensor network system used as communication infrastructure in the proposed traffic light controller. The system uses fuzzy logic methods to determine the direction of the ambulance. The main monitoring system collects all necessary information and provides the necessary responses. A limitation of this system is that communication using a wireless sensor network system is still a research area. Communication between sensors is not a reliable method.

In addition, the sensor must be robust to respond to all climatic conditions.

[3] Celil Ozkurt and Fatih Camci propose a method using active RFID and a global system for mobile communication technology. The system includes RFID tags, wireless routers and coordinators, GSM modems and monitoring station software. The wireless device collects data from active RFID tags installed on the side of the road. The monitoring station collects all data from GSM and responds to corresponding traffic signals.

The main limitation of this system is that it contains many communication systems, making the device very expensive. Wireless communication systems have their drawbacks, which also require the installation of a monitoring station.

[4] Zhou J., Gao D., and Zhang D. presented an optical flow approximation method, which can independently detect moving objects and is highly sensitive to changing environments even in the absence of prior information about the background. It's very good because it does it well.

Real-time applications are challenging to implement due to the high processing expense. Additionally, interference from things like car headlights is very likely to affect the device.

[5] S. Zeadally, R.Hunt, Y. Chen, A. Irwin, and A. Hassan proposed the development of a vehicle peer-to-peer network (VANET). This is a very important and exciting new type of network emerging in wireless technology. A feature of VANET is the provision of communication between the vehicle itself and between the vehicle and the road block.

VANETs also play an important role in concepts such as smart cities. This document builds on the framework of a smart city that transmits information about road conditions and helps drivers make voluntary and intelligent decisions to avoid traffic jams, which will ultimately help reduce overall traffic congestion. will. . Limitations include routing protocols that rely heavily on GPS. Also, location servers may not always be within reach. It's also a very unfortunate system in environments with low vehicle density.

[6] Ye Li, Bo Li, Bin Tian, and Qingming Yao an other approach, known as the AOG method, that uses the AND OR graph was proposed. By building an AND OR graph and focusing on the easily accessible and highly apparent aspects while ignoring the lesser vehicle features, this strategy complicates the detection of vehicle features. A decomposition of the vehicle representation is proposed during AOG construction and thus it helps in further reduction of the vehicle congestion or

occlusion using this method. A quantitative experiment was also conducted under several traffic conditions especially during the congested conditions. This method was used to effectively deal with vehicle shape, vehicle motion, vehicle pose and the climatic or weather conditions over the time of day.
A limitation of this method was that it was limited to automobiles and had to be developed for vehicles such as buses. Also, this method cannot be applied to real-time traffic processing and monitoring. Also, for a red vehicle, the system cannot determine whether it is a rear vehicle or a front vehicle, which reduces the system's accuracy and makes the system unreliable for real-time applications.

[7] Salama A.S. Saleh B.K. and Eassa M.M. The use of photoelectric sensors to ensure the design of an integrated intelligent control and monitoring system for traffic lights.
The installation of the sensors is a crucial component of this system because the traffic management department needs to keep track of the number of vehicles moving at a certain rate before sending this information to the traffic control cabinet, which can then use an algorithm based on the relative importance of each road to control the traffic lights in accordance with the sensor readings. The system will then calculate the relative weight of each road and open traffic on the road with the most traffic and give it more time than the other routes with less traffic. The system's ability to make decisions in real time stands out very strongly. Due to the sensors the system is expensive and also the sensors need to be kept in safe to prevent them from weather conditions. It also needs precision in the installation of sensors very accurately for efficient results.

[8]Porter presented aerial wide area motion imagery method for accurately registering the roadmap to wide aerial motion imagery by making use of locations of the vehicles detected and determining a transform for aligning these locations with network of the roads on the roadmap. The registration of the vehicle is calculated using expectation maximization algorithm. This method overcomes the challenges of feature estimation and can be applied easily to different imaging modalities. Three wide aerial motion imagery data sets will be used and the results of the three wide aerial motion imagery data sets will be captured by infrared sensors. A limitation of this method is that it uses sensors which are robust and affected to changes in the climatic or surrounding conditions.It is also an expensive method because it uses multiple sensors for each large set of air traffic images.

[9]Ms. PM Daigawane proposed a software-based system for counting and classifying vehicles.This method relies heavily on algorithms rather than sensors. Vehicle classification and counting can be performed using image or video processing techniques. This method uses the Scale Invariant Feature transform. This algorithm is used to detect key points. This method is widely used to rotate, align, and transform images.
A limitation of this method is that it uses only one specific algorithm which reduces accuracy and efficiency. Additionally, because it is completely algorithm-dependent and does not use sensors, minor errors in the algorithm can affect the system output, reducing efficiency.

[10]Badura S., Leskovsky A. presented a new model of an intelligent transportation system that includes surveillance using cameras installed at intersections and allows users to access this data with the help of a data delivery system.
Data transmission across a mobile Ad-hoc network will make up the data delivery portion of the overall system. Image analysis and foreground/background modelling techniques would be the key components of surveillance. In the course of the project, a number of experiments have been carried out, and they show a lot of promise in terms of effectiveness and real-time implementation. A limitation of this system is that it lacks the detection of emergency vehicles and methods of reducing congestion when an emergency vehicle is detected.

Conclusion

In comparison to all the existing methods mentioned in the literature survey we propose a method that makes use of Image processing techniques for better efficient systems. The system aims at having an Android application that helps the user to get interfaced with the actual system.

The system basically involves cameras that are installed at every signal from smaller roadways to highways. These cameras continuously capture the images and shoot the videos which are later enhanced by extracting its features using image processing techniques.

Vehicle detection and Motion detection techniques will be used along with a feedback controller that gives the count of number of vehicles which is taken into account to decide if the congestion in the traffic is minimal to moderate to heavy. The status of the traffic is then updated in the Android application which provides an interface for the user. Based on the status of the traffic that is updated in the application the user can login to find out the traffic conditions at various roadways and hence divert or avoid that particular route when the traffic is heavily congested. This method aims to achieve better results as it employs image processing and feedback control techniques along with a user interface which eventually leads to an efficient system.

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