SHADOW MAIMED CLASSIFICATION, LICENSE PLATE RECOGNITION AND LOG GENERATION IN ITS

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Abstract*: *In intelligent transport system (ITS), Video surveillance is the hot research topic, this surveillance is applied in many fields which is useful to detect the cause of an accident, to trace and find out the particular vehicle and to find out the route between major places. In this area object detection and shadow elimination are the major task. 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. Addition to this, text recognition is another challenging task in video surveillance. This paper proposes classification of the detected vehicle using the machine learning approach known as Delta learning algorithm (Widrow-Hoff Learning Rule) where the system is trained with various types of vehicle using its appearance, color and the build type. 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. A method for log generation is proposed to retrieve vehicle's travelling details, is also to be proposed by classifying the vehicles using the machine learning technique, Artificial Neural Network, which is to be trained by a high-performance machine learning algorithm called Delta Learning Algorithm. Additionally a method to recognize the number plate is also proposed in this paper, the number plate is recognized using text correlation and edge dilation techniques. The number plate recognition is challenging task when video text recognition is concerned.

Keywords*: *Surveillance video Monitoring; Intelligent Transport System; Delta Learning Rule; Vehicle Classification; Text Correlation; Edge Dilation.

I. INTRODUCTION

Intelligent Transportation System (ITS) is the applications of new information and communication technologies (ICT) into vehicles and roadways for monitoring traffic conditions, enhancing mobility, reducing congestion helps in the transport infrastructure and improving traffic security [2]. They also helps to draw traffic forecasts and advise the user about departure times in different regions and alternative way or route to major places or areas. In this work, the classification and log generation is proposed to minimal congestion, predict traffic, avoid accidents and used for investigations etc., shadow elimination and vehicle detection is done with IOOPL algorithm [1]. Here, the vehicle classification, log creation and license plate recognition is preceded with following algorithms namely –Delta learning algorithm for classification of vehicle to classify a vehicle in a complex background environment, the shadow is eliminated and then the vehicle is detected and classified. Text Correlation is a dependency deriving statistical tool, which used to find the relation between two random sets variable and edge dilation is Dilation is a morphological process of detecting and categorizing the actual and background objects in a input image.

II. RELATED WORK

Mathematical modelling of Gaussian distributions employed to find the threshold value for differentiating foreground and background objects (Background elimination) [2]. Fixed threshold value cannot be applied other than traffic images. It can able to differentiate only between background and object. Multilayer object detection is impossible which should more accurate when talking about traffic monitoring and shadow elimination. Only shadow elimination and classification is done without log Generation [2].Gaussian Distribution [2] in image processing is a way of determining the threshold value of background, Threshold value prediction is based on histogram method i.e. Maximum number of pixel occurrences. In Shadow elimination and vehicles classification approaches in traffic video surveillance context [2] paper required high resolution videos are required and it depends on manual searching. In order to avoid this problem the Intelligent Transportation System is introduced to detect a vehicle, which gives automotive vehicle searching and detection using log query.

Object extraction from a video or a moving object extraction is consists of many literature, threshold comparison multi-resolution processing, edge detection, inter-frame differencing and background subtraction. Such image processing methodologies is presented in [9]. As demonstrated in [10], background subtraction is the more accurate method for traffic monitoring and it is widely exploited in many other applications, such as human motion capture, hand written detection and video surveillance [2]. Many methods have been proposed for background subtraction, the basic technique is to model each pixel in a video frame with a Gaussian distribution [11]. The model does not work well in the case of dynamic natural environments, where the back- ground is multimodal. A very popular technique is the Mixture of Gaussians Models (GMM) [12]. It is used to model complex background, and applied to the traffic monitoring problem via video surveillance. GMM is one of basic and root algorithms for background modelling due to its effectiveness and efficiency

for motion detection and object detection from video sequences [12]. In [13], the authors argue that the GMM is not effective for outdoor scenes. They show that in outdoor scenes, the distribution of pixel intensity over a long period covers a wide range of intensity, and they choose to replace the GMM probability density function (PDF) with a kernel-based density estimation method [14]. However, the cost to compute the kernel density, estimate at each pixel, is very high in term of memory requirement and time. Another efficient technique is the Codebook model proposed in [14].

Detection of license plate is an important process in intelligent transportation systems before license plate recognition [5]. Sensors are been used before Using characteristics of dynamic images, our system rapidly identifies the license plate region. Car detection subsystem uses MMADR and NDDR of dynamic images to find the location of cars on the screen [5]. License plate detection and recognition is a crucial and difficult issue for an ITS (Intelligent Transportation System). This method is proposed as a robust license plate detection method using vertical boundary pairs and geometric relationships. By detecting the vertical boundary pair from the vertical sobel edge image that is processed with noise removal [7], simultaneously, it can classify the type of the license plate. This method is able to cope with varying complexities such as poor illumination, blurring and tilt [7].

III. PROPOSED WORK

Shadow elimination and Vehicle classification [1] in the field of computer vision is the challenging thing. In the proposed work it is extended to the license plate recognition and log generation. Shadow elimination is done by IOOPL[1][3] (inner-outer outline profile) , this algorithm marks the object by different boundaries , in which these boundaries helps to differentiate the background , shadow and the object[1]. Edge detection and threshold frequency is used to differentiate the object and background, the pixel value is also used to differentiate the background and foreground objects. They also helps to draw traffic forecasts and advise the user about departure times in different regions and alternative way or route to major places or areas. In this work, vehicle classification and license plate recognition is proposed to minimal congestion, predict traffic, avoid accidents, etc., log generation is mainly used for the later use. Here, vehicle classification and license plate recognition with following algorithms.

A. Delta algorithm

In order to get around the Perceptrons limitations researchers began to develop a neural network with an extra hidden layer of neurones between the inputs and Outputs. This hidden layer helps to process the data the Perceptron rule did not easily extend to multiple layers. An alternative approach to the perceptron learning rule is known as the delta rule. This rule was developed by Widrow and Hoff, this rule is also called the Least Mean Square (LMS) method. This learning rule is most commonly used method and it produces the accurate results. For example, F a given input vector, the output vector is compared to the correct answer, if it results in zero, no learning takes place, else the weights are adjusted to reduce this difference [8]. The difference in weight from ui to uj is given by: dwij = r* ai * ej, where r is the learning rate, ai represents the activation of ui and ej is the difference between the expected output and the actual output of uj. These include the generalized delta rule and the unsupervised competitive learning model.

Delta algorithm steps:

Step 1: Create a Neuron table with minimum of 10 vehicle images along with its make of vehicle

Step 2: Assign a target weight value based on the vehicle information (ex: mean, color distribution, shape pattern etc) for each group of similar type vehicles.

Step 2: Train the table with various input vehicles and calculate the weight value with each targeted output with reference to the already stored information.

Step 4: monitor the change of weighting function with each training set to match the target vehicle value.

Step 5: Update the Weighting values with neuron activation function; so that whenever a input vehicle combination is correlated with the neural weight value then corresponding output neuron functions will be triggered.

B. Text Correlation

Text correlation technique is used to compare or match the things from the input to the learnt database. This correlation technique is used in both vehicle classification and license plate recognition. In vehicle classification the database learnt the types of vehicles using delta learning rule. The specific weights are also assigned to the learnt object by delta rule by considering the outlook, length and model of the vehicle, when the object was captured either as a still or as a video it takes as a input and convert it to the weight after converting to the weight, a text correlation method is used to compare the acquired weight to the database, and in turn it results the exact result. In license plate recognition, the database learns the set of alpha-numeric values in correspond to the license plate format, when a license plate is detected simultaneously the alpha-numeric characters are compared to the characters in database. In Fig 3 the set of the alpha-numeric values, those values are learnt by the database is shown

Fig 1 Original License Plate

Fig 2 First Step of Extraction

In Fig 1 it shows the original license plate which is extracted by edge dilation technique, exact license plate is extracted from where in Fig 2 the first step of extraction is shown after the extraction of the text it compared to database and results in highly matched value.

a) Correlation steps in classification:

- Remove Background using gray threshold Otsu

method

- Detect moving Objects using Frame Subtraction
- Apply Edge detection and find Inner and Outline Profile using Horizontal and vertical scanning
- Segment the input Vehicle and apply cross correlation with the database vehicle to find the amount of matching index.
- After comparing all the db images with current segmented vehicle using correlation, the maximum matched index is updated in the rule and in the log.

b) Correlation steps in license plate recognition:

- Segment Vehicle using edge dilation and Preprocessing
- Apply color filter to find the Yellow pixel regions in the segmented vehicle
- Apply linear distribution area algorithm to find the difference between car and license plate. since the license plate area is bordered .
- After finding the LP area, use horizontal scanning to separate the alphanumeric contents in the LP.
- Apply Text Correlation between the input and template images to find the matching index value.
- Construct a switch table to identify the ASCII value of the alphanumeric with the help of maximum matched index and update log table.

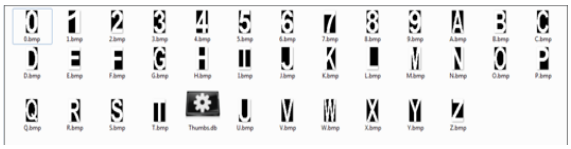

Fig 3 the set of alpha-numeric values is learnt by the system

C .Edge dilation

Dilation is a morphological process of detecting and categorizing the actual and background objects in a input image[8]. 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 the 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 [8]. It ensures the accuracy of the object detection and extraction in a noised/ moving environment and digital image. When a moving vehicle is captured in a stiil/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.

It is a technique which is used in for license plate recognition, where it is used for detecting the edges of the number plate. Dilation is used to detect both the vehicle edges and also the number plate edges which lead to extract the exact edges of the number plate. In Fig 1, it shows that the object edge is detected and dilated using the edge dilation technique. After this step the edge dilated object will go for text correlation steps.

Edge dilation steps in license plate recognition:

Step 1: Apply imerode matlab function in the segmented and color filtered vehicle image to find the 8 directional edge values.

Step 2: Track the edges in all directions using region growing method.

Step 3: License plate Text edges will can be identified by dilation value of the edges, for natural shapes the dilation is large and small for text shapes.

Step 4: Apply Area finding formula in the tracked vehicle edges to find the minimal edge dilation value by introducing threshold mechanism.

IV. IMPLEMENTATION RESULTS

As the result of this research work, IOOPL algorithm has been implemented to detect a particular vehicle in an highway traffic surveillance video by eliminating the other background objects and the results of implementation [1] Delta learning rule has been implemented to classify the vehicle type by learning the different types of vehicles. The different phases of the object detection and background elimination are done [1] . In fig 2 it shows that the user can load the video and the license plate has been detected. There is also advantage of searching the particular vehicle number. In fig 5, it shows the vehicle log generation. This vehicle classification and log generation has many advantages over Intelligent Transportation System. This log generation and license plate detection is saved for the later use. The search query using license plate is the method of searching the particular vehicle in easy way. The main advantage of this work is for monitoring traffic conditions, reducing congestion, enhancing mobility helps in the transport infrastructure and improving traffic security. They also helps to draw traffic forecasts and advise the user about departure times in different regions and alternative way or route to major places or areas. In this work, the shadow elimination and vehicle classification is proposed to minimal congestion, predict traffic, avoid accidents etc. Real-time video has been used in this work to show the accuracy yielded by this work. That has been shown in the Fig 4. Vehicle tracking is also possible in this work using the license plate recognition. Search query option is used to that vehicle tracking work simpler.

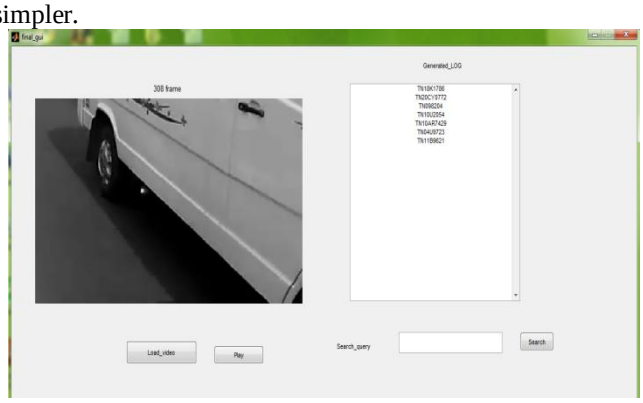

Fig 4 Shows the License Plate Detection

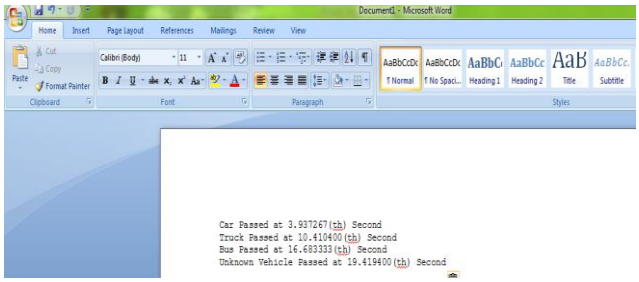

Fig 5 shows Log Generation

V. CONCLUSION AND FUTURE ENHANCEMENT

In this paper, the major critical task in ITS that is vehicle detection and classification is done with highway traffic surveillance. The proposed model can be used in any outdoor environment. License plate recognition in moving cast video is done with text correlation method and edge dilation method and the log also been generated in read-only format for later use. These approaches give satisfactory results in shadow detection, vehicle classification, license plate recognition and log generation and in other hand our approaches are cost effective and highly accurate. So, the integration of these algorithms and methods can enhance the performance in ITS. This license plate recognition is mainly used in vehicle tracking. The video used in this work is a real-time video, it is used to show the accuracy of the work.

As a future work, planned to implement these algorithms and approaches using embedded system in Real-time and its accuracy have to be checked.

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