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Automatic Traffic Light Control System By Using Digital Image Processing

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ABSTRACT : A steady increase in population and big increase the number of vehicles on road, leads to traffic jam often during peak hours. The traffic analysis and controlling becomes a challenging problem as well as it needed to control the traffic in decent and safe manner. The trraffic signals are operated on the fixed predefined program,these are based on the time. If there is no vehicle on the road, the time will lapsed for the other vehicles which are waiting on the other side. To solve this issue, this paper present an approach for analysis and detecting vehicels by CCTV cameras in form of images. The methodology consists of four steps : images acquisition by CCTV cameras, RGB to gray conversion, Image enhancement and image matching using edge detection. Three Mark pole were in installed and time alloted to each pople for green signal. When traffic touch first mark pole the green light on after 90 second, if traffic touch second mark pole the light on after 60 Second and in last if light touch third mark pole the light on after 30 Second. This system control traffic automatically.

Keyword : CCTV camera, RGB, Grayscale, image enhancement, edge detection.

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I. INTRODUCTION

Traffic system plays a very important role in this civilized world and many aspects of life that relies on it. The inefficient controlling traffic signal always affect the flow of traffic.We should set up a good sytem for optimizing traffic flow in rush hours. Normally traffic is controlled by traffic lights (green, orange and red), timing of these light is set or programmed in fixed manner or static manner. There should be a system that light change should be based on density of traffic on that particular route. Most of the city traffic is controlled by sensors and cameras shall be installed in big highways and streets. The most common use for the traffic image data collection is signal timing. Traffic signal preemption or prioritization allows the normal operation of traffic lights to be preempted. The most common use of these systems is to manipulate traffic signals in the path of an emergency vehicle, halting conflicting traffic and allowing the emergency vehicle right-of-way, to help reduce response times and enhance traffic safety. This problem can be controlled by the proper analysis of traffic, proper adjustment in the controlling of traffic management. There is one methods to overcome the traffic problem is to develop a traffic analysis by measuring the traffic density on a road using images processing techniques. In this proposed work, images of traffic are captured by using CCTV cameras and three (may more) mark pole are placed on road side, if traffic touch that pole line then green light on after a fix minute, the different time slots are given to different poles to on the green light. This system really automaticaaly control the traffic system. This method uses a series of image processing operations such as preprocessing, image enhancement, segmentation and morphological operation to detect the vehicles. The result message is shown to inform the density of vehicles in highway. The vehicle density decides the traffic.

Fig.1 Traffic jam at road

II. LITERATURE REVIEW

Many researches and works have been done on traffic analysis using image processing techniques.

E.Atkociunas et al. [1] has proposed an approach to road monitoring and traffic problem, such as vehicle tracking, speed measurement, jam detection and number-plate recognition. Vehicle tracking based on Contour extraction; it is extracted

for edge linking process. At last geometric centre is calculated for tracking the vehicle. Speed measurements were achieved by motion detection method and number-plate is recognized by neural network technology.

Bharathi Sharma et al. [2] has proposed automated vehicle detection based on average filter to reduce the noise effect, also discussed differential morphological closing profile for vehicle segmentation and shape detection. Thresholding value is applied to remove the unwanted objects other than the vehicle. Finally to extract the target vehicle shape index thresholding has discussed.

Pratishtha Gupta et al. [3] discussed a model to count the traffic load by some parameters such as edge detection, histogram equalization, labeling and removing the noise with the help of median filter. To get smooth image and sharp boundaries Pratishtha Gupta proposed median filter.

Prutha Y M and Anuradha S G [4] have proposed real time vehicle detection based on background differencing, morphological operations and edge detection. Threshold techniques are applied to calculate traffic parameters such as counting the number of vehicles and speed of the cars. Naveen Chintalacheruvu and Venkatesan

Muthukumar[5] have proposed an efficient video based vehicle detection system based on HarrisStephen corner detection algorithm. They implemented the video based detection system on embedded computer platform.

Prabhakar Telagarapu et al. [6] described a vision based pedestrian and car tracking system which is able to distinguish between car and pedestrian using morphological and Blob analysis.

III. PROPOSED METHOD

The main objective of this work is to detect vehicle and finding the density of traffic in order to analyse the traffic. To detect and find densityof vehicle two images are taken, first one is kept as reference image (road without vehicle) and the second image is road without vehicle. First, two RGB images are converted into gray scale image and then these images are subtracted using absolute difference operation. The enhanced image is filtered using, median filter to reduce the noise. Filtered image is then converted into binary image using Otsu's gray scale threshold. Differential morphological operations are used to segment the shape of vehicles. Proposed algorithm, automatically detects the shape of vehicles by setting some initial parameters like a series of opening and closing operations of disc-shaped structure sizes to implement the morphological profile.

IV. METHODOLOGY

There are four stages in image processing:
4.1 Image acquisition
4.2 RGB to Gray Conversion
4.3 Image Enhancement
4.5 Edge detection
4.6 Image matching
4.1 Image acquisition

Image acquisition is first step of traffic control system. The image is captured by CCTV cmeras which are placed at traffic control light or on seperates poles. These images are captured regularly whole day and

We have to change over the simple picture to computerized picture to process it through advanced PC. Each advanced picture made out of a limited components and each limited component is known as a pixel.

Reading the Image

```
imagen=imread('image_a.jpg');
```

Fig. 2 RGB to Gray Conversion

This is second step of image processing. The CCTV captured images are color images and these images have the combination red, green and blue colors. These image is converted in Gray scale format. This gray scale format is combination of Black and White colors. This process is completed by use of following MTLAB command.

Convert to gray scale

```
if size(imagen,3)==3 % RGB image
        imagen=rgb2gray(imagen);
```

Convert to binary image

```
threshold = graythresh(imagen);
```

imagen =~im2bw(imagen,threshold);

Fig : 3 Image enhancement

Image enhancement is the process of adjusting digital images so that the results are more suitable for display or further analysis. For example, you can eliminate noise, which will make it more easier to identify the key characteristics. Algorithms for image enhancement:

- Histogram equalization
- Linear contrast adjustment
- Median filtering
- Unsharp mask filtering
- Noise-removal Wiener filtering

4.5 Edge Detection

Edge detection is the name for a set of mathematical methods which aim at identifying points in a digital image at which the image brightness changes sharply or, more technically, has discontinuities or noise. The points at which image brightness alters sharply are typically organized into a set of curved line segments termed edges. Edge detection is a basic tool in image processing, machine vision and computer envisage, particularly in the areas of feature reveal and feature extraction

In MATLAB by default, edge uses the Sobel method to detect edges. Here we use Sobel type of edge detection. The Sobel administrator plays out a 2-D spatial slope estimation on a picture. It utilizes a couple of 3×3 convolution masks, one assessing the angle in the x-heading (sections) and the other evaluating the slope in the y-course (rows).These pieces are intended to react maximally to edges running vertically and on a level plane with respect to the pixel grid, one portion for each of the two opposite introductions. The parts can be connected independently to the information picture, to produce isolate estimations of the inclination segment in every introduction (Gx and Gy). These can then be consolidated together to locate the total greatness of the slope at each point and the introduction of that angle.

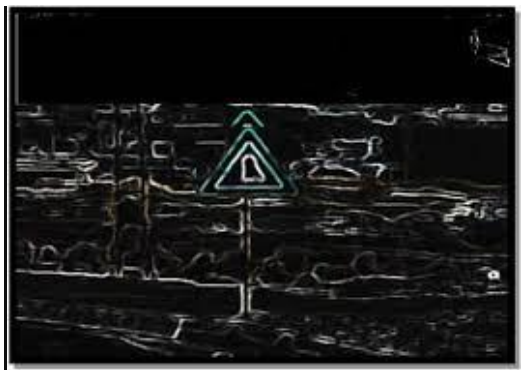


Fig. 4 Edge detection image

4.6. Image Matching

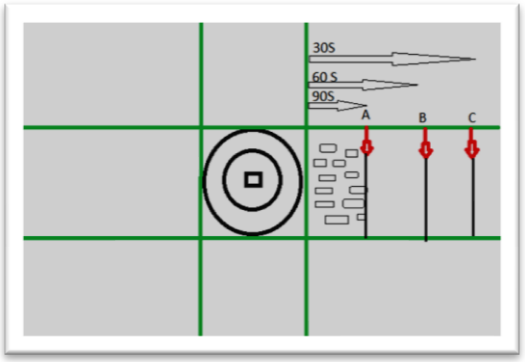
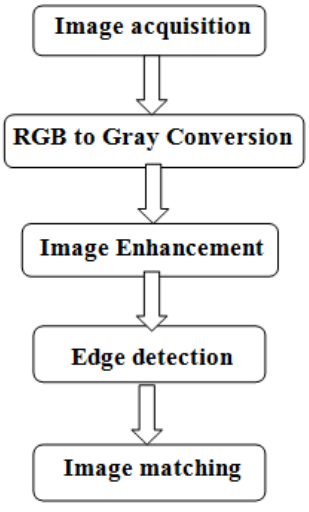


Fig 5. Automatic Traffic light control system

After edge detection procedure both allusion and real time images are matched and traffic lights can be controlled based on percentage of matching.

- If the Traffic is upto the point A - green light is on after 90 seconds.
- If the Traffic is upto the point B- green light is on after 60 seconds.
- If the Traffic is upto the point C-green light is on after 30 seconds.

V. FLOW CHART



VI. CONCLUSION

The study revels that image processing overcomes the limitations of all traditional methods of traffic control. It eliminates the need for extra hardware like sound sensors. This method is using only simple CCTV camera which are already installed on road side poles. The traffic lights are controlled by three markers(it may more) . The Green light are controlled by using these markers. The use of image processing is good for traffic management but it still requires much improvement. The use of image processing may help to identify density of vehicles as they pass and priority can be given to emergency vehicles and help in supervision on a reasonably large scale.

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