IJCSC

ISSN : 0973-7391

Vol. 3, No. 1, January-June 2012, pp. 207-210

CONSECUTIVE FRAME SCANNING ALGORITHM FOR MULTI VEHICLE VELOCITY DETECTION

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ABSTRACT

A new method is developed to extract the moving vehicles and subsequently detect their velocity from consecutive frames. To develop multi vehicle detection system by using consecutive frame scanning. Detecting background with the use of RGB color scheme based but it has a great effect when the intensity of light changes. To detect the background data for any video where the camera is placed for detecting velocity and logging the data into memory. After detecting background components for the particular image we stored that vales in memory so that we use that for calculating next background values. If the vehicle is at rest due to some reason it can calculate the average velocity for that individual neglecting the time of their rest.

Keywords: Vehicle detection;unique id vehicle number;multi vehicle velocity.

1. INTRODUCTION

Increasing traffic congestion in the city has become a critical problem. Every minute, at least one person dies in vehicle crash. Vehicle speed and vehicle detection is the one of the most basic parameter in the intelligent transportation on systems .Vehicle speed is important information for traffic management, commonly we use inductorium, radar, image recognition method and so on to detect vehicle speed.

The disadvantage of intuctorium metod is the necessity of opening the road by lay coils.Traditionally, vehicle speed detection or surveillance was obtained using radar technology, particularly, radar detection and radar gun.

The radar system operation is known as Doppler shift phenomenon. The concept is that system is Doppler shift that happens when the created sound is reflected off a moving vehicle and frequency of the sound is returned, it is slightly changed. However, this method has several disadvantages. High cost of radar system and also with the increasing requirements on the accuracy of the outputs.

Image processing is the technology, which is based on the software component that does not require any hardware. Image processing has grown considerably during the past decade.

2. ISSUES OF RADAR SYSTEMS

A. Problem Defination

Nowadays radars are extremely expensive, their accuracy falls short consequently they need to be replaced by automated system in order to have better accurate outputs.

Recently there are two types of radars commonly used in Egypt

- ***High way radars:*** These radars are extremely expensive (200,000-300,000 LE).They calculate the speed of moving vehicles by means of sensors and capturing still image for vehicles violating limited speed.
- ***Inner town radars:*** These radars are less expensive (about 70.000 LE). They calculate the speed of moving vehicle by means of sensors only and need an operator to capture the images for vehicle violating speed limit.

3. PROPOSED SYSTEM

Our proposed system detects the velocity of multi vehicles in a video with stationary background in the consecutive frame scanning(as shown in figure 1).This part introduces our approach of creating a system of vehicle detection and counting from the consecutive video frame. We will start with overall framework of the system and description of each component in the framework and apply new algorithm area wise consecutive frame scanning.

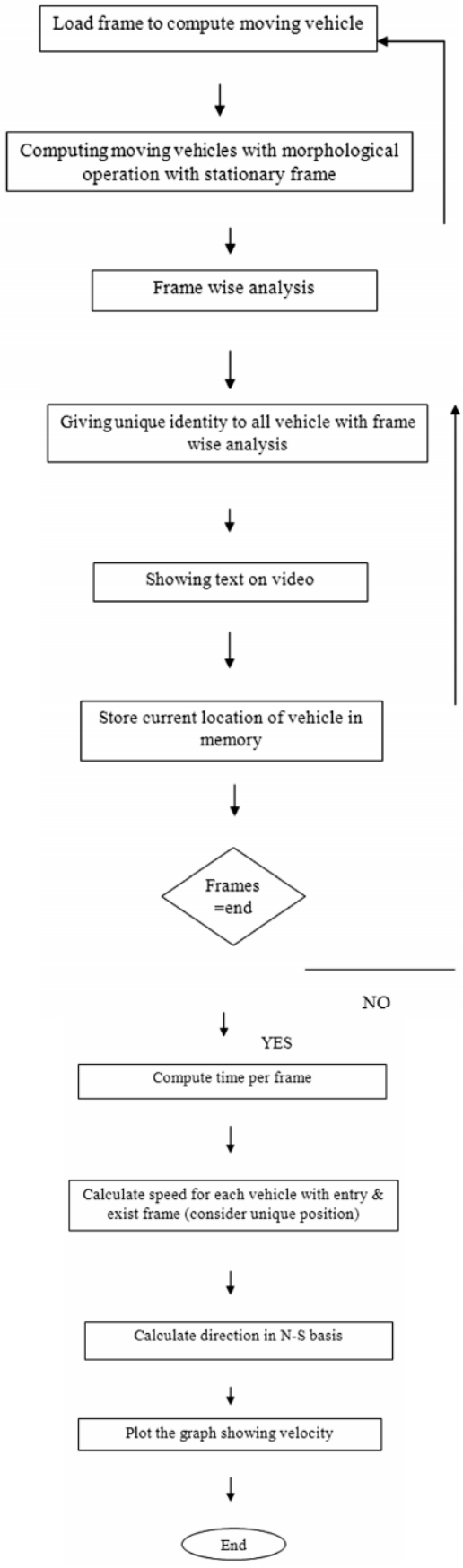

Figure 1: Flow Chart of Multi Vehicle Velocity Detection

4. DATA ACQUISATION PROCESS

The first component is image acquisition. The processes in this component are "video stream" which is an input from the video camera "single-sequence image" which comes from capturing the video stream to single-sequence image in one frame, "store image in buffer" which is used to store the images in the buffer, and "display captured image" which will show the image in picture box.

A . Mean Image

When we subtract two subsequent frames clicked by our cam, the part of image which does not change (background) get subtracted to give zero intensity (black). Only the part of the image moved (moving object) don't get reduced to zero as intensity of pixels of two consecutive frames are different. so we get non zero intensity of pixels corresponding moved objects. Rest is simple. Just convert the image into binary and obtain the centroid of largest area of connected pixels.

B. Morphology Operation

Morphological operations preserve the image shape and make it simple, and increase the quality of the object. Morphological operation are used generally for the object structure improvement, image preprocessing.

Morphology is broad set of image processing that process images based on shapes. Morphology operation apply a structuring element to an input image, creating an output image of the same size. In a morphological operation, the value of each pixel in the output image is based on a comparison of the corresponding pixel in the input image with its neighbor. The most basic morphological operation are dilation and erosion

Dilation adds pixels to the boundaries of objects in an image, while erosion removes pixels on the object boundaries.

Figure 2: (a) Sample Frame of Video Sequence; (b) Extracted Background Image

5. CONSECUTIVE FRAME ANALYSIS ALGORITHM

The processes in this component are "consecutive image" which will traverse the whole pixels of background

image and it has to compare the RGB value of each pixel at the same time during traversal in the consecutive image process, "store the different RGB value" which is a process that stores the values that come from consecutive image process and it will store value as binary number and, "display binary image" which is used to show the image after previous processes are done, and the image is displayed in black and white. The brightness of surrounding environment is one of the factor that can affect the result because the brightness of environment affects the color value of the road.

6. VEHICLE DETECTION AND UNIQUE NUMBER

In this project we make a program possible to detect multi vehicles on the road which are recorded in video file. Moreover the program can detect the cars. The program contains picture of the road that have no cars. As a background picture and then the program can differentiate the cars from the road and make car detection with a captured image. After the car detection process is done, the program will give a unique number to car and show the number of cars in the program. To provide a better understanding and more details for each operation of vehicle detection and counting.

In order to distinguish moving pixels from stationary pixels, first we apply a frame wise analysis on video. The intensity of the objects (in motion) increases or decreases sharply. This gives us the background image without any objects in motion.

After the training phase, initial background model for each pixel is obtained. The resulting background image is then used in the background subtraction process. Background subtraction results in an image containing only the moving objects for every frame in that scene. After subtraction we convert the resulting image to a binary image.

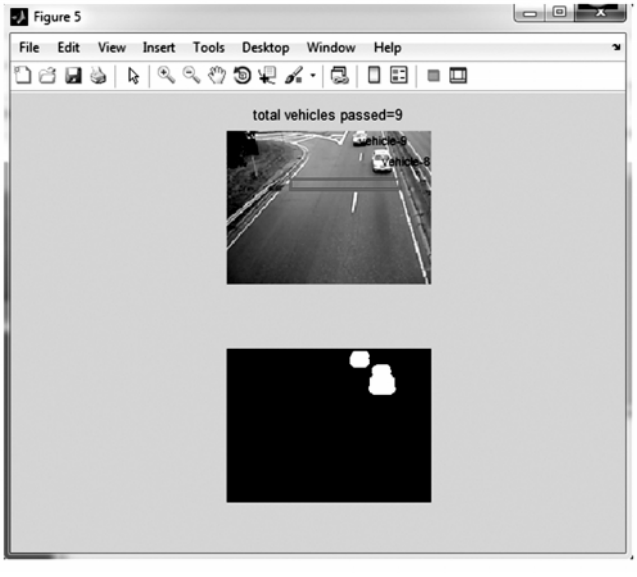

Figure 3: Vehicle Detection and Mean Image

7. VELOCITY CALCULATION AND DIRECTION OF THE VEHICLE

The velocity of vehicle in each frame is calculated using the position of the vehicle in each frame, we can calculate the position by rows and columns, we give the unique id for each vehicle, this information is used If the vehicle is rest position in the video we also calculate velocity. We are using frame number for direction of the vehicle. We can save the frame number that vehicle entered and the frame number that vehicle left.

Distance = x

Fps = y

Time for one frame = $1/y$

Frame taken = length(position vehicle)

Time taken = frame taken *time for one frame

Speed = distance/time

Speed 1 = speed * 3.6 km/hour

8. EXPERIMENTAL RESULT

The vehicle velocity detection algorithm has been developed using maltab version 7 on laptop by intel core i5 and 4 GB ram. In our experiment, we used video and taking distance of about 40 meters with frame rate of 20 frames/seconds and time taken for one frame is 1/20. We used 10 vehicles and calculated their velocity in m/s and km/hour and 2 has been taken to show direction from north to south ,1 has been taken to show direction from south to north,3 has been taken west to east and 4 has been taken from east to west direction with the help of frame number. With the help of this algorithm we also calculate the velocity of vehicle which is rest position and showing the graph.

Table 1
Speed and Direction for Different Vehicles

Vehicles	*Velocity m/s Km/hour*	*Velocity N-S*	*Direction*
1	30.76923	110.7692	2
2	30.76923	110.7692	2
3	29.62963	106.6667	2
4	29.62963	106.6667	2
5	25	90	2
6	25.80645	92.90323	2
7	34.78261	125.2174	2
8	28.57143	102.8571	2
9	29.62963	106.6667	2
10	28.57143	102.8571	2

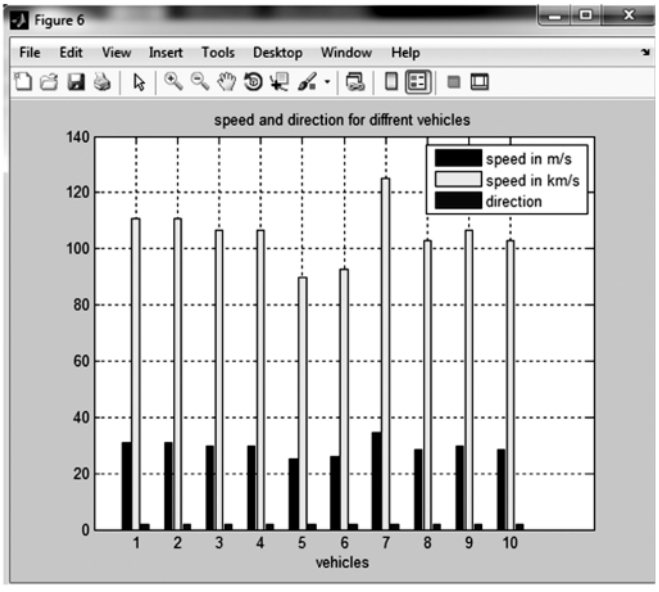

Figure 4: Speed and Direction for Different Vehicles

9. CONCLUSION

Based on the experimental result in the previous section, we can conclude that the correctness of the result depends on frame wise analysis. We have presented an algorithm area wise consecutive frame scanning through we calculated the direction of multi vehicle on the road. The system cannot differentiate some vehicle size that is too small or too large and we have calculated position repeation which is coming in each frame so we are taking one position of the frame for calculated speed at rest.

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