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Smart Traffic Light Controller Using Image Processing

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ABSTRACT: Traffic cramming is one of the noteworthy issues in numerous urban territories around the world. As a result of the rapid increase population, the amount of vehicles was extending greatly. It causes many traffic issues like disasters, wastage of time, vehicle convergences, pollution, and various health issues. Currently, methodologies have more burdens in execution while controlling the traffic. So it is mandatory to direct and manage traffic blockage in an effective way. Traffic management techniques are based on the timer runs on the lane rather than the density of the lane. The proposed system uses a singular camera mounted on a stepper motor to recognize the traffic density on the intersection of road. The camera turns 90˚ for every one minute to get the accompanying the next lane traffic density. The captured pictures are processed by edge detection and image enhancement techniques. The system will measure the traffic density at each lane in the intersection and accordingly the number of vehicles was identified at each lane. By then the control signal will be given by the controller to open that lane traffic light. The system digital image processing techniques and MATLAB programming to manage and control traffic congestion.

KEYWORDS: Traffic congestion, Image processing, Edge detection, Image enhancement, Traffic Control.

I.INTRODUCTION

In modern life, we have to stand up to various issues one of which is traffic blockage transforming into a huge issue for a long time. The major traffic blockage happens due to the huge number of vehicles at every nooks and corner of the city. To accord with this issue, researchers have recommended various plans. One of the presently used techniques is the timer model. Traffic can be managed to a great extent, by utilizing timers at each period of the traffic. Another model utilized is with the assistance of electronic sensors that perceive the presence of vehicles, and produce a suitable signal. The reason for traffic is dependent on many factors like peak time, special days, season, bad weather, or unpredictable crisis like accidents, special events, or constructional activities. When we get stuck in traffic, we may need to wait for hours to get out of it.

We can deal with this issue to a great extent by implementing this density based traffic control system utilizing image processing which consistently deals with the traffic lights dependent on traffic. This system uses image processing techniques essentially uses background subtraction to perceive the count of vehicles present on the road which can be utilized to control the traffic signal light. The image processing tools which are accessible in Matlab can be used to program the code for finding the incorporate of vehicles in a lane. Diminishing of traffic blockage improves the safety, avoidance of accidents, and reduction of environmental pollution.

II. LITERATURE REVIEW

An article proposes the system which uses electical IR sensor and controller. The Infrared (IR) sensor emits and detects the IR rays. The IR sensor used as an object detector,it emits an IR rays that hits the objects and get reflected. The reflected IR rays are received by the sensor receiver. By this number of vehicles count are determined and the required time for the traffic light and control signal are provided by the controller. [1]

An article proposes an image processing technique. Here the system uses four cameras for all for lanes in the intersection. Each camera captures the image continuously and feeds to the controller. The captured image are compared to the reference empty road image by image processing technique. The controller process the image by

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grayscale conversion, edge detection, image enhancement and image matching. Then the control signal for the traffic light is passed by the controller. [2]

Anarticle proposes a different image processing technique. The image processing is done by recording the live video of traffic congestion then the video photages are converted into frames. Finally the images are processed asusal with the image processing process. Here the multiple image frames are provided by the video photage so controller takes more time to process each image and takes more time to provide control signal to the traffic light. The performance and the efficiency of the system is not effective compared to the other image processing techniques.[3]

This proposes a framework which uses the thickness based traffic sign control. Here as opposed to catching the picture they use video caught by the web camera mounted close by the sign. The video is isolated into outlines and by including the number of pixels in each edge the thickness of the vehicle is resolved to utilize the all-out territory canvassed by the vehicle in a path. This uses different picture handling systems. This picture preparation is finished utilizing MATLAB.[4]

The proposed a paper that proposes an effective traffic framework that uses watchful edge recognition and article discovery. These recognitions are finished utilizing MATLAB programming. Vigilant edge recognition used to check the number of vehicles on every path. Accordingly by looking at all the paths, the path with most elevated thickness is discharged first by utilizing green light.[5]

III. METHODOLOGY

In order to structure the productive traffic control framework to conquer the downsides of traditional framework the accompanying strategies ought to be utilized. At first the Camera is put close by of the traffic signal. This Camera is utilized to catch the live stream video. At that point the caught video is isolated into outlines. Each edge is then changed over into Gray scale picture. After this transformation the canny edge discovery procedure is to check the quantity of vehicles present in every path. At long last the quantity of vehicles in every path is contrasted and each other path. After comparison the path with higher number of vehicles is liberated first. If there should be an occurrence of any crisis vehicles, it is distinguished utilizing the sound sensor put at the intersection. The path with crisis vehicles will be given need rather than paths with higher thickness ofvehicles.

IMAGE ACQUSITION

In this methodology the system gets the image and feeds the captured images progressively to the controller. The captured image is differentiated with the reference image. The reference image is taken with the empty road and set aside in the system. All the captured images are initially converted from RGB to a grayscale image. Then all the captured images are continuously differentiated with the reference picture and the image is set up with the RGB to grayscale conversion, image enhancement, edge detection, and image matching techniques. All the acquired images are processed by the image processing system. Finally the number of vehicles is counted and the required time is feed to the traffic light by the controller.Figure 1.

Figure 1 Captured Image

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GRAY SCALECONVERSION

A real-time image of traffic at the intersection of each lane is captured, and converted into grayscale. In RGB format three separate image matrices are storing an amount of red, amount of green, amount of blue in each pixel. Therefore, a grayscale image contains only shades of gray and no color. Even the captured color images contain dark data. This is on the grounds that every pixel has luminance esteem, regardless of its color. The luminance can likewise be depicted as brightness or intensity, which can be estimated on the scale from dark (zero intensity) to white (full intensity). By comparing the luminance value of the empty road image and the captured image the vehicles are detected. Figure 2.

Figure 2 Grayscale Image

FLOW DIAGRAM

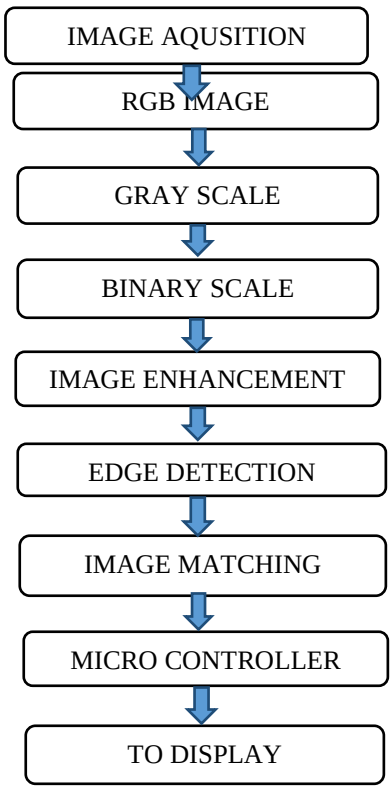

Figure 3 Flow Chart of Image Processing

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CANNY EDGEDETECTION

The canny edge detector is one of the widely used image processing tools used for effectively recognizing boundaries. In the Canny edge detection system an adaptive background subtraction is used. Canny edge detection is a multi-step computation that can perceive edges with noise suppressed at the same time. After that, a Canny edge detector will distinguish all the boundaries of the vehicles present in the image Canny edge detector may wind up being ground-breaking as it considers every neighbourhood pixel while recognizing edges. It is completely utilized in the PC Vision framework. At the point when separated and other edge recognizing procedures it is the most productive strategy.The edge detector perceives the boundaries of the captured image. At that point the background of the captured image and noise in the image is evacuated. It works by recognizing discontinuities in brightness. The detector tool contrasts every pixel with the neighbour pixel and then the number of vehicles is detected. By this vehicles are distinguished and counted. Figure 4.

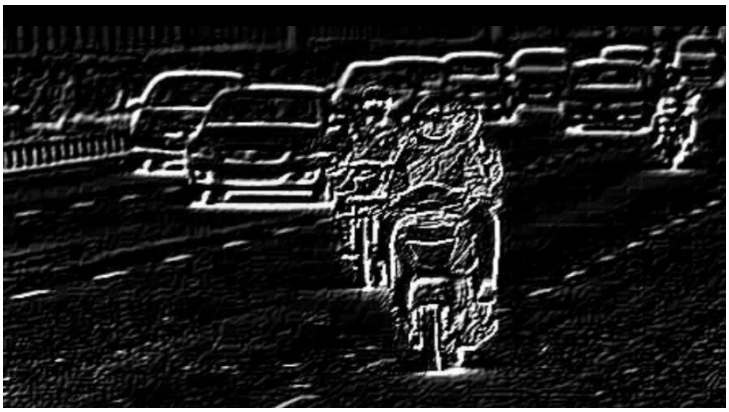

Figure 4Edge Detected Image

IV. EXPERIMENT RESULTS

The system uses an empty road image as a reference image for detecting the number of vehicles on the road. So every captured image is distinguished with the reference image. The comparison process of the image processing window is shown above.

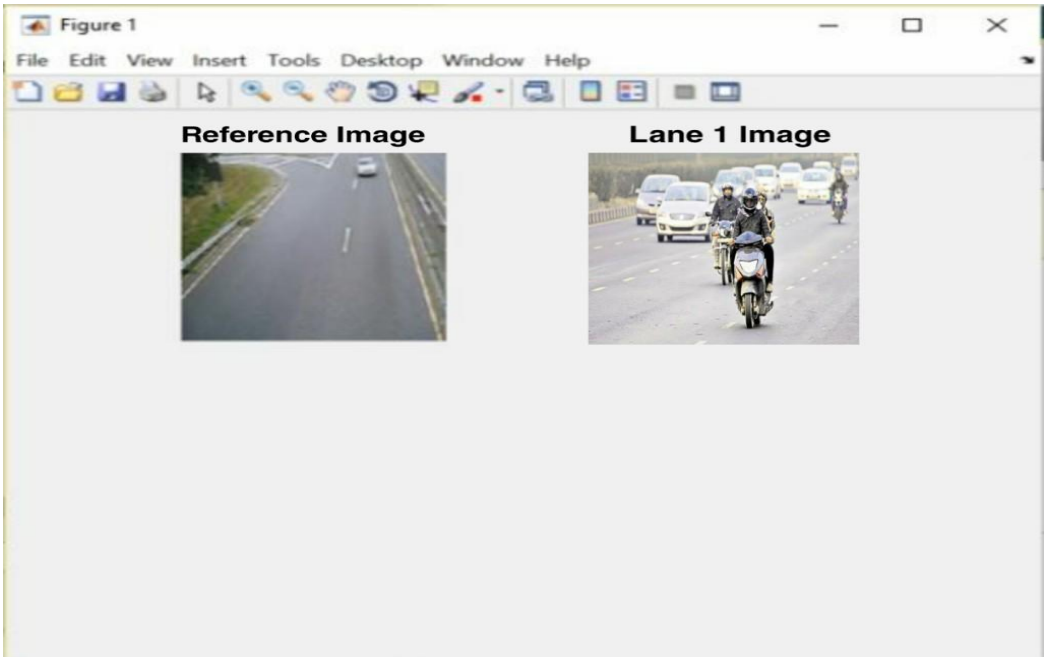

Figure 5 Captured Image

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A captured color images are converted into a grayscale image by grayscale image technique used in image processing. All the color images are converted to a grayscale image for detecting the vehicles. The gray image has shades of dark and white color. By comparing the intensity of dark and white color the object in the image can be easily recognized.

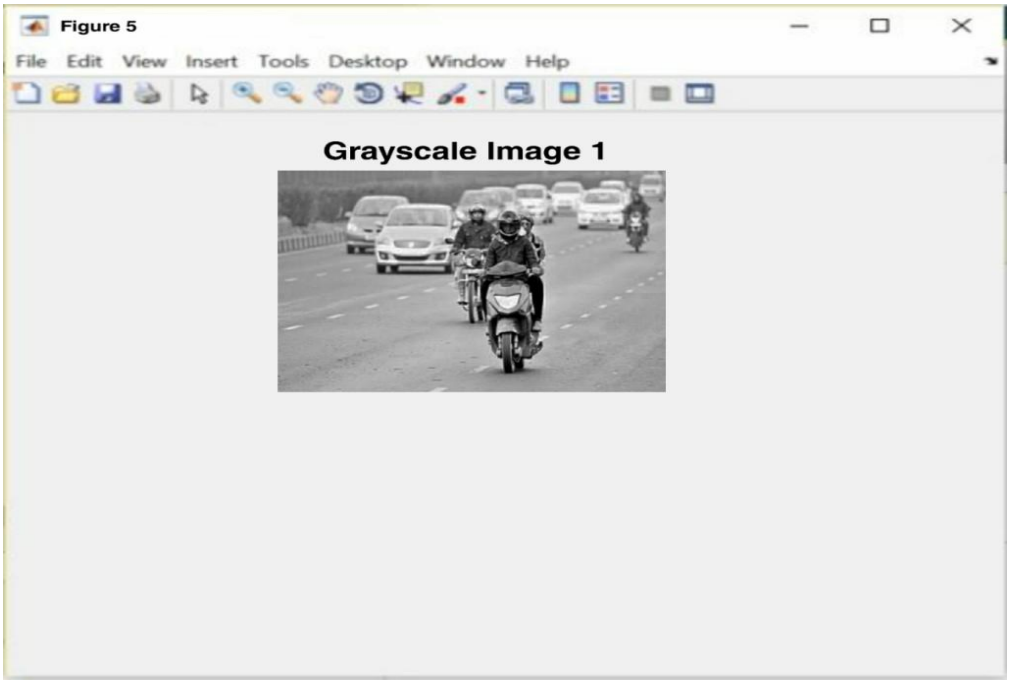

Figure 6 Converted Grayscale Image

The grayscale image is converted to a dark inverted image by edge detector tool for better recognition. The edge detector tool suppresses the background of a captured image and removes noise in the image. By this process the pixels in the edge image compare each pixel with the neighbour pixel.

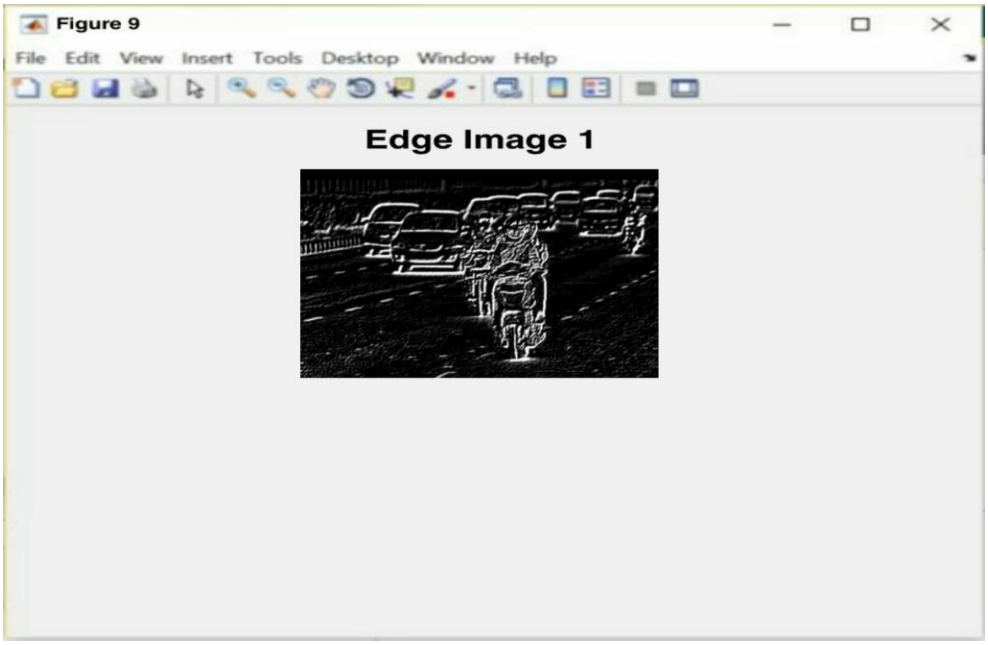

Figure 7 Converted Edge Detected Image

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The outputs of all four captured images are compared with the reference image of an empty road. Finally the traffic density of each road is found using Image processing technique. The output of each lane density is displayed on the command window of the Matlab software. The number of vehicles are also found and displayed on the command window.

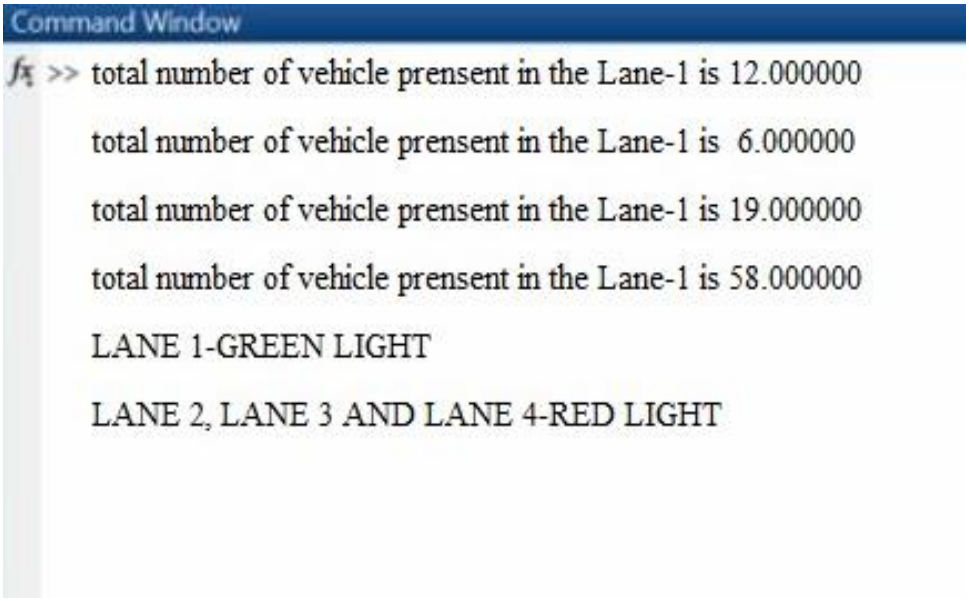

Figure 8 Command Window Output

V. DICUSSION

Our proposed system is used to handle traffic management efficiently. It uses Image processingmethodology to identify the thickness of the traffic. Here in this project phase we have completed the software part by using reference images for all the four lanes. All the captured images are sequentially fed to the controller and the captured images are compared to the reference image one by one. This reference image is thenconvertedinto a grayscale image and then the density of the traffic is determined by using a canny edge detection algorithm. By comparing the density of traffic in all the four lanes, the lane with a higher density is freed first. It is indicated by using the green LED.

VI. CONCLUSION

Traffic congestion, utilizing picture handling disposes of all the inadequacies of prior standard frameworks utilized for controlling traffic. Over the top, labouris required in manual controlling, while clock is utilized in modified controlling had a drawback of time being wasted by green light on an unfilled road. Picture handling kills every one of these traps. This strategy is unmistakably increasingly powerful in rush hour gridlock control. It reduces the utilization of additional equipment gadgets like sensors, remote switches, GSM modems, arrangement for an observing station and so forth. Nearness of vehicles discovery is predictable as we are utilizing genuine pictures of traffic here. The truth is envisioned and thus, usefulness is more powerful and proficient than all strategies. It accomplishes close to consummate precision and execution of framework ismomentous.

This system can be successful to battle the developing weight of traffic on Indian streets. It uses image processing to assess the thickness of vehicles on streets and controls the traffic at fixed interims of the time. It is cost-effective and doesn't require the establishment of complex hardware to screen the traffic. Conveying this framework won't just spare the time devoured in holding up at traffic intersections, yet will likewise ration a lot of assets that are generally squandered.

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