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MOVING OBJECT SEGMENTATION TO DETECT SPEED AND WEIGHT APPLICATION IN VIDEO SURVEILLANCE

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Abstract:

Vehicle detection and tracking plays an effective and significant role in the area of traffic surveillance system where efficient traffic management and safety is the main concern. Instead of limiting the function of the cameras for these purposes, the images from the cameras can be captured and analyzed for further decision making processes. This paper suggests image processing algorithms for traffic counting, queue length, speed measurement and vehicle classification. Traffic counting algorithm adopted in this study is carried out by observing changes in pixels values in the middle of traffic lanes. The queue length measurement, vehicle classification and determination of speed, a single line of pixels placed along a traffic lane are observed. The pattern of these pixels values are used to measure the queue length, length of individual vehicle and to detect the position of a particular vehicle within a short interval of time. Video surveillance is a very lively research topic in the form few years due to its growing importance in security, law enforcement, and military applications

Keywords: Input video, Frame separation, wavelet transform, Motion detection, Morphological Filtering, speed and weight

1. Introduction

Surveillance cameras are normally installed at major road links and intersections in urban area for observation by human operators. Image processing has been widely applied to traffic analysis for a variety of purposes. As traffic research field is very wide and it has many goals that include detection of queue, detection of incident, classification of vehicles, and counting vehicles. One of the most important of these purposes is to estimate the speed of a vehicle, a vehicle. Traffic congestion poses lot of problems for people. Because of this, many accidents occur. To reduce this problem, new approach has been developed for estimating the speed of vehicle. A radar technology was used to determine the speed on highways. But it has a disadvantage of high cost. Then a radar detector was designed to detect the infrared emissions of law enforcement agencies radar speed and weight detection devices and warn motorists that their speed is being measured.

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Fig 1.1: Closed-circuit television (CCTV)

Its disadvantage is it has to be held or placed at a static point. These drawbacks of speed detection techniques motivated to develop new technique for that purpose. At the basic level, computers have surveillance goal because huge amounts of personal information are stored on top of them. Anyone who can access or remove a computer can retrieve information. If somebody is capable to install software on a computer system, after that they can turn the computer into a surveillance device. CCTV is a collection or a album of videotape cameras used for video surveillance Closed-circuit television (CCTV) makes use of video cameras to broadcast a signal to a specific place, on a limited set of monitors.

The main tasks in the video surveillance systems include motion detection, object classification, tracking. Our focus here is on the finding phase in general video surveillance system using fixed cameras. The typical approach for object detection in motion is throughout background subtraction that consists in maintaining an up to date form of the background and detecting moving objects when those that deviate from such a model. The background image is not permanent but must and should adapt to: lighting changes, sudden (such as clouds), Motion changes, camera oscillations, and high-frequencies surroundings objects (such like tree branches, sea waves, and similar) change in the background geometry.

II. Literature Survey

Several problems may happen while segmenting the video sequences because of changing background, clutter, occlusion, varying illumination conditions, automatic operation, bad weather conditions such problems are fog, rain, snow, camera angle, and real time processing requirements etc. [1-7]. Zhang [4] divided the techniques of segmentation into six groups: - Threshold based techniques, Pixel organization based techniques, Range image segmentation, and Color picture segmentation, on the other side boundaries include detection of only moving object and the presence of ghosts in segmented object only presented. Cheng *et al.*[11] Was projected a discrete wavelet transform (DWT) based techniques for approach , inter-frame differencing technique is used for moving object segmentation in DWT domain. DWT based methods are shift-sensitive. Any shift sensitive methods will not provide good results for video applications because in video application, objects are present in shifted form. Motivated by these facts, a new technique using discrete wavelet domain for video segmentation is proposed in this paper. The DWT contain advantages of shift invariance and better directional selectivity. As compared to DWT the performance and presentation of the proposed model is compared with other standard methods available in journalism such as Frame Difference,

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Background subtraction, SOBS [12-15].

The Frame differencing may be the simplest form of background subtraction. Frame differencing is also known as temporal difference, uses the video frame at the time t-1 as the background method for the frame at time t. This technique is sensitive to noise and variations in light, and does not trust local consistency properties of the change mask. This method also fails to segment the non-background objects if they stop moving. While it uses simply a single previous frame, frame differencing might not be capable to recognize the internal pixels of a large, uniformly-colored moving object. This is usually known as the space problem. It has strong adaptableness, but in general difficult to obtain a whole outline of moving object, liable to show the empty phenomenon, as a result the moving object detection is not exact.

a) **Background subtraction method**

The basic design of background subtraction means to subtract the image from an indicated image that models the background scene. Background modeling constructs a reference image instead of the background. Threshold selection determines suitable threshold values used in the subtraction operation to get a desired recognition rate. Subtraction process or pixel arrangement classify the type of a given pixel, i.e., the pixel is a part of background (including ordinary background and shaded background), or it may be the moving object. After background image B(X, Y) is obtain, then subtract the background image B(X, Y) from the existing frame FK(X, Y). If the pixel differencing is greater than the set threshold T, then determine that the pixels are appear in moving object, otherwise, like the background pixels . After threshold operation the moving object can be there detected

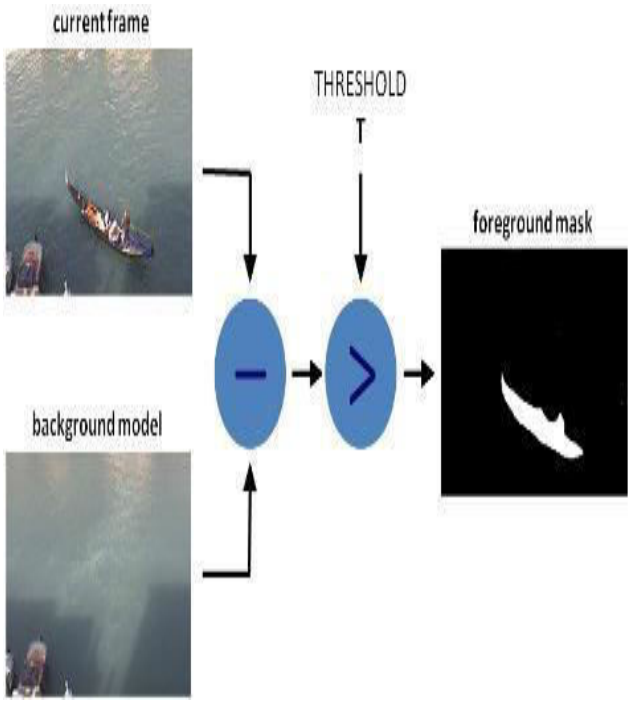

Fig.2.1: Example of Background subtraction method

$$DK(X,Y) = \begin{cases} \text{if } (|FK(X,Y) - B(X,Y)| > 1) \\ 0 \text{ Others} \end{cases} \quad \ldots\ldots\ldots\ldots (1)$$

Background subtraction model is very sensitive to changes in exterior environment. The methods with a background model based on a single scalar value can guarantee adaptation to slow lighting changes, but cannot cope with multi-valued background distributions. As such, they will be prone to errors whenever those situations arise. Processing time requisite to detect the object using this technique is low but exactness might not be good enough.

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b) **Implementation**

This is a biologically motivated problem-solving technique based on visual attention mechanisms. This approach defines a method for the generation of an active attention focus to monitor dynamic scenes for observation purposes. The idea is to construct the background form by learning in a self-organizing manner many background variations, i.e., background motion cycles, seen as trajectory of pixels in time. Based on the learnt background method during a map of motion and stationary patterns, this can notice motion and selectively inform the background model. Every node computes a function of the biased linear combination of incoming inputs, where weights may be similar to the neural network learning. Doing so, each node could be represented by a weight vector obtained to collect the weights related to incoming links. In the following, the set of the weight vectors will be called a *model*. An incoming prototype is mapped to the node whose model is "most similar" to the sample, and weight (mass) vectors in a neighborhood of such nodes are updated. Therefore, the network behaves like a competitive neural network that implements a winner take- all the function with a connected system that modifies the local synaptic plasticity of the neurons, allowing learning to be restricted spatially to the local neighborhood of the most active neurons. For each color pixel, consider the neuronal map consisting of n*n weight vectors. Each incoming sample mapped to the weight vector that is closest according to a proper distance measure, and the weight vectors in its neighborhood are updated. The whole set of mass vectors act as background model, that is used for background subtraction method in order to recognize moving pixels [1-10].

III. Proposed Method

The proposed method is Background subtraction method based on this effective detection of moving object can be done using Wavelet transform.

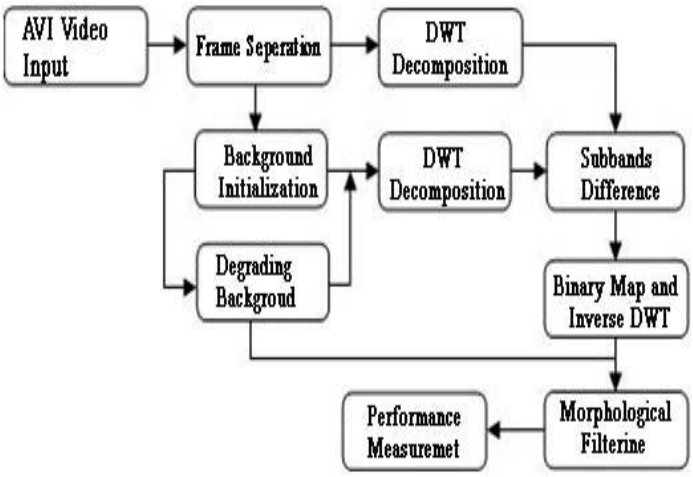

Fig.2.1: Block diagram for proposed method.

The process algorithm is described as follow:

a. Load an input video

b. Make as Frame Separation

c. Obtain Image series

d. Separation of Image Sequence in presented Frame and Background Frame Image

e. Apply wavelet transform for both background and present image

f. Sub-band Differencing

g. Soft threshold

h. Inverse wavelet transform

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i. Threshold for foreground detection(discovery)

j. Noise removal

k. Morphological filtering

l. Moving Object Detection

m. Performance measurement

The future technique is an approximate median-filter based technique in discrete wavelet domain. Differencing in frames is used for obtaining video object planes which gives the changed pixel values from repeated frames. First, we decompose the video in to two consecutive frames (I_{n-1} and I_n) using Discrete wavelet transform has several advantages. One of the major advantages is remote person authentication. Like any other pattern recognition systems, speaker recognition systems also involve two phases namely, training and testing. Training is the process of familiarizing the system with the voice characteristics of the speakers registering. Testing is the actual recognition task.

Frame Subtraction:

We decompose two consecutive **frames (I_{n-1} and I_n)** using complex wavelet domain and then apply approximate median filter based method to detect frame difference For every pixel location **(i, j)** the co-ordinate of frame of frame I_n **(*i*, *j*)** and I_{n-1} **(*i* , *j*)** respectively

$$FD_n(i , j) = WI_n(i , j) - WI_{n-1}(i , j) \quad \text{.....(2)}$$

Discrete Wavelet Transform:

The foundations of the DWT go back to 1976 when to decompose discrete time signals.. They named their analysis scheme as **sub band** Sub band coding is explained below. A detailed coverage of the discrete wavelet transform and theory of multi resolution analysis can be found in a number of articles and books that are available on this topic, and it is beyond the scope of this tutorial. And then apply estimated median filter based technique to detect frame difference. For every pixel location (i, j) the match of frame. Applying the soft threshold to remove noise. In presence of noise, equation is expressed as:

$$FDn(i , j) = FDn(i, j) - \lambda \quad \text{.....(3)}$$

Where FD_n' ***(i, j)*** is frame difference without noise, λ represent to equivalent noise components. For de-noising, soft thresholding method in wavelet domain is used for the estimation of frame difference FD_n' ***(i, j).*** Inverse wavelet transform is applied to get the segmentation of moving object in spatial domain i.e. E_n. The obtained segmented object may include a number of disconnected edges due to non-ideal segmentation of the moving object edges. Therefore, some morphological procedure is wanted for post processing of object edge map to produce connected edges. Here, a binary closing morphological operation is used. After that applying the morphological operator M (E_n) is obtained which is segmented moving object, and finally temporal updating the background model is wanted in order to adjust the changes in background and in lighting conditions.

Speed

Frame rate (expressed in frames per second or fps) is the frequency (rate)

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at which consecutive images called frames appear on a display. The term applies equally to film and video cameras, computer graphics, and motion capture systems

Weight:

The Vehicle Body block represents a two-axle vehicle body in longitudinal motion. The vehicle can have the same or a different number of wheels on each axle. For example, two wheels on the front axle and one wheel on the rear axle. The vehicle wheels are assumed identical in size. The vehicle can also have a center of gravity (CG) that is at or below the plane of travel.The rate of the pitch that occurs during vehicle acceleration depends on three torque components and the inertia of the vehicle:

$$\alpha = \frac{(f.h)+(f_{zf}.a)-(f_{zr}.b)}{J} \ldots\ldots\ldots(4)$$

IV. Experiments and Results

In this work the aim is to build such a surveillance system, which will detect motion even if the moving background, gradual illumination variations and camouflage and shadow into the background, thus achieves strong detection for dissimilar types of videos taken by stationary cameras. To fulfill this aim, tough computing software is used called Mat lab. Mat lab provides image acquirement and Image Processing Toolboxes which make easy us to create a good code.

experimental results for the detection of moving object using the proposed technique have been produced for input video that represent usual situations critical for video surveillance systems, and current qualitative results obtained with the proposed technique and other three methods are also efficient conditions of accuracy is better than other methods developed

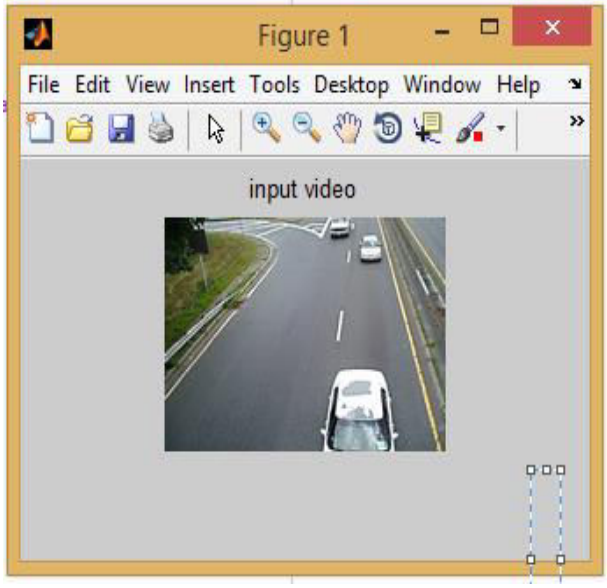

Fig.4.1: Input Video

FIG.4.2: Video divided into no.of frames

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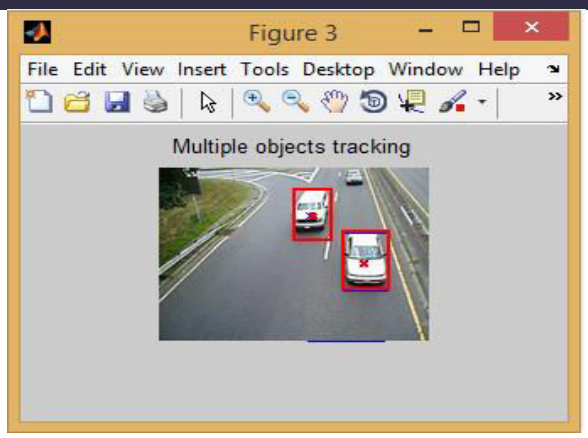

Fig.4.3: Object Tracking

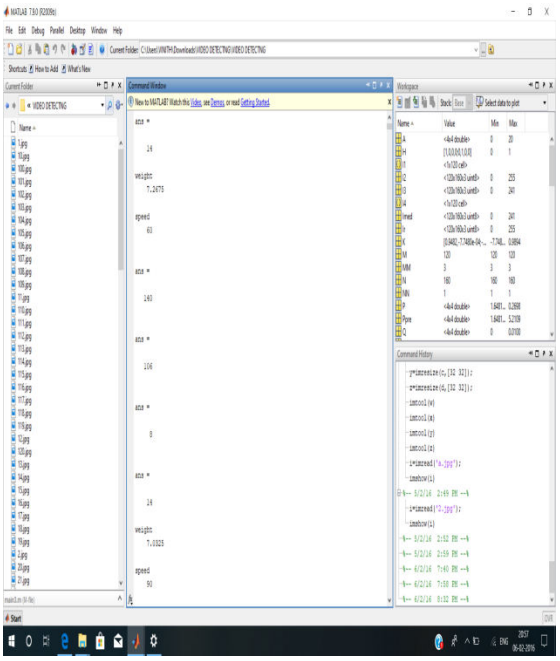

Fig.4.4: Speed and Weight

IV Conclusion

The image processing algorithms to obtain multilane traffic volumes and queue length using a single camera at an intersection mentioned above are fast and efficient enough to be executed by a Pentium based computer. A single camera with four algorithms (ie. traffic volume, queue length, classification and speed measurement) can replace many inductive loops, thus making wide area detection cost effective. For traffic control, the algorithms are able to provide two more parameters in addition to the traffic volumes, namely, downstream congestion and the queue length at approach roads, thus a more effective controller can be here is another advantage when using a computer based system, in which they can be easily networked for co-ordination between intersections as normally required in Urban Traffic Control system.

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