Shadow Elimination and Vehicles Classification Approaches In Traffic Video Surveillance Context and Log Conversion

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ABSTRACT- Object detection in the field of computer vision stands to be a crucial and critical task for object and scene recognition, employment of object recognition is vast in field of surveillance and artificial intelligence. An inner–outer outline profile (IOOPL) algorithm is employed to detect the three levels of object boundaries to enhance the satellite imagery segmentation with the help of shadow elevations. This method can be adopted to an experimental model of traffic surveillance video monitoring. In Intelligent Transportation System (ITS) it is very important to recognize the type of a detected object in order to track reliably and estimate traffic parameters correctly .This work addresses the major difficulty faced in the vehicle image segmentation due to the misconception of assuming object shadows as part of object itself. The proposed methodology will be utilized for vehicle detection and segmentation by eliminating its shadow counterpart.

Index Terms: Intelligent Transport system, Shadow Elimination, IOOPL Algorithm

1. INTRODUCTION

Accuracy in Image feature extraction is a mandatory in the field of Computer Vision .The Image feature detection is based on Shape, Pattern and Feature extraction of image become complex with homogeneous type of image and It can be extended to the field of Robotics as Artificial intelligence. In Intelligent Transportation System (ITS) it is very important to recognize the type of a detected object in order to track reliably and estimate traffic Parameters correctly. Image boundary extraction and background elimination is implemented with help of gray code conversion.

Intelligent transportation system (ITS) are advanced applications which, without embodying intelligence as such, aim to provide innovative services relating to different modes of transport and traffic management and enable various users to be better informed and make safer, more coordinated, and 'smarter' use of transport networks.

They inform road users in real time on their travel time and best routes to be taken given a destination and so on. They provide more coverage including all locations and streets. They are faster to setup and low maintenance and works in all weather conditions.

Research began to mobilize around the 1960 to fight against the harmful effects of congestion. Indeed, the overall congestion of transport infrastructure is a socio-economic cost in terms of air pollution, as well as time wasted by users in transport. Video surveillance on highway is a hot topic. The Support Systems Traffic Management (SSTM) is present on the three basic steps of traffic management:

1. The collection of traffic data via sensors on infrastructure and in vehicles.
2. The processing of these data with computer systems. 3. The action on users by providing information via VMS, the Internet, but also personal systems such as guidance systems incorporating real time information on traffic.

Step2 plays an important role, requiring more attention and attracting lots of researchers .Different techniques are used in this step ,among them ,the vision-based approach is the one of the most popular techniques used for traffic controls .Indeed ,traffic video analysis can provide a wide range of useful information to traffic planners. In this context   ,video data can enable vehicle classification, traffic flow analysis ,incident detection and analysis at intersections ,vehicle

tracking for traffic operations, traffic parameters estimation and update. There have been many approaches proposed to solve these and related problems. Hongya Zhang in his paper [1] shadow features is taken into consideration during image segmentation, and then, according to the statistical features of the images, suspected shadows are extracted. Furthermore, some dark objects which could be mistaken for shadows are ruled out according to object properties and spatial relationship between objects. For shadow removal, inner-outer outline profile line (IOOPL) matching is used. First, the IOOPLs are obtained with respect to the boundary lines of shadows. Shadow removal is then performed according to the homogeneous sections attained through IOOPL similarity matching. Yongqunan in his paper [2] discussed a simple and fast segmentation approach is proposed for on-road object in ITS. Liangli in his paper [3] proposes a robust license plate detection method using vertical boundary pairs and geometric relationships.

These problems can be classified into three major types: detection and tracking , occlusion elimination, feature extraction and vehicles classification. In the following section, we detail some of the proposed approaches that tackle different related problems based on computer vision and image processing techniques.

2. PROPOSED WORK

In this paper ,we are focused on visual traffic surveillance on highways and we present two ideas to tackle the problem of cast shadow elimination and vehicles classification as follows .The first one is a novel simple method of moving shadow elimination using the information contained in contrast .The main contribution of this proposal is inspired of the colour distribution . Indeed, the comparison between the histograms of lighted and shadowed regions show that the latter is darkened and less dispersed. The property of darkness is exploited in many works and is known as linear attenuation or non-linear attenuation, which considers the effect of shadow as an attenuation of luminance of corresponding background. Several methods have proposed an estimation of the coefficient of linearity between light and shadow region, for example the work

proposed in adopt the hue/ saturation/value information and the ratio between image and corresponding background luminance and the work in addressed the non-linearity attenuation by using a dichromatic reflection model to account for both the sun and the sky illuminations in an outdoor environment. The goal of our method is to make a region under shadow similar to corresponding background in order that a background subtraction algorithm did not detect it as part of moving object. The notion of contrast introduced in this paper is very suitable to take into account the change produced by shadow. Indeed, a contrast ratio allows producing a distribution of shadow region similar to its corresponding in background in term of dispersion and darkness.

The second method focused on the classification of vehicles. Unlike the previews works that use the dimensions of vehicle, we use a Hu moments associated with knowledge base to characterize vehicles, which allow describing shape in a manner that is independent of scale, position and orientation. Experimental results show that the proposed methods offer great improvements, compared to methods , in terms of accuracy and robustness in traffic surveillance. The rest of this paper is organized as follows. In the next Section, the background theory and related works are given. The research goal is described and the procedures of the whole proposed approaches are detailed. Reports the experimental results and the comparative evaluation.
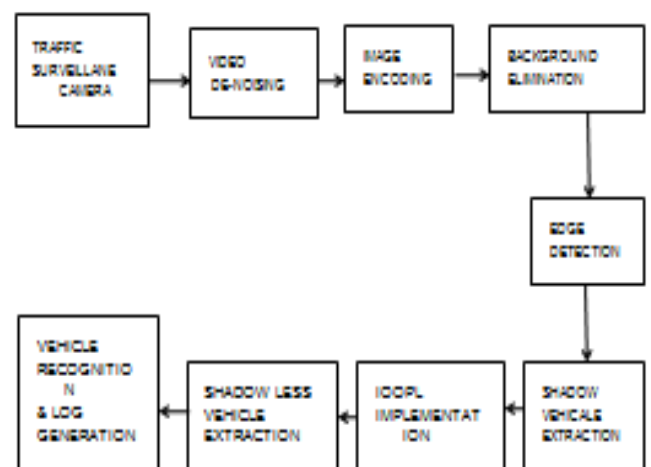

Figure.1 Block Diagram

1. Video is taken from surveillance camera and noise is removed by de-noising technique
2. Whole video is converted into many frames and image encoding is done
3. Background is eliminated by subtracting current frame from the previous frame
4. Edge detection is done with the help of techniques like gradient and Laplacian techniques
5. Shadow of the vehicle is detected by IOOPL (inner outer outdoor profile) algorithm and then shadow is eliminated simultaneously
6. Vehicle is recognized and converted into log format

2.1 SHADOW DETECTION

Shadows are created because the light source has been blocked by something. There are two types of shadows: the self-shadow and the cast shadow. A self-shadow is the shadow on a subject on the side that is not directly facing the light source. A cast shadow is the shadow of a subject falling on the surface of another subject because the former subject has blocked the light source. A cast shadow consists of two parts: the umbra and the penumbra. The umbra is created because the direct light has been completely blocked, while the penumbra is created by something partly blocking the direct light, as shown in the following Figure.

Figure.2 Edge
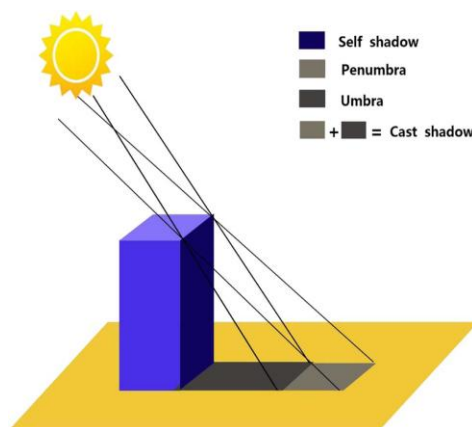
Detection in Image processing

Edge detection is the name for a set of mathematical methods which aim at identifying points in a digital image at which the image brightness changes sharply or, more formally, has discontinuities. The points at which image brightness changes sharply are typically organized into a set of curved line segments termed edges. The same problem of finding discontinuities in 1D signal is known as step detection

There are many ways to perform edge detection. However, the majority of different methods may be grouped into two categories:

Gradient based Edge Detection: The gradient method detects the edges by looking for the maximum and minimum in the first derivative of the image.

Laplacian based Edge Detection: The Laplacian method searches for zero crossings in the second derivative of the image to find edges. An edge has the one-dimensional shape of a ramp and calculating the derivative of the image can highlight its location.

2.2 SHADOW ELIMINATION

Here shadow is eliminated with the help of IOOPL (inner outer outline profile) algorithm.

1. Acquire input image.
2. Apply Gaussian Smoothing ($\alpha=2, n=11$).
3. Divide image into smaller sub sections.
4. Similarity matching will be done for each subsection by employing image correction.
5. If correction result is high than two sub sections belongs to same object then merge.
6. If correlation result is small then other object shadows are present in the sub sections and need to be separate.

2.3 FEATURE EXTRACTION AND VEHICLE CLASSIFICATION

Estimating road traffic parameters such as volume, density, mean speed and lane flow is very important for traffic analysis and management. In the literature, there are many different approaches based on image processing. So, several vehicle features like shape, length, width, height, texture, etc. are extracted to classify vehicles into different categories and to determine traffic parameters.

Creating a large DB for every vehicle combination is a Memory and Cost consuming task, whereas classifying the type of vehicle with its dimension alone reduces the memory complexity

and a license plate logging mechanism adding further access to vehicle classification. After vehicle background elimination and movement detection, the moving vehicle is sensed with a length counter whenever it crosses the video frame boundary. Based on its length value it can be categorised into bike/car/truck etc.

2.4 TEXT CORRELATION

Correlation is a dependency deriving statistical tool, which used to find the relation between two random sets variable. Text correlation utilizes the cross correlation searching method to calculate the similarity index level between two extracted text images. A template data base which contains all the alpha numeric images with standard times new roman font is designed.

Figure.3 Template data base

Using Edge dilation, the license Plate text images will be pre-processed and the unnecessary image background will be removed.

Figure.4 Original License Plate

Extracted Number   66 720 27

The extracted Number plate will be compared with each and every alphabets in the template database and the resultant matching index will compared fir maximum similarity and the detected text will be updated in Log File.

2.5 EDGE DILATION

Dilation is a morphological process of detecting and categorizing the actual and background objects in a input image.

The dilation operator takes two pieces of data as inputs. The first is the image which is to be dilated. The second is a (usually small) set of coordinate points known as a structuring element; it is this structuring element that determines the precise effect of the dilation on the input image.

Edge Dilation is used to detect the flow of edge linings in a digital image and can be used to refill the missed (gap) and noised edge linings. It ensures the accuracy of the object detection and extraction in a noised/ moving environment digital image. When a moving vehicle is captured in a still/moving camera the edge linings of the input video frames will be quite dynamic and disoriented, Edge Dilation is used to morph the exact boundaries of the vehicle frames by filtering unnecessary background objects.

The correlated text value will be written into a text file as log generation.

3. RESULTS AND DISCUSSIONS

Acquiring a tracking video and converting video frames into separate images For each image pre-processing techniques are applied, The output of single frame is shown in the figure5.1 after converting whole video into many frames,

Figure.5 Input video file to frames conversion

3.1 IOOPL ALGORITHM

1. Acquire input image.
2. Apply Gaussian Smoothing (=2,n=11).
3. Divide image into smaller sub sections.
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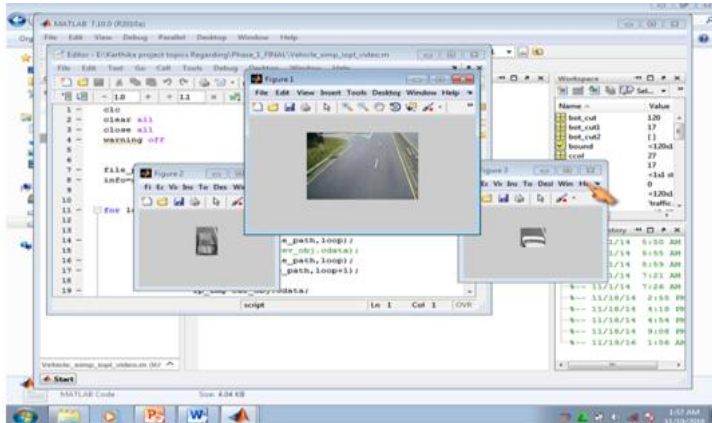
Sections and need to be separate.

Figure 6: IOOPL shadow less vehicle detection

After applying Gaussian smoothing the shadow is removed, the above output is shadow separated object.

3.2 LICENSCE PLATE

After applying text correlation and edge dilation the output of some 20 cars is taken out in that below one is example
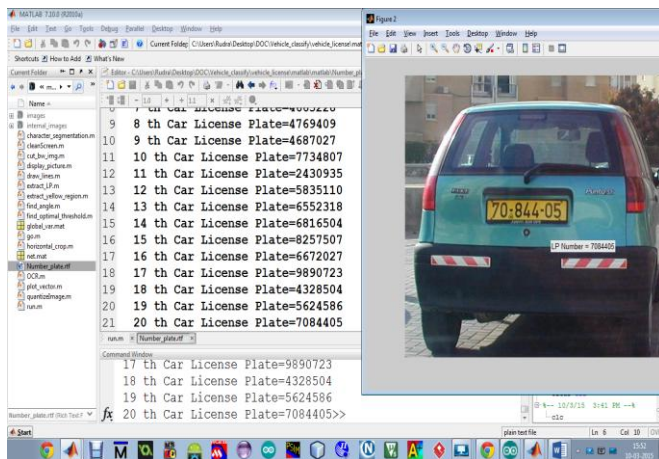

Figure. 7 Licence plate output

4.CONCLUSION

To detect a vehicle in a complex background environment, the shadow is eliminated first then the vehicle is classified (detected).These things are used to estimate the traffic parameter correctly. For example calculate the traffic rate to build flyovers. The conventional methods required high resolution satellite images and it depends on manual searching. This problem is solved by the Intelligent Transportation System which gives automotive vehicle searching and detection using log query.

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