Traffic Signal Control System using Morphological Operation based on Boundary Detection

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***Abstract*—Boundary detection aim to score pointed intensity change in an images and is a based on big quantity of image study and machine vision applications. Traffic is the major trouble which every country faces because of the enlarge in quantity of motor vehicle during the world. Driver should stay for the predefined traffic signal timings flat though the quantity of vehicles is very a lesser amount of other directions, especially in little cities..This trouble can be solved based on the dimension of traffic thickness on the road. This technique presents based on morphological edge detection. The effort is mainly careless for the traffic of town such as, Chikkamagalur, Hassan etc..**

Keywords:- Morphological Edge detection, Gamma correction, Fuzzy logic controller.

I.INTRODUCTION

The traffic signal causes people on uncongested routes, stops at traffic signals disrupt an urban or suburban area expedition School children obediently wait for a traffic signal to interrupt traffic so they can cross a busy thorough accuse examine .

positive travel system have been term adaptive, that is, they have the ability to mechanically change signal time in response to both small term and longer term variation in traffic. These system not simply give more competent control of traffic but also need smaller amount human and monetary capital to update the system's database. However, they often necessitate more strong operation of traffic detectors.

operations based edge detection is used to calculate the vehicle density. The morphological edge detection method detects the more edges compared to other edge detection methods with comparatively less processing time. The proposed system avoids the drivers or riders irrelevant waste of time even though the numbers of vehicles are less in other directions.

1.1. Edge detection

Images consists of important features of edge and carries important objects iformations present in the images. removal of edges is known as edge detection.

There are many methods to detect the edge such as Sobel, Laplacian, ACO, Robert, Prewitt, C
fuzzy logic.

1.2. Morphological image processing

Morphological image processing is a set of non-linear operations related to the shape or morphology of features in an image. Morphology as a tool for extracting image components that are useful in the representation and description of region shape, such as representation and description of region shape, such as boundaries, skeletons, etc.

Morphological method use an image with a little shape or pattern to perform respective operation called a elements structure. The elements structure is positioned at all possible locations in the image and it is compared with the parallel neighbourhood of pixels.

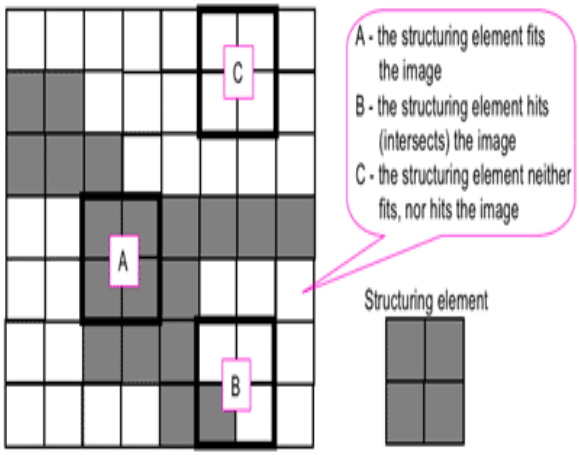

Figure 1: Placement of elements structure

Figure 1 illustrates Placement of element structure, morphological operation based on a binary image create a new binary images in which the pixels has a non-zero value only if the test is successful at that location in the input imagess.
The element is a small binary images that is a little matrix of pixels, each with a value of zero or one.

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1.3. Fundamental operations

Erosion and dilation are the fundamental operations which are discussed below:

The erosion of a binary images f by a structure element s (denoted f ⊖ s) produce a new binary image g = f ⊖ s with ones in all locations (x, y) of a elements structure's origin at which that structuring part s fits .

Figure 2: Gray scale image, Binary image after Erosion by 2×2 square elements structure

Figure 2 illustrates Gray scale image, Both the inner and outer boundaries of regions consists of Erosion with little square elements structure minimize an image by stripping away a layer of pixels. The regions is larger between holes and gaps, and small details are eliminated.

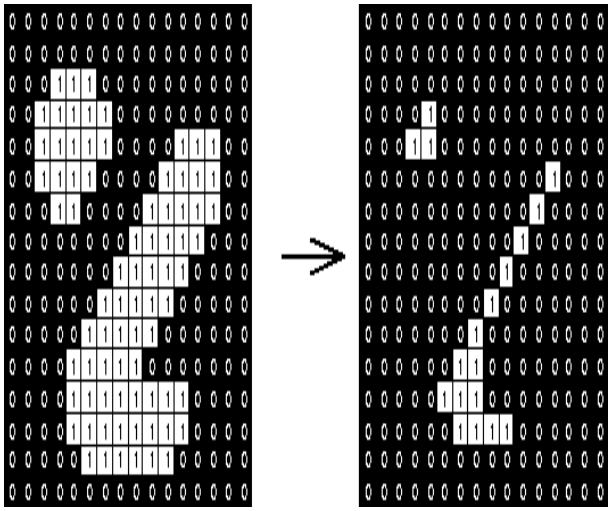

Figure 3: Erosion: a 3×3 square elements structure

Figure 3 illustrates erosion of 3×3 square elements structure. larger elements structure have a extra distinct effect, iterated erosion consists of the result of erosion with a big elements structure using a smaller elements structure of the sameshape.

Figure 4: Binary image, Dilation of 2×2 rectangle elements structure

Figure 4 illustrates the dilation of an images f, a new binary images g = f ⊕ s produced by elements structure s (denoted f s) with ones in all locations (x, y) of a elements structure's basis at which that elements structure hits the the input images f.

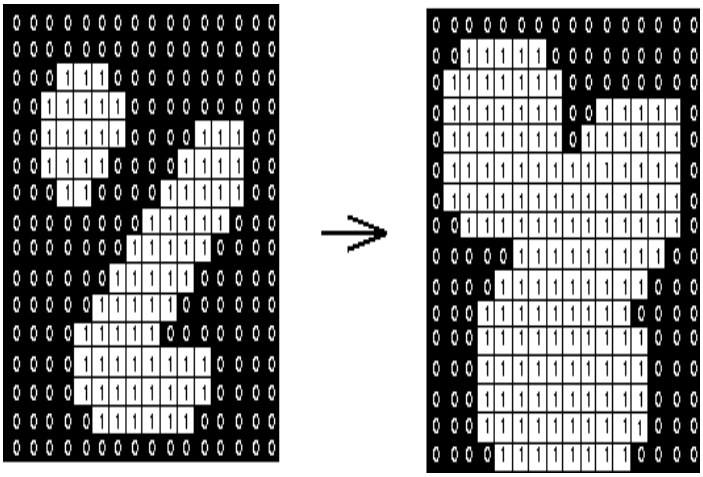

Figure 5: Dilation of 3×3 square of elements structure

Figure 5 illustrates the dilation of 3×3 square elements structure. The Single region and gaps between different regions and small Instructions consists of holes . the size and shape of the elements structure influences by both dilation and erosion results.images are replaces 1 with 0 and vise versa.

II. LITERATURE REVIEW

[1]Edge detection by grouping of morphological operators with special edge detection operators find edges in different direction can be detected by this process efficiently. The experimental results are showed to compare this method with other different edge detection operators.

[2]Smart traffic control system using plc and scada initial steps in the implementation of a smart traffic light control system based on Programmable Logic Controller (PLC) technology. in this method, mean to measure the traffic density by counting the number of vehicles in each lane and their weight, then park in automated parking or diverge them accordingly. It is also difficult for a traffic police to observe the whole scenario round the clock. So, this system can be implemented on highways and city traffic.

[3]Traffic organization System using thickness estimation and Emergency Vehicle Alerts method provides automate the traffic tracking for the square and presents emergency vehicle alert and traffic density computation methods using IR and GPS.

[4]Traffic Signal Control with WANET technique provides automate the traffic tracking for the square and systems is a lesser amount of multiple methodologies which can be use in traffic control systems.

III.METHODOLOGY

Design considerations

- The project focuses on the approximation of vehicle density based on the edges.
- Experimental Images are captured using camera of 8Mega Pixel (Nikon coolpix L29).
- To get the top view of the vehicles density, the photos are captured using 3 steps photographer stand to the experimental images.
- The captured image is of type jpeg and resized to 256*256.

The proposed technique for vehicles edge density based traffic control system can be shown as below:

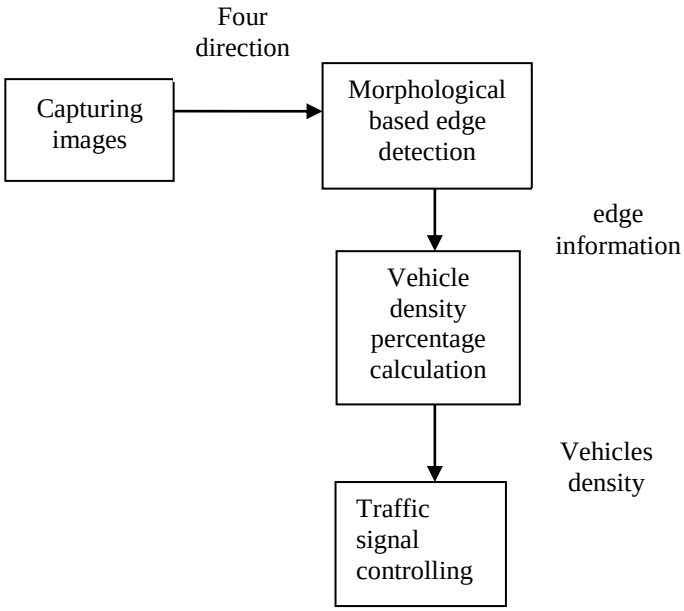

Figure 6: Block diagram of vehicles density based traffic signal controlling system

Figure 6 illustrates the vehicle density based traffic signal controlling system. Initially the road with vehicles images of all the directions are captured and then sent to the morphological edge detection module. It extracts the edge information of the vehicles which is used for vehicle density percentage calculation. Then, based on the vehicle density traffic signal is adjusted

The proposed edge density based traffic control system involves four modules whose working is discussed below:

1. Capturing images

Initially the road with vehicles images of all the instructions is captured. The images are resized to 256*256 to speed up the edge detection process. The range of the road to be captured is maintained to around 30 feet. The images are changed into gray scale format. The images are captured such that it includes slant top view of the vehicles. These images are sent to the morphological boundary finding module.

2. Morphological operations based edge detection

Figure 7 illustrates morphological process based boundary detection. The gray scale image is taken as input for this unit. The gray scale image is dilated then the dilated image is eroded.

3. Vehicle density percentage calculation

The edge detected image is converted into binary image. That is pixels with white and black. The morphological based edge detection gives the edge information as the white pixels. So the total numbers of edge pixels are equal to the number of white pixels.

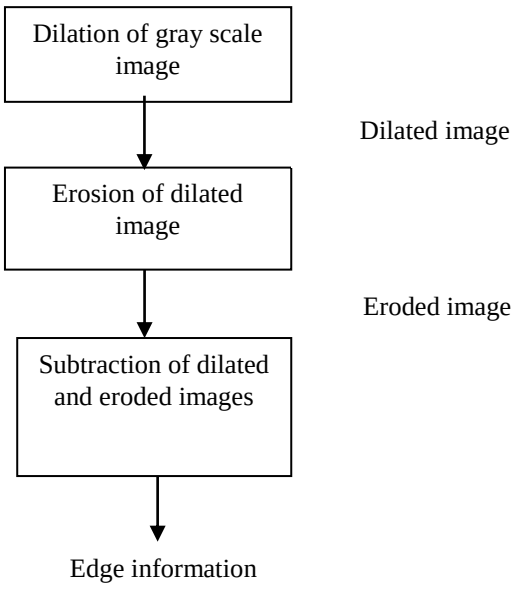

Figure 7: Morphological operations based edge detection

4. Traffic signal control system

The Signal traffic light to go green and red based on the density of the vehicles. First signal traffic light to go green the street or direction having minimum vehicle density and all remaining directions or roads will be set to red signal. Next, the green light is set for the road having next minimum vehicle density and making remaining all roads with red signals. This procedure is repeated until all the directions are done with green light. The duration of green light is based on the vehicle density.

IV. RESULT AND DISCUSSION

First capture the traffic image and resize it into 128*128 pixels then convert that image into grayscale image. In morphological edge detection method grayscale image is taken as input and dilate that image and erode that dilated image. After the dilation and erosion we will get edge information, The obtained edge information is send to vehicle density calculation module to calculate the vehicle density, The calculated vehicle density is send to the traffic signal controlling system, In traffic signal controlling system it controls the traffic based on the obtained vehicle density.

West side images:

Figure 8: Input images

Figure 8 illustrates the west side image and its taken as input for vehicle density based traffic signal controlling system.

Figure 9: Edge detected image

Figure 9 illustrates the edge detected image of west side input images and its taken as edge detecte input images for vehicle density based traffic signal controlling system.

South side image:

Figure 10: Input images

Figure 10 illustrates the edge detected image of south side input images and its taken as input for vehicle density based traffic signal controlling system.

Figure 11: Edge detected image

Figure 11 illustrates the edge detected image of south side input images and its taken as edge detected input images for vehicle density based traffic signal controlling system.

East side images:

Figure: 12: Input images

Figure 12 illustrates the edge detected image of east side input images and its taken as input for vehicle density based traffic signal controlling system.

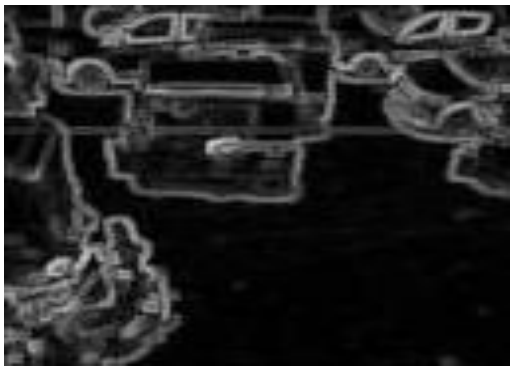

Figure 13: Edge detected image

Figure 13 illustrates the edge detected image of east side edge detected input images and its taken as input for vehicle density based traffic signal controlling system.

North side images:

Figure 14: Input images

Figure 14 illustrates the edge detected image of north side input images and its taken as input for vehicle density based traffic signal controlling system.

Figure 15: Edge detected imag

Figure 15 illustrates the edge detected image of north side input images and its taken as edge detected input images for vehicle density based traffic signal controlling system.

Vehicle density calculation:

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empty =
     0

west =
        1047

south =
   665

east =
   547

north =
   608
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Figure 16: Vehicle density calculation

Figure 16 illustrates vehicle density calculation.The edge detected image is send to this vehicle density calculation module. The edge detected image is converted into binary image. That is pixels with white and black. The morphological based edge detection gives the edge information as the white pixels. Then it calculates the vehicle density for empty road image. Then it will calculate the vehicle density of images of other directions. So the sum amount of edge pixels is identical to the amount of white pixels.

V.CONCLUSSION

Proposed the system to provide automatic traffic signal controlling based on the vehicle density. The morphological operations based edge detection is used to calculate the vehicle density. The morphological edge detection method detects the more edges compared to other edge detection methods with comparatively less processing time. The proposed system avoids the drivers or riders irrelevant waste of time even though the numbers of vehicles are less in other directions.

VI. FUTURE WORK

The proposed method is very suitable for traffic signal controlling system that the images taken during day time. We can extend this method for the images taken during night time with the help of filtering techniques. The job is mainly focused for the traffic of towns such as, Chikmagalur, Hassan etc... Since the traffic thickness is smaller amount of compared to urban cities. We can apply this work for urban cities.

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