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Image Comparision Based Traffic Queue Length Measurement for Real Time Signal Controlling

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Abstract—Due to the increase in the number of vehicle day by day traffic congestion is the main issue we face today. due to which road accident increasing day by day. to solve this issue we need an automated intelligent system that can handle this issue easily compare to our current scenario where we provide manual power to handle it which is not possible each and every time. This paper discusses about some of the standard traffic control system and their drawback, Image processing technique which helps in finding traffic queue length and some of the methods of it.

Keywords*: *Traffic light control, image processing, image matching, edge detection

I. INTRODUCTION

The number of vehicles on the road increases day by day therefore for the best utilization of existing road capacity, it is important to manage the traffic flow efficiently. Traffic congestion has become a serious issue especially in the modern cities. The main reason is the increase in the population of the large cities that subsequently raise vehicular travel, which creates congestion problem [1-5]. Due to traffic congestions there is also an increasing cost of transportation because of wastage of time and extra fuel consumption [2]. Traffic jams also create many other critical issues and problems which directly affect the human routine lives and some time reason for life loss [6-8]. For example if there is an emergency vehicle like ambulance on the road with the critical patient on board. In that situation if an ambulance gets stuck in a heavy traffic jam then there are high chances that the patient cannot reach the hospital on time. So it is very important to design an intelligent traffic system which controls traffic intelligently to avoid accidents, collisions and traffic jams [7].

The most common reason of traffic congestion in third world countries is an inefficient traffic signal controlling which affects the traffic flow. For example if one lane has less traffic and the other lane with huge traffic but the duration of green light for both lanes is same then this is the waste of available resources and is inefficient. By considering the above example if the lane with higher traffic density should switch on the green signal light for a longer period than the lane with lesser density. There are lots of techniques proposed to design an intelligent traffic system, for example, fuzzy based controller and morphological edge detection technique are proposed in [1]. This technique is based on the measurement of the traffic density by correlating the live traffic image with a reference image. The higher the difference is, higher traffic density is detected. In [9] another technique is proposed to design an intelligent traffic system, which is based on four lane system in which time is allocated according to the number of vehicles on the lane. In [10] another technique is proposed which is based on neural networks, which identify the vehicles and traffic density by processing the traffic videos. The technique proposed in [11] is based on computing the traffic load by comparing two images, the reference image and the live traffic image. They improved object detection using image segmentation and noise removal operations. In [2] another technique is proposed to control the traffic signal by using image processing, in which they first selected the reference image which is the image with no vehicles or less vehicles and every time matching real time images with that reference image. On the basis of the percentage of matching traffic lights controlled. But in this technique image matching is performed by the edge detection. The reference subtraction is a complex technique, with limited outcomes. This paper presents an idea of image matching between reference image (blank image of a road with no traffic) and live image (capture by camera at actual scenario), which provides us more accurate information for signal decision making. The paper is organized as follows: section I gives the introduction why image processing technique is needed to control traffic, section II explains the recent trends and technology followed till now Section III discusses the introduction to image processing. Finally section IV discuss the proposed methodology and section V concludes the paper. The paper followed by the key references used in the work results followed by the key references used in this work.

II. RECENT TRENDS & TECHNOLOGY

Existing System for Controlling Traffic

Manual controlling 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. In 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.

Fix controlling Fix controlling 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.

Need for 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 along side 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 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.

III. 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, 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.

3.1 Image Acquisition

Generally an image is a two-dimensional function f(x,y) (here x and y are plane coordinates). The amplitude of image at any point say f is called intensity of the image. It is also called the gray level of image at that point. We need to convert these x and y values to finite discrete values to form a digital image. The input image is a taken from stare data base and drive data base. The image of the road with traffic is taken for processing and to check the traffic on either side of the road. Each digital image composed of a finite elements and each finite element is called a pixel. The figure is the captured by a sensor. Here photo diode sensor is used. The sensor is constructed with silicon material. The output voltage waveform of sensor is proportional to light. We can also use filter to improve selectivity. We can also make a output which has one strong colour than remaining visible colours using filter. We can generate a 2-D image using single sensor with a displacement in both directions of plane. The arrangement used here is for capturing real time traffic image with the help of cameras mounted on signal poles. We can use four static camera or on single camera that will be rotated through some mechanical system. This mechanical rotation provides displacement in one direction. Images captured through these cameras will be passed to system for further processing.

3.2 Image Cropping

The second step is to select the targeted area by designing image cropping algorithms in MATLAB. The purpose of cropping is to identify the road region where the vehicles are present and exclude the unnecessary background information. This unnecessary information is fixed in every frame of the live video because the camera is stationary. To crop the required area, reference image has been used which has no road traffic. First, a binary image of having the same dimensions is created, as in the reference image, then the road area has been shaded white, and the leftover region as black Finally, the multiplication of the reference image with the cropping black and white image results in the final desired target area. The next part explains the procedure of object detection.

3.3 Object Detection

The third step is the object or vehicle detection in order to identify and count the vehicles which are present in the targeted area. To perform the object detection, first the frame from the real time video sequence is extracted. The next step is to convert both images; the reference image and the real time image into gray scale and then the absolute difference of two images will be determined. Since the dimensions of the road are fixed therefore the difference image only highlights the presence of vehicles in the desired target area.

3.4 Traffic Density

The next step is to calculate the traffic density in the desired target area. In order to determine the traffic density, the vehicles are marked first and then their numbers are counted. The algorithm search for a set of connecting pixels. In order to consider a connected region as a vehicle, a minimum threshold has been defined. However, it is possible that more than one region of a vehicle is detected using the above criteria. This problem could be overcome by finding the overlapping bounding boxes of the selected regions and thus smaller and highly overlapping regions are filtered out.

IV. PROPOSED METHODOLOGY

The work is divided into 4 parts. The first part is to process the video signal and image acquisition from fixed camera using MATLAB. The second part is the image comparison which is performed by comparing the reference image and one captured by the live camera captured at real time as shown in figure 3.The third part is comparing all four corners of square. Finally, the last part is the queue length counting, comparing with all four corners and switching green signal according to it where the queue length is maximum obtained by percentage after image comparison. The overall block diagram of the proposed system is illustrated below.

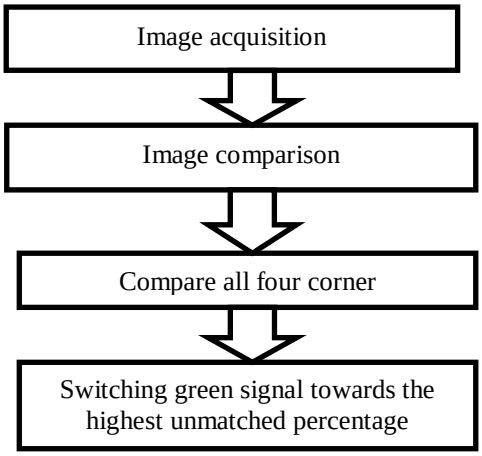

Fig:1- Block diagram-Proposed model (for square)

In the second figure a Block diagram for calculating percentage is shown. Here we take input from camera as shown, then we acquire image taken from the camera. Then we go for next process of converting image into gray scale by a command RGB2GRAY in MATLAB as shown in figure 4(ii).Then we perform denoising on the image. Denoising means removing noise that are present in image. Noise is random variation of brightness or colour information in images, and is usually an aspect of electronic noise. It can be produced by the sensor and circuitry of a scanner or digital camera. Image noise can also originate in film grain and in the unavoidable shot noise of an ideal photon detector. Image noise is an undesirable by-product of image capture that adds spurious and extraneous information. There are various noises occur in Images such as Gaussian noise, Poisson noise, Salt and Pepper noise, Speckle noise. It can be removed with the help of Filtering. The concept of filtering has been applied in the frequency domain, where it rejects some frequency components and accepts others. Median filtering is then implemented for the effective removal of speckle noise, salt and pepper noise (impulsive noise). The aim of this process is to increase and improve the visibility of the image. Hence, these noises are filtered using command 'bwareaopen'.

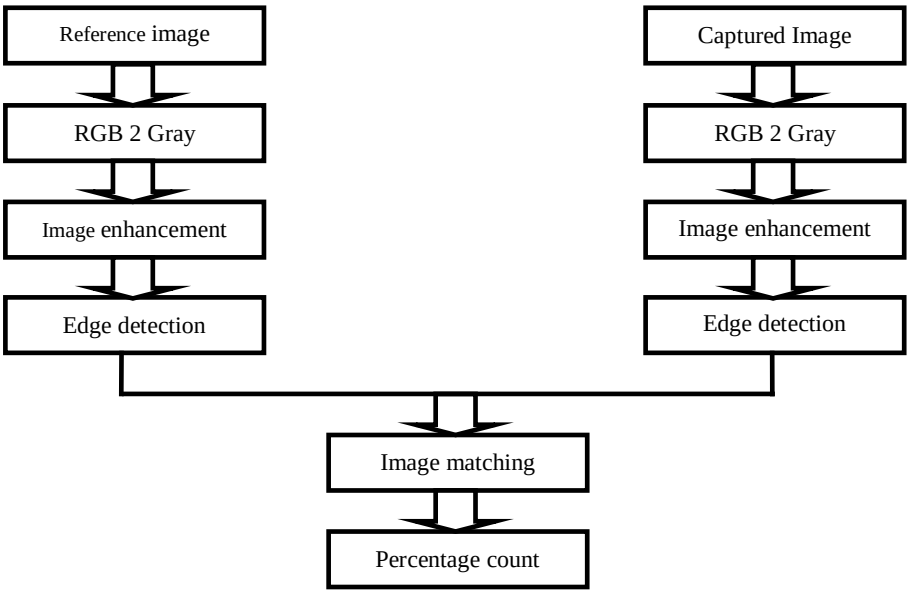

Fig:2- Block diagram-Proposed steps in this work

Figure 3 (i) Reference image on left side for image comparison (ii) Captured image from camera

Figure 4 (i) Process of Edge detection on the captured image (ii) Conversion of captured image in black and white

4.1 Edge Detection Techniques:

Different colors has different brightness values of particular color. Green image has more bright then red and blue image or blue image is blurred image and red image is the high noise image as shown in figure 4.

In MATLAB by default, edge uses the sobel method to detect edges but the following provides a complete list of all the edge-finding methods supported by this function;

MATLAB Syntax; BW = edge(I,'sobel').

BW = edge(I,'prewitt').

BW = edge(I,'roberts').

BW = edge(I,'log').

BW = edge(I,'zerocross',thresh,h).

BW = edge(I,'canny').

In all the above syntaxes I is the input image.

4.2 Image Matching:

Edge based matching is the process in which two representatives of the same objects are paired together .Any edge or its representation on one image is compared and evaluated against all the edges on the another image as shown in figure 3 and figure 4. Edge detection of reference and the real time images has been done using Canny operator. Then these edge detected images are matched and accordingly the traffic light durations can be set.

4.2.1 Implementation

As mentioned earlier the components required for this system are classified by two different modules and mentioned. They are explained below.

- Hardware and interfacing
- Software module

The software module has been finished with the reference and captured images. Remaining the hardware module and interfacing the software module with hardware module has to be done in future. MATLAB version 7.8 as image processing software comprising of specialized modules that perform specific tasks has been used.

4.2.2 Calculation of Matching and Timing Allocation:

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 matching is between 0 to 10% - green light is on for 90 seconds.
- If the matching is between 10 to 50% green light is on for 60 seconds.
- If the matching is between 50 to 70% green light is on for 30 seconds.
- If the matching is between 70 to 90% green light is on for 20 seconds.
- If the matching is between 90 to 100% - red light is on for 60 seconds.

After that we count queue length in this way we count number of person at squares at one side there by counting queue length of each side.

V. CONCLUSION

This paper discusses a method for control the traffic signal and queue length count on the square by using image processing. The advantages of this proposed technique is that there is no need to use aerial imagery or complex sensor based system. The proposed system is very cost effective as it does not require installation of any additional devices, such as RFIDs. This work can be enhanced further by proposing a system which identifies the presence of emergency vehicles and by giving preference to those emergency vehicles. Secondly, it can be enhanced by using VANETs(vehicular Ad-hoe Networks) as it provides road safety and intelligent transport system.

REFERENCES

[1] Chandrasekhar. M, Saikrishna. C, Chakradhar. B, Phaneendra Kumar, "Traffic Control Using Digital Image Processing "International Journal of Advanced Electrical and Electronics Engineering (IJAEEE) 2278-8948, Volume-2, Issue-5, 2013

[2] Arif A. Bookseller, 2Rupali R Jagtap "Image processing based Adaptive Traffic Control System" IOSR Journal of Electronics and Communication Engineering (IOSR-JECE) ISSN: 2278-2834, ISBN: 2278-8735, 2014

[3] V. Kastrinaki, M. Zervakis, and K. Kalaitzakis, "A survey of video processing techniques for traffic applications," Indian Journal of Computer Science and Engineering (IJCSE), vol. 21, pp. 359-381, Apr 1 2003.

[4] Ahmed S. Salama, Bahaa K. Saleh, Mohamad M. Eassa, "Intelligent Cross Road Traffic Management System (ICRTMS)," 2nd Int. Conf. on Computer Technology and Development, Cairo, Nov 2010, pp. 27-31.

[5] B. Fazenda, H. Atmoko, F. Gu, L. Guan1 and A. Ball, "Acoustic Based Safety Emergency Vehicle Detection for Intelligent Transport Systems," ICCAS-SICE, Fukuoka, Aug 2013, pp.4250-4255.

[6] Y. Wu, F. Lian, and T. Chang, "Traffic monitoring and vehicle tracking using roadside camera," IEEE Int. Conf. on Robotics and Automation, Taipei, Oct 2012, pp. 4631– 4636.

[7] Z. Jinglei, L. Zhengguang, and T. Univ, "A vision-based road surveillance system using improved background subtraction and region growing approach," Eighth ACIS Int. Conf. on Software Engineering, Artificial Intelligence, Networking, and Parallel/Distributed Computing, Qingdao, August 2010, pp. 819-822.

[8] M. Siyal, and J. Ahmed, "A novel morphological edge detection and window based approach for real-time road data control and management," Fifth IEEE Int. Conf. on Information, Communications and Signal Processing, Bangkok, July 2009, pp. 324-328.

[9] K. Wang, Z. Li, Q. Yao, W. Huang, and F. Wang, "An automated vehicle counting system for traffic surveillance," IEEE Int.Conf. on Vehicular Electronics and Safety, Japan, Dec 2007, pp. 1-6.

[10] Sonu Agrawal, Sushil Kumar, Sangeeta Agrawal, "A Survey on Face Recognition Techniques", in the proceedings of International Journal of Engineering Research and Applications (IJERA – 2012), Volume 2, Issue 4, July 2012.

[11] Sonam Saluja, Aradhana Kumari Singh, Sonu Agrawal, "A Study of Edge-Detection Methods" International journal of advanced research in Computer and Communication Engineering, Volume 2, Issue 1, January 2013

[12] Pooja Kamavisdar, Sonam Saluja, Sonu Agrawal "A Survey on Image Classification Approaches and Techniques" International journal of advanced research in Computer and Communication Engineering, Volume 2, Issue 1, January 2013

[13] Rohit Raja, Tilendra Shishir Sinha, Ravi Prakash Dubey "Neuro-Genetic and CCM based biometrical authentication through side-view of human-face", In the proceedings of IEEE International conference on EESCO-2015 on 24-25 Jan at Vishakhapatnam (AP), Vol. 4, 2015, pp. 1975-1979

[14] Rohit Raja, Tilendra Shishir Sinha, Ravi Prakash Dubey, "Recognition of human-face from side-view using progressive switching pattern and soft-computing technique" in Association for the Advancement of Modelling and Simulation Techniques in Enterprises" *Vol 58, pp 14-34, March 2015*

BIOGRAPHY

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Dr. Sanjay Kumar received his Ph.D. in Computer Science & Engg. from Ravishankar Shukla University, Raipur in 2005. Presently working as Reader, School of Studies in Computer Science & IT at Pt. Ravishankar Shukla University, Raipur. He has more than seventeen years long experience in the field of teaching and research. His research area includes advanced networking, parallel computing and image process. He has delivered a lot of expert lectures, chaired number of conferences and inducted with various professional bodies. His research work has been published in many national and international journals and conferences.

