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INTELLIGENT TRAFFIC SIGNAL MANAGEMENT SYSTEM USING CLOUD VISION AI AND MACHINE LEARNING

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ABSTRACT: Time and money has equal powers, to save time humans do not give a second thought for money and this goes vice-verse. This is why nearly every house has a vehicle in present situation. The effect of this has lead to the increasing traffic especially during peak hours. Research is still going on this field to have an efficient way of traffic management. This paper is on one such proposal where dealing with the traffic management is different from the existing technology. We are mainly focusing on two aspects which although nearly interrelated. Firstly on cut shot the timing of the less dense traffic (keeping equal priority on each lane) to achieve this we use cloud vision APIs which incorporates Machine Learning by using image taken by HD cameras as our input based on the congestion on the next lane the whole system is carried. The former being the traffic signal jump or breaking law enforcement this is done by using IOT device RFID which send the alert to the owner of the vehicle through cloud.

Key Words: Vision APIs, priorities, CNN, Edge Detection

1. INTRODUCTION

Fast transportation system and rapid transit system are important for economic development of any nation. Mismanagement and traffic congestion results in wastage of time, loss of fuel and money, there is a need for fast, efficient and economical traffic management system. The monitoring and controlling traffic becomes a major problem nowadays. The numbers of users are increasing day by days due to this proper management is being required and there is a need for smart traffic control system. To have proper traffic management there are several techniques are available. But no technique is perfect itself as the real-time situation is continuously changing and the no system is suitable to adopt the change continuously. There is two standard traffic control system such as 1) manual controlling: It requires manpower to control the traffic. Traffic police are allocated to that particular area and he will carry the signboard, sign light, Whistle.2) automatic controlling: Controlled by the timers and electronic sensors. The sensor detects the availability of the

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vehicle and according to that the timers are adjusted. But it has too many drawbacks not adaptable and not an efficient system. [4] We proposed a system for controlling density based smart traffic light control system in these is aims are to achieve goals: • Distinguish presence and absence of vehicles in capture road image. • Signal traffic light goes red when the road is empty. • Signal the traffic light go green accordingly to the density of the vehicle and the duration of green light adjusted based on calculation. This proposed system can be done by using mat lab software and aim to have proper traffic management. The camera is installed in the particular area where all the lanes are visible just above the traffic light. The film comes in the form of consecutive frames and each frame is compared with the first frame from which the density of car specified, further, the number of vehicles are displayed on the screen. According to that traffic control algorithm is used to display the allocation time. Accordingly, the green light adjusted. According to that, the traffic signal is being controlled. Using the information of traffic density is passed on the android application user can select the location as per his choice. It gives various locations along with the traffic status. This status provided information can use to choose the particular location to the destination. This application is easy and no extra cost is required. In these use of canny edge detection made because 1,) Have a proper detection, a strong response even at lowcontours.2) a good location guarantee ensures .3) for a contour there will be only one edge detection avoid the effects of rebounds. [9] As per stated in [7], Here these shows the comparison between different edge detection technique such as zero crossing, Prewitt, LOG, Robert, canny and Sobel. The Canny edge detector is better than other techniques due to its higher accuracy in detection of an object with higher entropy, PSNR (Peak Signal to Noise Ratio), MSE (Mean Square Error) and better execution time. It's having better overall performance as compared to other techniques

2. LITERATURE REVIEW:

Automatic traffic monitoring system and traffic surveillance are important for road usage and better traffic control. There are various methods are available for traffic management, because it has become serious issues nowadays. There are various techniques are available using different sensors, RFIDs tags etc. Out of all these techniques, the image processing technique is better because it's having its own computer visions, adaptable to the particular environment. Low cost and avoids the distortion and provides the accurate output and helps to control the traffic light time limit, depending on the density of the vehicles.

- As per [1], the image is acquired by using the web camera and furthers it goes through the four stages such as image acquisition, RGB to grayscale conversion, Image enhancement, and image matching technique. Here the reference image is compared with the captured image and it goes through the different technique. In these RGB to the grayscale conversion of these two images are done further the binary conversion is made. Than gamma correction to remove the error and the edge detection technique using Prewitt edge detection technique. These two images are matched using image matching technique and further the percentage of image matching is used, to indicate the time allocation of a traffic light.
- In [2] the new technique is used to see the status of the traffic over the android application. When the

count of the vehicles are detected these are passed over the server its updates status as high traffic or medium traffic or small traffic. A new application user is required to update the information during login into the application. Then the application returns the various locations and update of the new location is also available. The user can use the status provided by the server to update the alternative paths to the destination.

- In [3] the input is taken via the camera of the reference image and the real-time image is passed through the grayscale conversion. Further, the grayscale converted reference image is cropped and is multiplied using the real-time image and the required area is only considered. Then the binary conversion is done the traffic density is detected by making the bounding box property the accurate number of vehicles can be detected. In order to deal with the noise added in different lighting condition at different times of a day, the set of the reference image is captured and stored accordingly different time slots of a day. The system cycles these reference image accordingly the current set of the day.
- In [4] the new technique is developed to detect the emergency vehicle detection in these the obtained binary image is a threshold in such a way that only red light can be detected. The headlight of the vehicle can be detected, so further the processing is done so that the blinking of redlight should be visible. When this red light is detected that lane is given the higher priority and the entire system is halted for that period of time so that the vehicle can pass easily through that lane. This is helpful to detect the ambulance, fire vehicle etc.
- In [5] there are four steps such as Vehicle detection system, Vehicle counting classification system, Traffic signal control system and Data display system. Traffic signal control system detects the number of vehicles on the road and accordingly, the priority is assigned to the particular lane. Data display system display the total number of vehicles and the number of pixels each vehicle contain. Accordingly, the number of vehicles falls in which category is considered.
- In [6] in these two methods are used to find out the traffic density and both the methods will be used simultaneously. One is using gradient magnitude method and other by using direct subtraction method. This combination of the two methods helps to detect the vehicle without the distortion. The use of traffic control algorithm to implement the traffic system. We take the traffic density of the different roads at a given input time and accordingly the time allocation is done to the traffic signal. Time is allocated based on traffic cycle and weight factor. This proposed system is implemented by acquiring the traffic information; the mat lab is used for image processing, an ATMEGA8 microcontroller for controlling the traffic light and USART module for sending the control information to the microcontroller. Accordingly, the controlling of the traffic signal takes place.
- In [7] is shown the various comparison of edge detection method, out of which the canny edge detection method is the best technique. Canny edge detector depicts the higher accuracy in detection with higher entropy,

PSNR (peak signal to noise ratio), MSE (Mean square error) and better execution time. It has better overall performance as compared to another method. The image is captured by using the camera; the video is recorded and converted into the frames. The processing of the captured image and reference image. The gray scale conversion than theGaussian noise filter is used to eliminate the noise. Further, the use of canny edge detection is applied, the white point is count. Accordingly, the percentage matching and the time allocation is done. Further, these are implemented using the hardware in which the four ways traffic intersection model is designed. These four ways intersection model is consists of four arrays of LEDs with each array having red and green light. Python programming language is used for image processing and Arduino development board is used for controlling the LEDs.

- In [8] the image is captured by using camera than its converted into a grayscale image. The grayscale image is converted into the threshold image. The edge detection method using canny edge detector. On which the contour has been drawn in order to calculate the vehicle count. The vehicles are boxed to find the count, the output screen in the command prompt to display the vehicle count. Density measurement is implemented by using OpenCV software for image processing, by just displaying the various conversion of the image on the screen. Finally surrounding the box on the vehicle in the given image. The number of vehicles counted and the density of the vehicle is counted by using mat lab.
- In [9] the density of the vehicle count is done by using the video and the image. Overview of vehicle detection and counting system consists of the input frame, segmentation, and detection, tracking, and counting. In these we have used vehicle detection using image processing consists of the input image, Converting RGB to gray, Convert to binary, Edge detection, Image enhancement, Labeling the detected region, Vehicle tracking and vehicle counting

3. PROPOSED SYSTEM

3.1. The architecture of the system In these cameras is placed at the top of the signal to have a better line of sight. Also, the clear view of the traffic on the particular side of the signal so that it will capture an image and analyzes the image and get the count of the vehicle at that particular side. This count helps to detect the density of the vehicle and accordingly the signal is adjusted

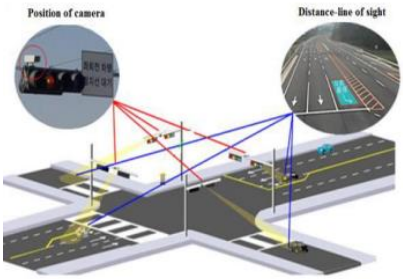

Fig :System Architecture

Vehicle usage is increasing day by day regardless of population of the country. This is one of the reasons for traffic congestion. For a country which is not highly populated, dealing with this problem may be a little easier whereas for the over populated country such as India this is a major issue. The effect of this is polluted air, high fuel consumption and slow economic growth. To slightly overcome these problems traffic congestion has to be reduced by giving equal priority to each lane.Traffic congestion is a major issue in over populated area that even the traffic

authorities are providing funds to researchers to adopt latest technologies which can reduce traffic congestion especially during peak hours. Considering the traffic in Bengaluru where there is 24/7 traffic, one should leave from starting point an hour early to reach his/her destination spot. This has resulted in poor time management and also other related issue. Our aim is to reduce the traffic by efficiently managing time and also by controlling traffic signal. ML (Machine Learning) is the latest technology and the emerging one, which is why we make use of this technique in our project [10][11][12][13][14]. Another reason being the accuracy of the vehicle count and density is more using this technique than with any other. Deep learning is a part of ML which takes the input data iterate it using CNN (Convolution neural network) and produces the required output[15][16][17][18] With the development of deep learning methods,Big data and cloud one can determine traffic related problems, which includes traffic flow prediction [1], traffic accident risk prediction [2] , arrival time estimate[3]. In this paper we make use of the images taken from cameras installed in traffic junction and this image is used as the input to the CNN (Convolution Neural Network).With the help of MATLAB we determine the density and count of vehicles[19][20][21]. Once we get the count of vehicle the time take for the vehicle to pass the traffic signal is determined using ML algorithm[22][23]. And then the required time is reduced from the fixed time of the traffic if the required time is less than the fixed time.Another reason for traffic congestion is that even after the stop light is on the vehicles move breaking the traffic laws. This will lead the consecutive junction a problem of traffic variation.

CONCLUSION These paper we discuss a method for estimating the traffic density on the different lane based on image processing, we can use it to count the number of dynamic vehicles that are passing on the highway and to control the traffic. These are advantageous technique over such as the use of Ariel imagery, complex sensor-based system and using any additional devices, such as RFIDs. The image is acquired by the camera and it's being placed at a particular height. Traffic information extraction is done by combining the two techniques such as gradient magnitude and frame subtraction method. The vehicle count is found out by using bounding box property, further according to the traffic control algorithm we can allocate the time limit to the particular lane according to the traffic density. The use of emergency vehicle detection algorithm helps to detect the vehicle such as ambulance, fire vehicles etc. Helps to give the priority to those emergency vehicles. The controlling of traffic light takes place through the microcontroller ATMEGA8 communication takes place through USART and accordingly the traffic light control based on the priority assigned. The use of the Android-based application to detect the traffic status to the user and accordingly decided the path to the destination. It helps to save the time and also to control the traffic.

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