Automatic Number Plate Recognition for Video Surveillance System (ANPR): A Survey

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Abstract— The aim of the research work described in this paper is to develop a system for automatic car detection of vehicles and character recognition number plate. The image processing has been used for smart traffic surveillance system .Overall work for system comprises of software development and hardware development. Approach uses a single camera system mounted on a pole or traffic light which detects the over speeding vehicle and extracts its number plate. The system works by capturing the video frame of the moving object and by using image processing obtain its differencing image. First of all the moving object detection is done after that we will consider that object for number plate recognition. After object tracking we get the image of the car with number plate. Recognition of the number plate is proposed using different algorithms.

Key words: Automatic Number Plate Recognition (ANPR), GMM (Gaussian mixture model), optical flow, boundary and character feature optical character recognition

I. INTRODUCTION

Automatic License plate recognition is the extraction of vehicle license plate information from an image. It plays an important role in numerous real-life applications such as traffic video surveillance system, parking fee payment, parking access control and recovering of stolen cars. ALPR is also known as automatic vehicle identification, car plate recognition, automatic number plate recognition and optical character recognition. Now a day's video surveillance system has been developing rapidly. It detects the target in initial stage and then performs the function.

The escalating increase of contemporary urban and national road networks over the last three decades emerged the need of efficient monitoring and management of road traffic. Conventional techniques for traffic measurements, such as inductive loops, sensors or EM microwave detectors, suffer from serious shortcomings, expensive to install, they demand traffic disruption during installation or maintenance, they are bulky and they are unable to detect slow or temporary stop vehicles. Traffic surveillance system is an active research topic in computer vision that tries to detect, recognize and track vehicles over a sequence of images and it also makes an attempt to understand and describe object behavior, vehicle activity by replacing the aging old traditional method of monitoring cameras by human operators. A computer vision system can monitor both immediate unauthorized behavior and long term suspicious behavior, and hence alerts the human operator for deeper investigation of the event. The system can be developed for video surveillance system can be manual, semi-automatic, or fully-automatic depending on the human involvement.

The Automatic vehicle number plate recognition (ANPR), was invented the Police Scientific Development Branch in United Kingdom's in 1976 for safety and security

reasons. The prototype was implemented in 1979. Automatic vehicle plate detection system was commonly used in parking lot areas and road traffic monitoring system. There are some problems related to Automatic License Plate Recognition like 1) Plate variations which includes location, quantity, size, color, font, occlusion, inclination, standard versus vanity, etc: 2) Environment variations: which includes illumination and backgrounds. Various license plate detection algorithms have been developed in past few years. Each of these algorithms has their own advantages and disadvantages. For most traffic surveillance systems there are three major stages which are used for estimation of desired traffic parameters i.e. vehicle detection, tracking, and classification.

The simple flow of process is shown in figure 1.1. This flow chart is basic flow chart for Automatic car detection and number plate recognition for video surveillance system. As shown in the figure, the first step is video acquisition system in which input video is going for the process. Then after using moving object detection technique car is detected from the video for moving objection detection. There are mainly four methods to detect moving object from the video sequences i.e.

- Background subtraction
- Optical flow
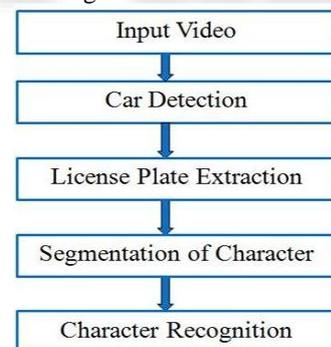- Frame differencing filtering
- Block Matching

Input Video
↓
Car Detection
↓
License Plate Extraction
↓
Segmentation of Character
↓
Character Recognition

Fig. 1.1: Simple flow of process

A. After detecting a car, license plate is extracted from detected area. License Plate extraction can be done by five different methods.

- License Plate Extraction Using Boundary/Edge
- License Plate Extraction Using Global Image Information
- License Plate Extraction Using Texture Features
- License Plate Extraction Using Color Features
- License Plate Extraction Using Character Features
  After extraction of license plate, the character segmentation is done. Character segmentation can be done in four different ways. Those are:
- Using Pixel Connectivity

- Using Projection Profiles
- Using Prior Knowledge of Characters
- Using Character Contours

After segmentation of each character individually from the number plate the character recognition will be done. Character recognition of number plate can done mainly using two different ways:

- Template Matching
- Artificial Neural Network

Car detection is done using very popular method i.e. background subtraction method. For detection of car Gaussian Mixture Modeling is used. After detecting a car from the video sequences, number plate is extracted by using horizontal and vertical edge features. Here for edge detection soble edge detection operator will be used. After that for segmentation of character of number plate will be done by using connected pixel approach. After that each character will be recognized using template matching technique. For template matching standard data base for each characters and numbers will also be formed. In this project, the main aim is to recognize Indian number plate but same algorithm is also applied to other countries number plate.

As Automatic number plate recognition (ANPR) is very crucial for the researchers in computer vision system for traffic surveillance system. The objectives of this project is to detect a car from video using background subtraction method and then number plate will extracted from the detected car area. Then character of number plate will be recognized using template matching. The main objectives of the research work are summarized as following:

- To detect car from video sequences using Gaussian Mixture Modelling.
- To detect number plate area i.e. localization using edge features.
- To segment each character individually from the license number plate using connected pixel technique.
- To recognize each character from segmented character using template matching method.

II. PROPOSED METHOD

As earlier said, the main objectives of this project are:

- To detect car from video sequences using Gaussian Mixture Modeling.
- To detect number plate area i.e. localization using edge features.
- To segment each character individually from the license number plate using connected pixel technique.
- To recognize each character from segmented character using template matching method.

So the object detection will be done by Gaussian Mixture Modeling, Number plate extraction will be done by edge feature, segmentation will be done by connected pixel techniques and character will be recognized using template matching method.

III. FLOW CHART

As shown in figure 3.1, the flow chart of automatic car detection and number plate recognition for video

surveillance system is shown. As shown figure 3.1, video sequence is given as an input to the algorithm. The input video is converted into frame and background is detected from the reference frame. Then using Gaussian Mixture modeling the foreground is defected. From the detected foreground, car is detected and captures the image of defected car. Then from the image by using sobel edge operator edge will be found.

After that divide the image into blocks, and calculate the threshold variance. By using morphological operation the car license plate is extracted. Then by using connected pixel method the character segmentation will be done. Then each character will be resized for the process of matching. By using template matching method, each character will be matched with the database and maximum match character will be displayed.
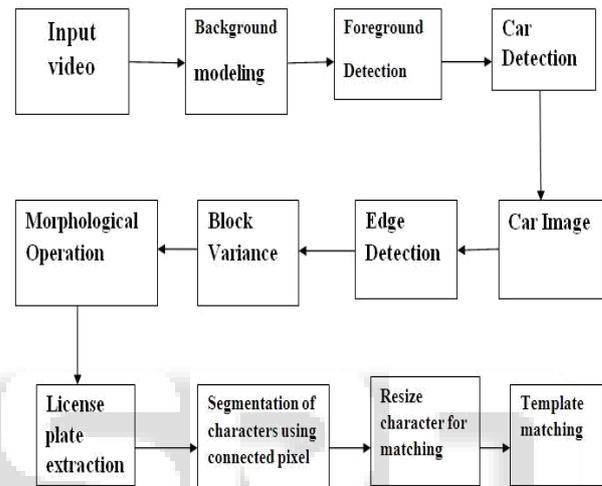

Fig. 3.1: Flow chart of automatic car detection and number plate recognition for video surveillance system

IV. CONCLUSION

In the recent years, license plate recognition for traffic surveillance system has attracts the many researchers. There are many problem faced like weather condition, distance between camera and car, number plate character variations etc. In this project, the main consternation is done on Indian license plate. Because of Indian license plate has many variations and number of characters is more to recognize it needs extra care. In this project, car detection is done using Gaussian Mixture Modeling and character recognition will be done by template matching method.

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