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GMM BASED VEHICLE COUNTING SYSTEM

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ABSTRACT *- Vehicle detection is a process of identifying only the vehicles and a type of vehicle using the Gaussian Mixture Model (GMM). GMM algorithm segments the image based on Maximum Likelihood estimation (ML). The segmentation is completed by clustering each pixel into a component according to the ML estimation. After that Foreground detection technique is used to extract the vehicle. In our project the aim is to identify the vehicle and to count the number of vehicles. Initially the VGA camera is used to record the moving vehicles. Then the captured video is splitted into number of frames and then each frame is converted into gray scale image. After that GMM algorithm is implemented to segment the image and then foreground detection is applied to identify the vehicle.. The main objective of using Mat lab is to apply some mathematical calculations to image by converting the image into matrix format. It integrates computation, visualization, and programming in an easy-to-use environment where problems and solutions are expressed in familiar mathematical notation.*

Keywords: Vehicle detection, Gaussian Mixture Model, Vehicle counting

1 INTRODUCTION

The objective of developing this project is to identify the vehicle and counting the vehicle which is in motion. This project has a wide application in the city check posts. Without using the man power the number of vehicles entering the city and exiting the city can be easily calculated by simple monitoring through the computer system.

One added advantage of this project is that the vehicle counting will be done lively. Like in exciting system it does not show the stored reports, we can see the identified objects and the count of vehicle which is increasing continuously whenever a new vehicle is identified, which is monitored by the authorized person and this will be very helpful in security departments.

The details are processed as report and stored in the main server where it serves the report throughout the entire nation. This is another advantage of this project since it serves the report to entire nation whenever we need it we can access those details with proper permission and can access from anywhere.

2 SCOPE

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The scope of the project **vehicle detection and counting system** is for computerizing the working in the Security department. The software takes care of all the requirements of the monitoring system and is capable to provide easy and effective storage of information related to vehicle that come up to the head quarters or administrator of security department in any field.

3 EXISTING SYSTEM

Existing method of traffic monitoring involves traffic count and classify the vehicle is done manually by employing number persons. Previous research work states that the accurate vehicle dimension estimation could be performed through the use of a set of coordinate mapping functions.

Although they were able to estimate vehicle lengths to within 10% in every instance, their method requires camera calibration in order to map image angles and pixels into real-world dimensions. Similarly, commercially available Video Image Processors (VIPs), such as the Video Track system developed by Peek Traffic Inc., are capable of truck data collection. However, the cost for such systems is significant and they require calibrated camera images to work correctly.

4 PROPOSED SYSTEM

This system requires less computational work to meet the practical needs. The computational complexity of our algorithm is linear in the size of a video frame and the number of vehicles detected.This allows the security guards to monitor the traffic at different junctions. There is a no need of workers, man-power etc.We propose to use un-calibrated surveillance video cameras as a cost effective means to collect real-time SV and LV volumes for each lane on roadways. Trigger lines are implemented to accurate the result of counting. Gaussian Mixture Model is used in this project to segment the image. False detection of vehicle is avoided by skull detection and region growth techniques

5 PROCEDURES

5.1 BACKGROUND REGISTRATION

A general detecting approach is to extract salient regions from the given video clip using a learned background modelling technique. This involves subtracting every image from the background scene .here first frame is assumed as initial background and thresholding the resultant difference image to determine the foreground image. Here we go by the fact that vehicle is a group of pixels that move in a coherent manner, either as a lighter region over a darker background or vice versa. Often the vehicle may be of the same colour as the background, or may be some portion of it may be camouflaged with the background, due to which detecting the object becomes difficult. This leads to an erroneous vehicle count.

5.2 FOREGROUND DETECTION

Detecting information can use to refine the vehicle type and also to correct errors which are caused due to occlusions. After registering the static objects the background image is subtracted from the video frames to obtain the foreground dynamic objects. Post processing is performed on the foreground dynamic objects to reduce the noise interference.

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6 IMAGE SEGMENTATION

In general, three steps are used in this study. The first step is segmentation to object regions of interest. In this step, regions which may contain unknown objects have to be detected. The second step focuses on the extraction of suitable features and then extraction of objects. The main purpose of feature extraction is to reduce data by means of measuring certain features that distinguish the input patterns. The final step is classification. It assigns a label to an object based on the information provided by its descriptors.

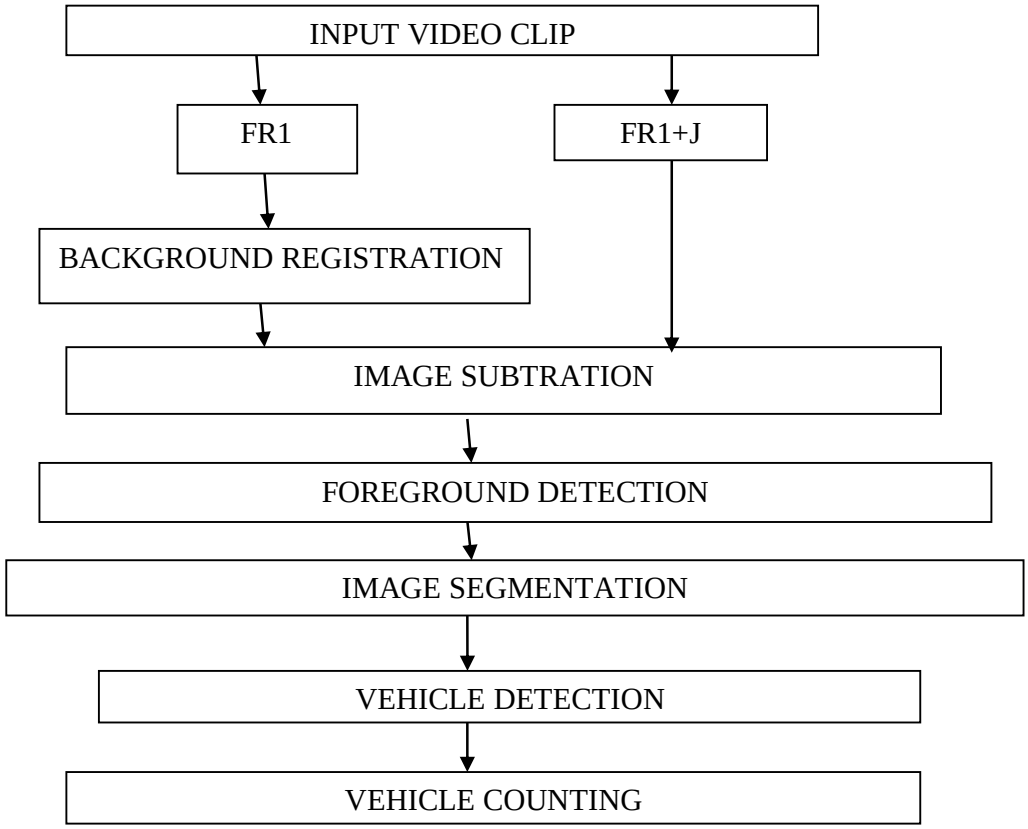

Figure 1: GMM for vehicle counting

7 BACKGROUND SUBTRACTION

In this, two models are used first is foreground and second is background. The subtraction of foreground from background is nothing but background subtraction. Background model is static once and foreground model is moving objects. In this system roads are background model and moving vehicles are foreground model.Background subtraction, also known as Foreground Detection, is a technique in the fields of image processing and computer vision wherein an image's foreground is extracted for further processing (object recognition etc.).

Background subtraction is a widely used approach for detecting moving objects in videos from static cameras. Background subtraction is mostly done if the image in question is

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a part of a video stream. Background subtraction provides important cues for numerous applications in computer vision, for example surveillance tracking or human poses estimation. However, background subtraction is generally based on a static background hypothesis which is often not applicable in real environments. With indoor scenes, reflections or animated images on screens lead to background changes. In a same way, due to wind, rain or illumination changes brought by weather, static backgrounds methods have difficulties with outdoor scenes.

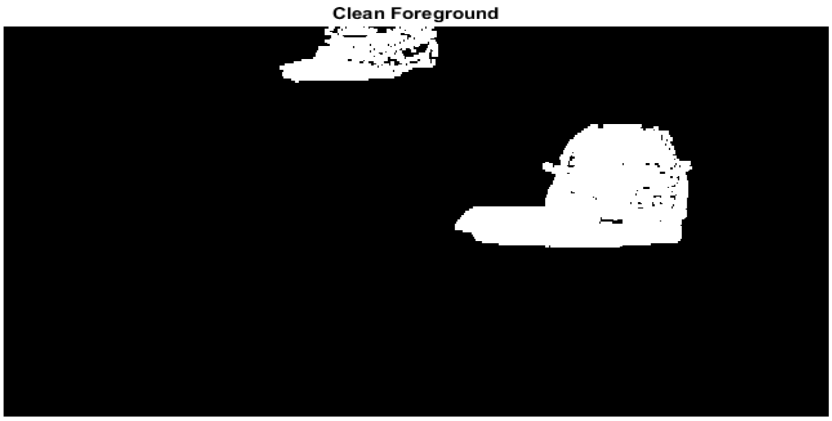

Figure 2: Background subtraction

7.1 GAUSSIAN MIXTURE MODEL

Counting of vehicles is important for the traffic control system. Counting is done for each of the four way road. For counting of the vehicles gaussian mixture model (GMM) is used.Gaussian mixture model (GMM) is important part counting of vehicles. It is important for the segmentation purpose. It is applied on the original image.

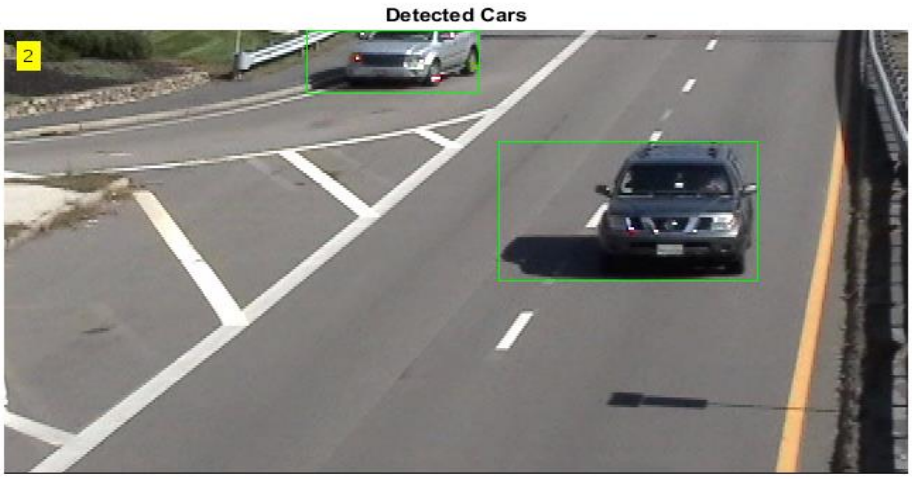

Figure c: Detected Cars

Gaussian mixture model by a mixture of K Gaussian distributions. Gaussian mixture model (GMM) evaluated the pixel values from reference pixel mean and variance. It is

evaluated for each pixel and updated with each new frame value. At the every new frame some of the Gaussians approximately equal to the current value. For these frames mean and variance is updated. Single Gaussian causes the multimodal behaviour of Gaussian mixture model. Some parameters of Gaussian mixture model are implemented such that number of Gaussians, number of training frames, learning rate, variance, subtraction ratio etc. using these entire parameters Gaussian mixture model is applied to the original image.

A Gaussian Mixture Model (GMM) is a parametric probability density function represented as a weighted sum of Gaussian component densities. GMMs are commonly used as a parametric model of the probability distribution of continuous measurements or features in a biometric system, such as vocal-tract related spectral features in a speaker recognition system. GMM parameters are estimated from training data using the iterative Expectation-Maximization (EM) algorithm or Maximum A Posteriori (MAP) estimation from a well-trained prior model.

8 CONCLUSION:

In this paper, we present a background registration technique and segmentation using morphological operator. A system has been developed to detect and count dynamic objects on highways efficiently. The system effectively combines simple domain knowledge about object classes with time domain statistical measures to identify target objects in the presence of partial occlusions and ambiguous poses, and the background clutter is effectively rejected. The experimental results show that the accuracy of counting vehicles was 96%, although the vehicle detection was 100% which is attributed towards partial occlusions. The computational complexity of our algorithm is linear in the size of a video frame and the number of vehicles detected. As we have considered traffic on highways there is no question of shadow of any cast such as trees but sometimes due to occlusions two objects are merged together and treated as a single entity.

9 FUTURE WORKS:

Motion history and path prediction are the future works of this project. The next step of this project is finding the speed of individual vehicles and classifying the type of vehicles. After tracking the vehicle A* algorithm is used to find the path of the individual vehicle. Feature extraction is used to classify the type of vehicle. For that database should be connected with Matlab Tool.

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