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Smart Traffic Control System

Kirushnacumar. A¹, Arun. M², Kirubanand. A³, Mukesh. S⁴, Aravindan@Sivakumar. A⁵

B. Tech Electronics and Communication Engineering

Achariya College of Engineering Technology, Pondicherry, India

Abstract- We are very much aware of the fact that, the population of city and number of vehicles on the road are increasing day by day. With increasing urban population and hence the number of vehicles, need of controlling streets, highways and roads is major issue. The main reason behind today's traffic problem is the techniques that are used for traffic management. Today's traffic system is not enough to reduce traffic. If the traffic light timers are showing correct time to regulate the traffic, then the time wasted on unwanted green signals (green signal, when there is no traffic) will be saved. Timer for every lane is the simplest way to control traffic. And if those timers are predicting exact time then automatically the system will be more efficient. This paper represents the project that has been implemented by using the MATLAB software with GUI and it aims to prevent heavy traffic congestion. This project does not actually measure the number of vehicles present on the road, but measures the area covered by vehicles on the road. Moreover, for implementing this project following steps must be considered: 1) image acquisition 2) RGB to grayscale transformation 3) image enhancement. A web camera is placed in a traffic lane that will capture images of the road on which we want to control traffic. Then these images are efficiently processed to know the traffic density. According to the processed data from MATLAB, the controller will send the command to the timer to show particular time on the signal to manage traffic.

Index Terms— Image enhancement, RGB to grayscale transformation, GUI.

I. INTRODUCTION

In modern life we have to face with many problems one of which is traffic congestion becoming more serious day after day. It is said that the high tome of vehicles, the scanty infrastructure and the irrational distribution of the development are main reasons for augmented traffic jam. The major cause leading to traffic jam is the high number of vehicle which was caused by the population and the development of economy. To unravel this problem, the government should encourage people to use public transport or vehicles with small size such as bicycles or make tax on personal vehicles. Particularly, in some Asian countries such as Viet Nam, the local authorities passed law limiting to the number of vehicles for each family. The methods mentioned above are really efficient in fact. That the inadequate infrastructure cannot handle the issue of traffic is also a Decisive reason. The public conveyance is available and its quality is very bad, mostly in the establishing countries. Besides, the highway and roads are incapable of meeting the requirement of increasing number of vehicle.

A. Standard Traffic Control Systems

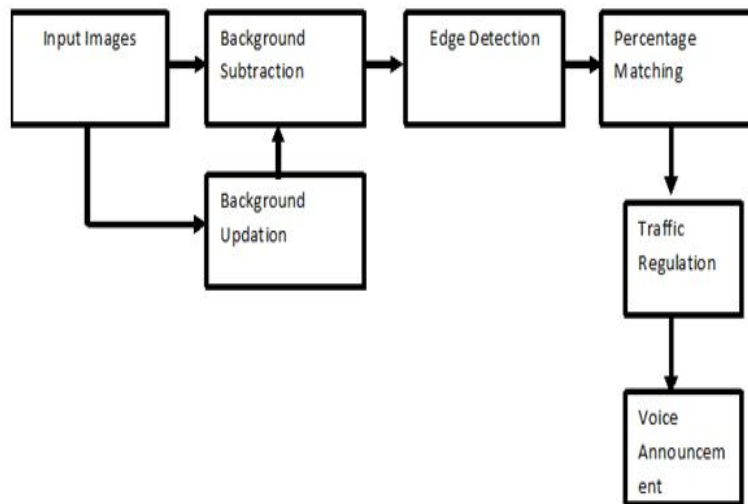
- 1) **Manual Controlling:** Manual controlling the name instance it require man power to control the traffic. Depending on the countries and states the traffic polices are allotted for a required area or city to control traffic. The traffic polices will carry sign board, sign light and whistle to control the traffic. They will be instructed to wear specific uniforms in order to control the traffic. Automatic Controlling Automatic traffic light is controlled by timers and electrical sensors. In traffic light each phase a constant numerical value loaded in the timer. The lights are automatically getting ON and OFF depending on the timer value changes. While using electrical sensors it will capture the availability of the vehicle and signals on each phase, depending on the signal the lights automatically switch ON and OFF.
- a) **Drawbacks:** In the manual controlling system we need more man power. As we have poor strength of traffic police we cannot control traffic manually in all area of a city or town. So we need a better solution to control the traffic. On the other side, automatic traffic controlling a traffic light uses timer for every phase. Using electronic sensors is another way in order to detect vehicles, and produce signal that to this method the time is being wasted by a green light on an empty road. Traffic congestion also occurred while using the electronic sensors for controlling the traffic need for Image Processing in Traffic Light Control We propose a system for controlling the traffic light by image processing. The vehicles are detected by the system through images instead of using electronic sensors embedded in the pavement. A camera will be placed alongside the traffic light. It will capture image sequences. Image processing is a better technique to control the state change of the traffic light. It shows that it

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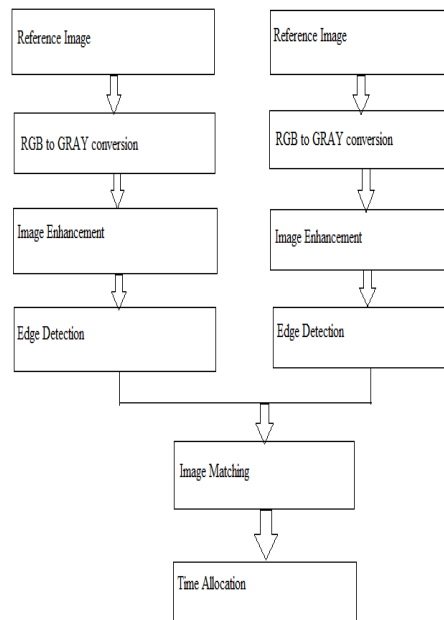
can decrease the traffic congestion and avoids the time being wasted by a green light on an empty road. It is also more reliable in estimating vehicle presence because it uses actual traffic images. It visualizes the practicality, so it functions much better than those systems that rely on the detection of the vehicles' metal content.

II. INTRODUCTION TO IMAGE PROCESSING

Image Processing is a technique to enhance raw images received from cameras/sensors placed on space probes, aircrafts and satellites or pictures taken in normal day-today life for various applications. Many techniques have been developed in Image Processing during the last four to five decades. Most of the methods are developed for enhancing images obtained from unmanned space probes, space crafts and military reconnaissance flights. Image Processing systems are becoming widely popular due to easy availability of powerful personnel computers, large memory devices, graphics soft wares and many more.



Block Diagram



Block Diagram of Proposed System

III. PROPOSED SYSTEM

A. Image Processing Based Traffic Control System

We propose a system of traffic density identification based on image processing technique. It matches the image frames and identify

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the level of traffic and accordingly on and off the signals. The system is efficient enough to catch the traffic congestion level.

B. Advantages Of Proposed System

- 1) MATLAB Image processing based intelligent traffic signal control.
- 2) Highly accurate.
- 3) Easily implementable.
- 4) Voice Announcement along with display.

C. Image Input

- 1) *Reference and Captured Image:* Here Reference image are given to camera, then captured image are compared with the Reference image.



- 2) First provide the input image.
- 3) Reference and Input images are provided to match up.

D. Background Updation/Subtraction

- 1) Background Updation is used to check the pixel value of each pixel which needs to be matched with corresponding frame.
- 2) Background Subtraction is used to check whether the images are matching or not.

E. Edge Detection

- 1) We use Prewitt edge detector to match the edges of the images.
- 2) This edge detection will provide the matching image levels.

F. Percentage Matching

- 1) This module shows the % level of the matching images.
- 2) The percentage of matching images will be shown.

G. Traffic Regulation and Audio Output

- 1) Traffic will be regulated based on the matching percentage
- 2) It will also announce the traffic situation in audio message.

IV. DETAILED DESCRIPTION OF PROJECT

Many techniques have been developed in Image processing during the last four to five decades. Most of the methods are developed

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for enhancing images obtained from spacecrafts and military reconnaissance flights. Image Processing systems are becoming widely popular due to easy availability of powerful personnel computers, large memory devices, graphics softwares and many more. Image processing involves issues related to image representation, compression techniques and various complex operations, which can be carried out on the image data. The operations that come under image processing are image enhancement operations such as sharpening, blurring, brightening, edge enhancement. Traffic density of lanes is calculate during image processing which is done of images of lanes that are captured using digital camera. We have chosen image processing for calculation of density as cameras are very much cheaper than other devices such as sensors. Our project is fully based on image processing technique. It is done by GUI process in MATLAB. Here two images are used one is the reference image and other captured image.

Reference image will be given by us based on four conditions.

Reference Image with no traffic

Reference Image with low traffic

Reference Image with medium traffic

Reference Image with heavy traffic

There will be a fixed camera in the traffic signal, from this camera images will be taken based on the above conditions. Initially some images will be given as reference. First image acquisition will be done where the analog image will be converted to digital image, then image resizing will be done based on the constant size because if one pixel grid vary also output will change. Then these images which are in RGB format will be converted to gray condition. This gray conversion done because RGB images will have bright intensity so it give problem while matching with other image. So, by converting it to gray scale it has only black and white colors because of it matching the image will be easy. Image enhancement is done after that to reduce noise in the image. Edge detection is done after it here Prewitt edge detection method is done which used to find edges in the digital image. Then the converted image will be resized to the required pixel condition. Similarly the captured image will also go under the same condition up to edge detection. Atlast image matching will be done where the reference image and captured image percentage of matching occurs to the low, moderate, heavy traffic condition means timing will be displayed based on that condition. By using this technique we can able to reduce traffic time, fuel consumption can be reduced. Here the above mentioned steps will occur under image processing technique under MATLAB and at the output it is shown by comparing two images allocating time to that one based on traffic condition. The Four direction like north, south, east, west were used for four signal suppose if north signal is green means then all other will be red after decrease in allocated time of that traffic it will go to next signal in particular order. Here in the output audio also used which will represent the direction and timing of the traffic. Making use of the above mentioned virtues of image processing we propose a technique that can be used for traffic control.

V. IMPLEMENTATION OF ALGORITHM

The block diagram of the project was discussed in previous chapter. The algorithm behind the block diagram consists of following steps

A. Reference image and the image to be matched is continuously captured using a camera that is installed at the junction.

B. The images are pre-processed in two step as follows

1) Images are rescaled to 300 300pixels.

2) Then the above rescaled images are converted from RGB to gray.

C. Edge detection of pre-processed images is carried out using Prewitt edge detection technique.

D. The output images of previous step are matched using pixel to pixel matching technique.

E. After matching the timing allocation is done on the percentage of matching as based on the side

1) If the matching is between 0 to 30 % then green light is on for 90 seconds.

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- 2) If the matching is between 30 to 60 % then green light is on for 90 seconds.
- 3) If the matching is between 60 to 70 % then green light is on for 30 seconds.
- 4) If the matching is between 70 to 90 % then green light is on for 30 seconds.

VI. OUTPUT

If matching is between 60 to 70 % green light on for 30 sec on east side.

Traffic Image 1

Traffic Image 1

match

percentage of match

67.433

RESULT

East Signal GREEN for 30 Seconds

On east side green light on for 30 sec

East Signal (30 Seconds)

West Signal

North Signal

South Signal

WALK

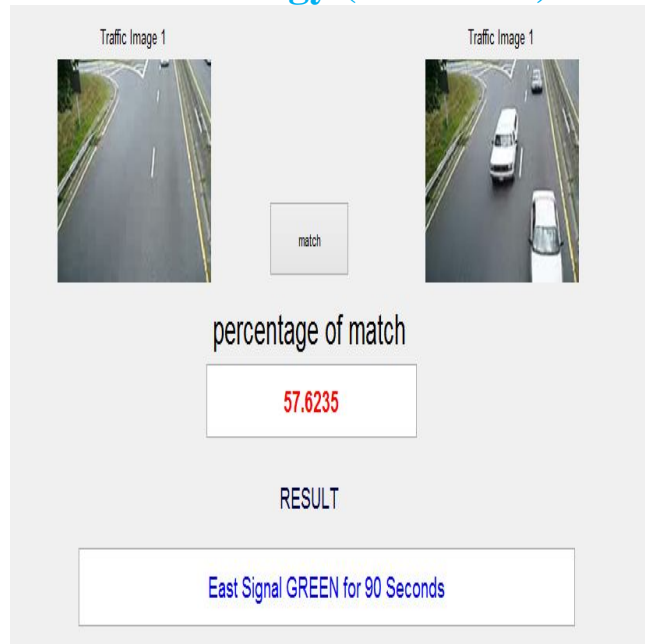
STOP

STOP

STOP

If matching is between 0 to 60 % green light on for 90 sec,

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On east side signal green light is activated on for 90 seconds by matching the two images.



East signal becomes green so, it is activated for 90 seconds and other three sides red signal is activated for 90 second. Similarly for north, south & west signals these conditions can be applied.

VII. CONCLUSION

Here discussed about existing traffic control system and their drawback, to overcome from those drawbacks can build a flexible traffic light control system based on traffic density. To find traffic density edge detection techniques can be used. The above paper presents the method of traffic light control through image processing. The earlier techniques had a drawback of time being wasted on green light on the empty road. Our implemented system avoids this problem. We have successfully implemented real time image

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processing based traffic light controller. The key feature of this paper is that it removes the need of hardware sensors such as infrared sensors and RFID tags. Based on the traffic condition green light timing are changed. So, by using this method the wastage of time and traffic in the signals can be reduced.

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