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Smart Traffic Control Using Opencv

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Abstract : *We know that, the population of cities and vehicles on the road is increasing rapidly. On account of this, controlling the roads have seamless traffic movement is major issue. Today's traffic management system has no emphasis on live traffic scenario, which leads to inefficient systems. The traffic timers now installed show the preset time making it an open loop system. If incorporated a closed loop system, it will be possible to forecast the exact time to regulate traffic light timers. If timers are made intelligent to predict exact time then the system will be more efficient as it will greatly reduce the time wasted on unwanted green signals . This project has been implemented by using OpenCV software and aims to have SMART way for signal management which will ultimately be a cost effective solution. The system includes a camera placed facing a lane that will capture images of the road on which we want to control traffic. These images are efficiently processed to know the traffic density. According to the processed data from OpenCV , a 8051 micro controller will send command to the traffic LED timer to show particular time on the signal to manage traffic.*

Keywords : *Open CV, Image Processing, density based traffic control, Adaptive traffic control system, fire detection.*

I. Introduction

Quick transportation frameworks and fast travel frameworks are nerves of financial advancements for any country. Blunder and activity clog brings about long holding up times, loss of fuel and money.[1] It is in this manner most extreme important to have a quick, temperate and effective movement control framework for national improvement. The monitoring and control of city traffic is becoming a major complication in many countries. With the ever increasing number of vehicles on the road, the Traffic Monitoring Authority has to find new methods of overcoming such a problem. One approach to enhance movement stream and wellbeing of the present transportation framework is to apply robotization and keen control techniques. As the quantity of street clients continually increments, and assets gave by current frameworks are restricted, clever control of movement will turn into a vital issue later on. Activity clog may come about because of substantial movement at an intersection. To abstain from congestion there are such a significant number of activity administration strategies accessible. Be that as it may, no method is flawless independent from anyone else as the ongoing circumstances are by and large ceaselessly changing and the framework needs to adjust to change in the consistently evolving conditions. We have made an attempt to provide some traffic administration strategy which is self-changing in nature, so as to fit into continuously changing real time traffic scenarios. We are detecting fire on the any of the lane, if fire is detected, in control room the concern person will get notification in speech format using TTS which present at PC side.

Need: Due to traffic issues in and around metro cities in India, people face a tremendous hardship during regular commuting resulting in wastage of time, money and energy. (This project is based on Traffic management system where the real time traffic situations are handled to avoid delays at traffic junctions for the smooth functioning of traffic.[3])Thus we felt a need that traffic should be handled during real time situations so as to avoid the hardships of people traveling around, also this would help vehicles in emergency to a certain extent.

Basic concept: Propose a system for controlling the traffic light by image processing. The system will detect camera will be installed along the traffic light. It will capture image sequences. The picture grouping will then be examined utilizing computerized picture handling for vehicle discovery, and as indicated by activity conditions out and about movement light can be controlled The framework depends on the AT89S52 miniaturized scale controller technology.[2] The code for this undertaking will be coded in Python and the recreated with Proteus programming.

II. Literature Survey

This paper talks about the camera-video-observation capacities of following crosswise over various and shifted street enviornments including discovery of vehicles. The framework is intended to screen the wellbeing level of roadway and motorways, it could identify the unlawful turning of the vehicle and it can work both in bright and blustery seasons. The framework is produced utilizing diverse processor speed and was created under GNV-Linux with C programming honesty with OpenCV function.[4]

System developed for the main intersections of the road. Microcontroller used is BeagleBoneBlack/Rasp Pi, algorithm used is Haar Cascade.The system proves that it can minimize traffic mobbing and reduce waiting time of vehicles in front of traffic signal. To make real time analysis of traffic in modern cities,the authors of this project have configured and coupled actual traffic images taken with microcontroller and gurantees that the average waiting time of vehicles in front of traffic signal will be lesser than present traffic control system.[5]

This paper calculates the number of vehicles present and according to the number the density is calculated. Rasberry Pi is used as a microcontroller which provides the signal timing based on the traffic density.[6]

This paper is designed to develop a system which performs execution based on density of vehicles i.e counting of vehicles, using raspberry-Pi as a microcontroller. It concludes that video processing is a better technique for calculation of traffic density and controlling the state change of traffic light also use of OpenCV library for video processing is good tool as a software.[7]

This paper introduces the advancement of thickness based activity framework utilizing video handling with OpenCV. Continuous vehicle thickness is ascertained utilizing blob calculation from live video sustain. Recognize crisis vehicle utilizing OpenCV library format coordinating and offer need to crisis vehicle report infringement of activity run the show. This project detects the traffic from video input and analyzes the traffic condition, also, it counts the number of vehicles and based on that the states of traffic and analyzed data the traffic signal will be changed.[8]

This paper focuses on the traffic surveillance system which performs execution based on density of vehicles i.e counting of vehicles using Rasberry Pi as a microcontroller. The system is designed with the purpose to clear the traffic in accordance with priority.[9]

III. Existing System

This system was first developed using sensors, but since sensors have a complicated hardware and implementation , the project was developed using OpenCV and Matlab, which made the project comparatively easy to implement and understand, also there were changes in the hardware such as the microcontroller used was Rasberry Pi. The techniques used were blob detection, blob analysis, vehicle counting, colour thresholding and background subtraction. Various algorithms used were Haar Cascade, blob detection .The previous project was implemented using video processing.

IV. Proposed System

This system uses OpenCV as a software, and uses the concept of Image Processing. The language that will be used is python. As observed in the previous implementation, since Rasberry Pi is complicated and is difficult to work with ,we are using 8051 microcontroller so that it becomes easy to convert digital language into a binary one .The techniques implemented are blob detection and colour thresholding . The algorithm used here is viola jones algorithm. Additional feature that will be implemented is, our system will be able to detect fire and will take the required actions, also we are implementing this project using the python language.Speaking about the feasibility,since we are using OpenCV as the software,the entire cost of the project is minimised.

Features: Fire Detection

We are detecting Fire on road using colour thresholding technique, so that immediate actions can be taken and again the lane where fire is detected is given first priority so that traffic in that lane where fire is detected can be cleared. Once the traffic in fired lane gets cleared, again camera will capture the image and the process continues as above, we have a text to speech device, which helps the authority to detect fire .A message will be prompted on the command window regarding the fire.

V. **Working**

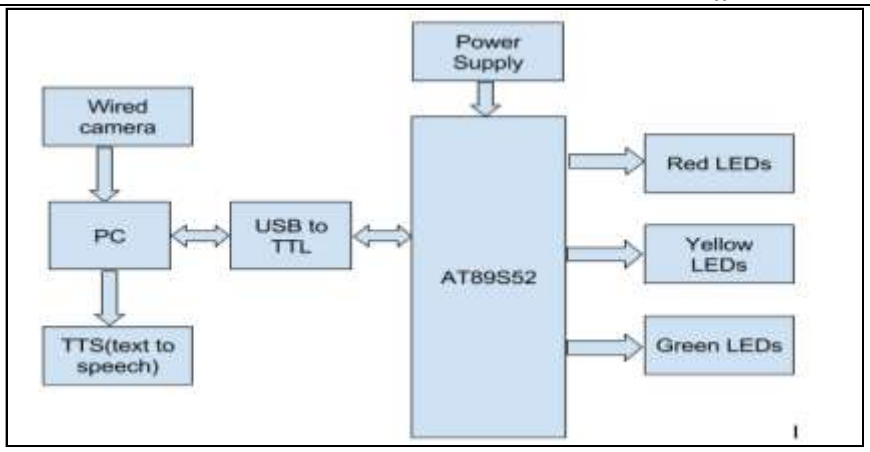

Fig.1 Block Diagram

We are using OpenCV software for detecting the density of a traffic on road and according to density we are controlling the traffic. Camera will capture the images of roads and it will send them to PC for processing it in OpenCV software. PC and camera will be connected using USB. According to the density of a traffic, the traffic lights will be controlled through 8051 microcontroller. PC and microcontroller are connected through USB to TTL device (Which is used to convert the data coming from PC to microcontroller understandable language i.e. TTL (Transistor transistor logic)) . PC will give signal to microcontroller to on the traffic lights according to the density of a traffic on the road. Roads are divided into two lanes, one traffic in and other is traffic out. The density of a traffic depends upon the vehicles present on traffic in lane. And the time period provided for a vehicles to go on other lanes is depends upon vehicles Traffic out lane. The maximum time period provided is 12sec and minimum is 0sec. We are detecting fire on road, so that immediate actions can be taken . PC side Text to Speech (TTS) is used, when Fire is detected then along with the command window message, there will be message in Speech format also.

The work is divided into 3 parts. The first part is to process the video signal and image acquisition from fixed camera using Image Processing where Blob Detection Technique is used for density for traffic density calculation.[9] The second part is to change the timer according to the traffic density. Microcontroller will do the processing part. The third part is to send the audio whenever fire is detected in the lane. The final result will be seen on the LED's. The Overall block diagram of the proposed system is illustrated below (Fig.1).

A .Real Time Image Processing

A System having camera is installed at the intersection of lanes, where camera continuously records the traffic . It will then send the recorded video and will take one frame per second from the video and then will send it to PC for processing it in Open CV software[4]. PC and camera will be connected using USB.

Image Subtraction: In system we already save background image without vehicles (Initial Condition) and subtracts current image of traffic from background image[5].

Image Acquisition: Image of the vehicle is captured using video camera and transferred to the image processing system in Open CV

Pre-processing: Acquired image is enhanced using contrast and brightness enhancement techniques.

Greyscale conversion: It involves conversion of colour image into a gray image. The method is based on different colour transform. According to the R, G, B value in the image, it calculates the value of gray value, and obtains the gray image at the same time[6][4]

Image Binarization: Greyscale image is converted into black and white image i.e. binary image using thresholding operation.

Traffic Density Calculation:By applying Blob Detection analysis on the binary image number of vehicles will be count and compare with Traffic density threshold[8].

B. Change of Timer according to the traffic density

Timer can be changed according to the output of viola-jones algorithm. This project works manly on junction[5]. Considering four lanes, each lane is divided into two parts viz the input lane and the output lane. The lane having the maximum number of vehicles in the input lane will be given the first priority, the lane with the number of vehicles lesser than the higher priority lane will be give the second priority and so on .Since we are using the concept of stack this system guarantees the processing of each lane. The maximum time limit is of 12secs.After giving priority to the lane it checks the other three lanes and then depending upon the number of

output vehicles, timeslot is assigned .For eg, if we consider the lane one as our priority lane, then the system check lanes 2,3,4 and then depending on the number of output vehicles timeslot is assigned .The output lane having minimum number of vehicles will be having maximum time for green signal i.e of 12secs.The lane after that will be having time period of 8 secs, and the lane having the maximum number of output vehicles will be having the green signal on for 4 secs.

According to the density of a traffic, the traffic lights will be controlled through 8051 microcontroller. PC and microcontroller are connected through USB to TTL device (Which is used to convert the data coming from PC to microcontroller understandable language i.e. TTL (Transistor transistor logic)) .

PC will give signal to microcontroller to on the traffic lights according to the density of a traffic on the road. Roads are divided into two lanes, one traffic in and other is traffic out. The density of a traffic depends upon the vehicles present on traffic in lane. And the time period provided for a vehicles to go on other lanes is depends upon vehicles Traffic out lane. The maximum time period provided is 12sec and minimum is 0sec.

VI. Future Scope

The present system uses a single camera for monitoring traffic at an intersection. By using a separate camera for each road at an intersection can improve the system efficiency further. The vehicle objects can also be categorized into various classes depending upon the geometrical shape of vehicle for blocking the passage of large vehicles e.g. trucks during day time. The emergency mode can be refined further by installing a GPS receiver in ambulance so that the base station will keep track of the ambulance location on a continuous basis and clear the road whenever will be required.

III. Conclusion

In this paper, a method for estimating the traffic using OpenCV is presented. This is done by using the camera images captured from the road lanes. Each image is processed separately and the number of cars has been counted. This system guarantees that the average waiting time of the vehicle in front of traffic signal will be lesser than present traffic control systems, also the techniques and algorithms used in this project promises to be more effective as compared to the previous system. The advantages of this new method include such benefits as use of OpenCV over sensors, low cost, easy setup and relatively good accuracy and speed. Because this method has been implemented using OpenCV software, production costs are low while achieving high speed and accuracy.The implementation of this system is not possible in rural areas since there are less number of vehicles present due to which there are no traffic issues encountered.

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