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Smart Traffic Control System Using Image Processing

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ABSTRACT: Traffic control frameworks are broadly used to screen and control the stream of vehicles through the intersection of numerous streets. With the increase of population, the problem of growing traffic is becoming critical day by day. Due to that on a daily basis, the commuters spend significant amount of time in travelling. There are techniques such as Timer Based System, Traffic Management Mystem using Wireless Technologies, Manual Traffic Control System, Traffic Control System using Image Processing and many more to control the traffic.This paper focus on traffic control system using Image Processing which helps the traffic control system to be effective. The paper centers around how the drawbacks of the traffic control system using other techniques can be resolved using image processing.

KEYWORDS: Image Processing, population, Techniques, Manual Traffic Control.

I. INTRODUCTION

In many parts of the world today, road transport is one of the primary modes of transport.Traffic management in fast-growing cities has become one of the most important issues.Due to the growing population, manual traffic control in a city is getting worse day by day, as it needs more human power. On the other side electric sensors are used to detect vehicles for controlling the traffic but time is wasted when the signal is green light on the empty roads. A better solution for traffic control is needed. To solve, all the drawbacks can be suppressed by using image processing. In contrast by using image processing the vehicles are detected by the images instead of using electronic sensors infixed in the paved path.Image processing imply compression techniques, image representation issues and different complex procedures that can be performed on data.

Figure 1: Traffic Congestion

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II. FLOW CHART DEPICTION

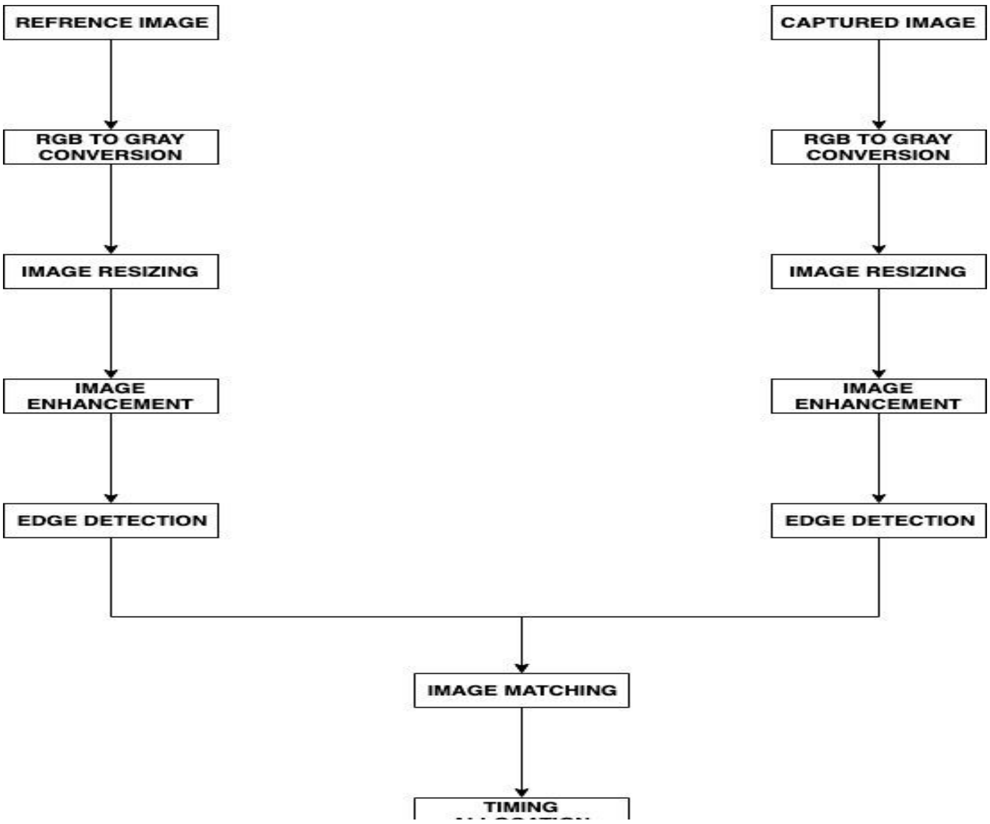

Figure 2: Block Diagram

III. STEPS INVOLVED FOR IMAGE PROCESSING

A. Image acquisition and RGB to gray conversion

There are three phases carried out for Image acquisition and RGB to gray conversion:
Phase 1: Image acquisition is initially carried out using web camera. The first image without traffic on the road is being captured. The image captured without traffic is considered as Reference Image and thereby RGB to gray conversion is done on it. Later gamma correction is done to achieve image enhancement. Sobel Edge Detection operator is used for the edge detection of reference image.

Phase 2: Image with traffic on the road is being captured. RGB to gray conversion is done on the series of the captured images Later gamma correction is done on the captured images to achieve image enhancement. Sobel Edge Detection operator is used for the edge detection of the real time images of the road.[4]

Phase 3: Reference and real-time images are matched after the edge detection procedure and traffic lights can be controlled based on matching percentage. If the match is between 0 and 10 percent-for 90 seconds, green light is on. If the match is between 10 and 50 percent-for 60 seconds green light is on. If the match is between 50 and 70 percent-for

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30 seconds green light is on. If the match is between 70 and 90 percent-for 20 seconds green light is on. If the match is between 90 to 100 percent-red light is on for 60 seconds.[9]

B. Image Enhancement

The image obtained is transformed into gray. The images are adjusted to make the results more suitable for further processing in this process. The fundamental techniques used for image enhancement are:[4]

1) Linear (negative and identity transformations)
2) Logarithmic (log and inverse log transformations)
3) Power law transformations (gamma correction)
4) Piecewise linear transformation functions

C. Edge Detection

Edges are the noteworthy transitions in an image. First, we detect these edges in the image and use these filters to enhance the image areas containing edges, increase the image sharpness and make the image clearer. Different operators used for Edge Detection are:

- Prewitt Operator
- Sobel Operator
- Robinson Compass Masks
- Krisch Compass Masks
- Laplacian Operator.

In the first derivative of the image, we used gradient-based Edge Detection that detects the edges by looking for the maximum and minimum. Sobel operator is used for detecting two kinds of edges. [8]

- Vertical direction
- Horizontal direction

Pseudo-codes for Sobel edge detection method [7]
Input: A Sample Image
Output: Detected Edges
Step 1: Accept the input image
Step 2: Apply mask Gx ,Gy to the input image
Step 3: Apply Sobel edge detection algorithm and the gradient
Step 4: Masks manipulation of Gx,Gy separately on the input image
Step 5: Results combined to find the absolute magnitude of the gradient
Step 6: the absolute magnitude is the output edges

Edge detection of the captured image is done using Sobel edge detection operator as shown in figure 3:

Figure 3: Edge Detection

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D. Image Matching

Edge-based matching is the process of combining two edges of the same objects together. Any edge or representation on one image is compared and assessed alongside with all edges on the other image. The edge detection of reference image and real images captured is done using Sobel operator.

Reference image Captured image

Figure 4: Images

IV. RESULTS

Result 1	Matching between 0 to 10% - green light on for 90 seconds.
Result 2	Matching between10 to 50% - green light on for 60 seconds.
Result 3	Matching between50 to 70% - green light on for 30 seconds.
Result 4	Matching between 70 to 90% - green light on for 20 seconds.
Result 5	Matching between90 to 100% - red light on for 60 seconds.

V. CONCLUSION

Image processing is a better technique to control the traffic on the roads and it overcomes all the limitations of the earlier technique used for controlling the traffic. It is a cost efficient and flexible technique to control the traffic. It reduces the traffic congestion and avoids the time wasted by green lights on empty roads.

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