MACHINE VISION BASED TRAFFIC CONTROL SYSTEM

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Abstract: **Today we live in the world of automation. The control of traffic lights is awell-known area where automatedcontrol system is incorporated. But the real time adjustment of the on/off times is not varied as per the traffic density at the junction. A system for controlling the traffic light as per the traffic density at the junctionusing image processing techniques is introduced in this paper. As concerned to any traffic control system using image processing, detection of density of vehicle is the most important part. Here without using any particular detection process such as edge detection, subtractionetc. we are effectively calculating the density of the vehicle by using simple threshold algorithm which reduces the complexity of the system and makes it much faster.**

Keywords: **Traffic Light, Image Processing, threshold**

I. INTRODUCTION

Traffic congestion has been causing many critical problems and challenges in majorcities. Traffic congestion directly impacts the day to day life every ones. To solve these congestion problems, we have to build new facilities and infrastructure.So for that reason we need to change the system rather than making new infrastructure twice.Due to this traffic congestion there is more wastage of time. The steady increase in the number of automobiles on the road has increased the importance of controlling traffic flow efficiently to optimize utilization of existing road capacity. Accident is another main problem in modern world.

Traffic Rules & Laws, Road Signs and Traffic Control Systems are used to solve the previously mentioned traffic problems. Traffic laws are the laws which govern traffic and regulate vehicles, while rules of the road are both the laws and the informal rules that may have developed over time to facilitate the orderly and timely flow of traffic. Traffic signs or road signs are signs erected at the side of roads to provide information to road users.

Traffic control system includes manual controllingand automatic 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. Image processing is a better technique to control the state change of the traffic light.

II. RELATED WORKS

In this section we provide a brief survey of various solutions to the traffic congestion problem.
Dinesh Rotake &Prof. Swapnili Karmore[1] suggested a system which utilized AVR 32 microcontroller with programmable flash memory, built-in 8 channel analog to digital converter and IR sensors. The IR sensors are used to detect the presence of emergency vehicle and the microcontroller is designed to give a red signal to all the sides but one with the emergency vehicle.
Shruthi K R and VinodhaK[2] proposed a Priority Based Traffic Light Controller usingwireless sensor network and fuzzy logic to define the direction of any emergency vehicle.A central monitoring system gives the corresponding appropriate responseby collecting all the information's related to traffic.

Traffic congestion problem can also be reduced to greater extent through the process of image processing. This is mentioned inImage Processing Based Intelligent Traffic Controller by VikramadityaDangi, Amol Parab, KshitijPawar and S.S Rathod[4] . In this technique a camera is used which is fixed on either poles or some other tall structure in such a way that theycan cover the whole traffic scene. Images extracted from the video is then analyzed and used to detect the vehicle and for counting them and thus depend upon the density, the time is allotted for each side.

A. .Limitations of Existing System

1) Heavy Traffic Jams
2) No traffic, but still need to wait:At certain junctions, sometimes even if there is no traffic, people have to wait. Because the traffic light remains red for the preset time period, the road users should wait until the light turn to green. If they run the red light, they have to pay fine.

III. PROPOSED SYSTEM

To solve the congestion related problems,no traffic still need to wait and wastage of time in traffic junction,weproposed a system using image processing. Here acamera is used which is fixed on a tall structure in such a way that theycan cover the whole traffic scene. Images extracted is then analyzed and used to detect the vehicle and for countingthem and thus depend upon the density, the time is allottedfor each side. For proper detection of density of vehicles we usethe method of thresholding which can eliminate the unwanted complexities and it make the processing simpler. It shows that it will decrease traffic congestion, avoid the time being wasted by a green light on an empty road.It is more reliable in estimating vehicle presence because it uses real time traffic images.

IV. METHODOLOGY

1) Image acquisition

The first stage of any image processing operation is the image acquisition stage. Instead of taking real time image of a junction we prototyped a junction scenario using dummy objects for vehicles. After the image has been obtained, various methods of processing can be applied. However, if the image has not been acquired satisfactorily then the intended tasks may not be achieved even with some form of image enhancement. Here the camera used for image acquisition is a web camera. A web cam is a video camera that feeds or streams its image in real time to or through a computer to a computer network.

The specification of camera used are
Video resolution - 640x480 sensor resolution
USB certification – USB 2.0 high-speed certified
Camera pixel size – 2 MP

2)Segmentation

Segmentation is the process of partitioning a digital image into multiple segments sets of pixels,also known as super-pixels. The goal of segmentation is to simplify and change the representation of an image into something that is more meaningful and easier to analyse.
Image segmentation is typically used to locate objects and boundaries (lines, curves, etc.) in images. Using this property of segmentation we get the required boundaries of the road and we can locate the vehicles in the captured image. Fig 1 shows the segmentation result.

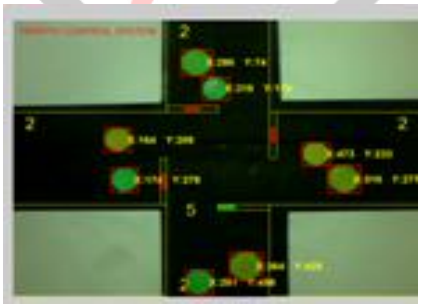

Fig 1.Segmentation result.

3) RGB to binary conversion

The captured image will be in RGB format. The RGB image is an image in which each pixel is specified by three values. For better detection the RGB image is converted into binary scale. Logical array containing only 0s and 1s, interpreted as black and white, respectively. From a grey scale image, binary image can be obtained by using suitable threshold values.

The output image replaces all the pixels in the input image with luminance greater than the level with a value 1 (white) and replaces all other pixels with the value 0 (black).

4) Detection

Now the number of vehicles at each side of the junction has to be detected. As concerned to this work, this is an important step. If the number of vehicles at each side of the junction is detected properly the accuracy and reliability of this system is improved significantly. Fig 2 shows the detection using thresholding process.Thresholding is the simplest method of segmentation. From grayscale image, thresholding can be used to create binary image. There are many detection processes such as Edge detection, Subtraction etc. are available to detect the number of vehicles. Here we properly detect the actual number of vehicles in the image using thresholding.It is not another process rather it's just a part in the conversion process. We want to convert the RGB image into binary image before detection. We used a threshold value and directly detected the density of vehicle by extracting the white objects from the black and white image thereby obviatingany particular detection method.
Here we get the correct count of vehicles at each path. Fig.3 shows the detected number of vehicles in each path.

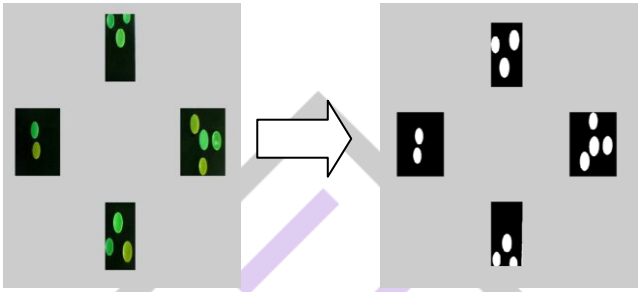

Fig. 2 Thresholding

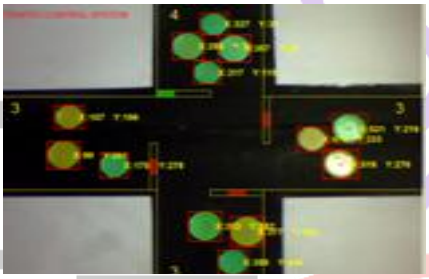

Fig.3 Detected the number of vehicles in each path

5) Updating of traffic light timer

From the information of traffic density, available from the preceding steps we can update the traffic light timer periodically.

First we gave a cut off value (say 30) to the number of vehicles at the junction. There are different cases in the working of timer.
1. If number of vehicles in all routes are equal and below cut off value (i.e. n<30), all routes have equal priority and each route allotted a time of 15 seconds. After 15 seconds the green light shifts into next route in a clockwise direction.

2. If number of vehicles in all routes are above the cut off value (i.e. n>=30). The green signal will first appeared at the route having more number of vehicles. Then the signal switches to next route in clock wise priority.

3. If number of vehicles at one route is greater than the cut off and at all other routes are less than the cut off, then the green signal shows first at rout with more number of vehicles. And it would get more time to pass the vehicles. All other routs have equal priority.

4. If one of the rout is empty, then the signal will never turn green at that route.

5. If the number of vehicles at a route is greater than the cut off, then 30 seconds time will be allotted to that route. If all the vehicles passed before 30 seconds then the timer will automatically shift to next path.

V. Conclusion

The proposed system is a cost effective solution for the high density traffic existing today and scope for improvement of the system is limitless and not but the least only less processing is required compared to other proposed systems.Main advantages of

this proposed system areif there is no traffic then no need to wait in the junction and thereby reduces the traffic jams and also easy to implement.The focus shall be to implement this for a multi junction traffic. The hardware implementation would enable the system to be used in real-time practical conditions.In the case of emergency condition, the path should be made open for the emergency vehicles such as ambulance, fire engine etc. by detecting them effectively without considering the timer.

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