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Automated Vehicle Tracking System (VTS) using Image Processing Techniques

Kamaljit Kaur, Dr. Rinkesh Mittal
Department ECE,
PTU, Punjab, India

Abstract*— In India, the vehicles sometimes bare extra textual region like signs, symbols, name of the owner, well-liked sayings and ad boards to the license plate. Situation demands for accurate recognition of text class and fine aspect ratio analysis. Along with this extra care taken up in this manuscript to extract license plate of vehicles i.e, two-wheeler such as motorcycle or scooter (size of plate is small and double row plate), car (single as well as double row kind), transport system such as truck, bus, as well as multiple license plates there in a digital image frame under consideration. However, it is observed that the vehicle is not only identified by its number plate but the model of the vehicle also possesses many information so that it could be identified from the distance or remote location as the number plate can only be extracted once the camera is focussed on it. But prima facie, the vehicle is identified by it appearance i.e. its shape, model, color or style of the body. Therefore, in order to identify a vehicle on road, prima facie, its data in terms of its body or appearance is an important source of information that must be retrieved or extracted form it s image.

***Keywords*— Vehicle Tracking System (VTS), Histogram of Gradients (HoG), Dimensional Features**

I. INTRODUCTION

In the transport and traffic management system, tracking or surveillance of vehicles on road is of prime importance. Vehicles are identified by reading their number plate and then retrieving the information from the record based on the number plate contents. The system becomes complicated when there is large number of vehicles being traced at different locations. In that case, manual reading of number plates and then retrieval becomes very tedious job and time consuming too. Therefore, an automatic visual vehicle number plate identification and management system is required that can grab the image of the moving/stationary vehicle's number plate, extract the contents from the same and then retrieve the details of the vehicle under surveillance. The image can be grabbed using CCD camera installed on traffic lights or by portable/hand held CCD cameras with traffic cops. Besides tracking or surveillance of vehicles, the same can be used to facilitate the operations at the toll collection booths.

Vehicle identification is a research area where image processing methods are used to identify vehicles by detecting and identifying the license plate numbers. Typical vehicle identification systems consist of three main stages. They are the identification and tracking of vehicles through motion, locating the license plate, and accurately identifying the numbers in the license plate. Although many intensive research studies have been conducted in other countries in the area of automatic vehicle identification, to our knowledge, there is virtually no research studies conducted in Sri Lanka in this area.

II. RELATED WORK

This paper have presented a traffic-monitoring approach for vehicle tracking based on rule-based analysis. The system pattern is structured between the low-level image processing modules that is used for extracting visual data of vehicles under various illumination circumstances and the high-level image processing module, that provides a general-purpose knowledge-based framework for tracking vehicles in the scene. Based on adequate image-analysis algorithms, the low level image-processing modules extract vehicles from the current frame. The high-level processing module is developed as a forward chaining production system.[1]

A world with the increase in traffic, requires an adequate algorithms for extracting the knowledge regarding vehicles and guidance for vehicles. That's why, a road traffic analysis system based on wide area camera has been recently developed by DLR. At this point, we proposed a new image processing series for real-time traffic knowledge base extraction from high resolution airborne image sequences with automatic techniques. This series is applied in a set of computer systems as a part of an operational sensor system for traffic monitoring onboard a DLR plane. Vehicle recognition is performed by a combination of Ada boost for pixel classification and consequent clustering by Support Vector Machine(SVM) based on a set of numerical features of the classified pixel.. This is done by pattern matching based on normalized cross correlation in RGB color space. The processing chain is used to obtain much more accurate and relevant traffic data. [2]

This article presents an application of computer vision methods to traffic flow monitoring and road traffic analysis which utilizes image-processing and pattern recognition methods designed and constrains of road traffic analysis. These methods joint together gives efficient capabilities of the system to monitor the road, , to measure the speed, to begin automated vehicle tracking, and also number plates of the car are recognized. Developed Software was applied with video monitoring system, based on ordinary CCTV cameras connected to wide area network computers.[3]

The vehicle license plate determination system has greater efficiency for vehicles observing in automatic zone access control. Unique tags will be ignored in this Plate detection method, since all vehicles have a distinctive registration number plate. A variety of methods have been developed for car plate characters recognition. This planned system uses two character recognition techniques: Neural network character recognition and pattern matching of letters. In this proposed method, multilayer feed-forward back-propagation method is used. The presentation of the proposed method has been tested on several car plates and provides very adequate and efficient results.[4]

Iranian License Plate Detection System is also used to recognize a vehicle by its license plate. this system is one kind of usual inspection of transport, travel and security systems.. This paper presents a real time and strong method of plate recognition from disorderly images based on the morphology and pattern matching. In this proposed system main stage is the segmentation of the license plate from the digital image of the vehicle under different conditions such as lighting, slop, space, and position. [5].

In an image processing technology, License Plate Recognition that is used to distinguish vehicles by their white license plates. The characters from an image are extracting by license plate reader. This technology is used for many applications such as payment booths, parking decks, margin control, and rule enforcement. [6].

Automatic License Plate Recognition (LPR) is an algorithm which is used to classify a vehicle by tracking a vehicles license plate. In this research we purposed a system which is used to capture the license plate area from the vehicle's image taken from its back side. The camera is required to capture the images with pre-defined resolution and passes it to the software part. [7].

Automatic license plate recognition (LPR) system plays an important role in various applications and a number of techniques have been proposed. The proposed algorithm LPR technique consists of two modules: a license plate locating module and a license number identification module Soft computing techniques rooted in fuzzy is used to extract for license plate location and neural aim to identify license number identification disciplines were introduced to balance for uncertainties caused by noise, measurement error and imperfect processing .[8].

This paper presented a novel approach to extract and recognize the vehicle number plates of the moving vehicle. Numbers are automatically extracted from the plate and then compared with the database to identify the cars owner. System has been developed to work on the standard Islamabad Computerized Number Plates (ICT). The method is fairly good, making it suitable for real time applications [9].

License plate recognition (LPR) is one of the most important applications of applying computer techniques towards intelligent transportation systems (ITS). In order to identify a license plate, position and extraction of the license plate is the key step. thus finding the location of a license plate in an image is measured to be the most important step of an LPR system. [10].

The vehicle identification is made based on identifying the number plate of the vehicle under scanner. The number plate is located based on color code identification of the entire vehicle and then localizing the vehicle plate. Once the vehicle plate is identified, the late is exposed to character recognition and then vehicle is identified for its owner. [11].

Automatic Vehicle Identification (AVI) has many applications in traffic systems (main road electronic payment collection, red light violation enforcement, margin and society checkpoints, etc.). License Plate Recognition is an effective form of AVI systems. In this method, a elegant and simple algorithm is presented for vehicle's license plate recognition system. [12].

A SVM classifier is used here for vehicular data extraction in order to extract the vehicle data for identification. The input vectors are the elements of histogram of gradients for the vehicle image acquired. Further, the HoG are normalized with respect to size of the image/vehicle so that the HoG are not changed if the same image is giving zoom in or out effect. Further, the HoG should not vary even if the image intensity is varied within the tolerance limits. [13]

III. ALGORITHM

The objective of the proposed thesis work is to extract the vehicle information on road based on its appearance that is color, shape, model, any identifiable mark or any other source of information that is apparently available on the vehicle. The presented work is divided into following steps:

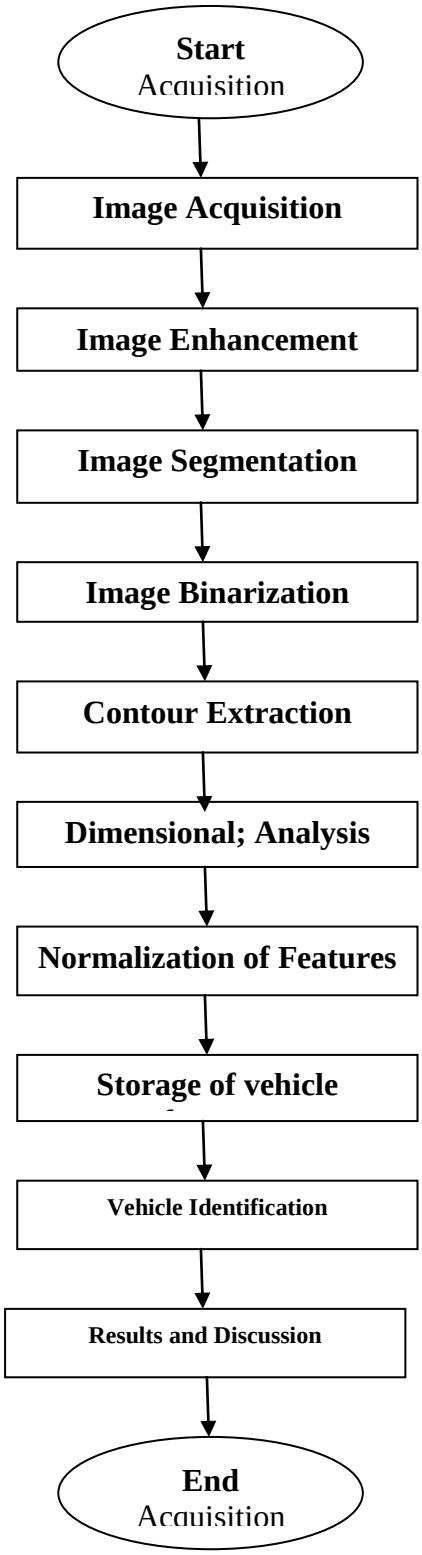
- Image Acquisition of vehicles on road
- Segmentation of vehicle amongst different vehicles
- Image Enhancement and binarization
- Extraction of vehicle shape, size and other dimensional features
- Normalization of features with respect to zooming effect With the rise in traffic related crimes the need
- Vehicle data storage for its identification

The basic method for extracting the vehicle data is divided into following steps

- Image Acquisition
- Image Enhancement
- Image segmentation for different vehicles in individual frames

- Image binarization using Otsu algorithm
- shape extraction
- Dimensional feature Extraction – size, body aspect, length, width etc.
- Normalization of features with respect to zooming effect.
- Storage of vehicle data for its identification

FLOW CHART



IV. RESULTS AND CONCLUSIONS

The presented algorithm is implemented on two different images for testing purpose. The below fig. .shows the outcome of the program. This program or algorithm is developed in matlab 2007b version.

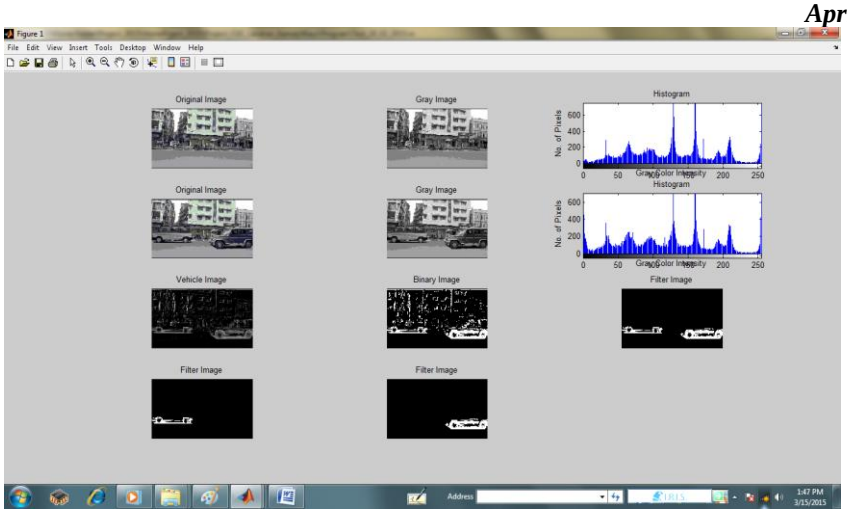


Fig. 1 Snap shot -1 of the output

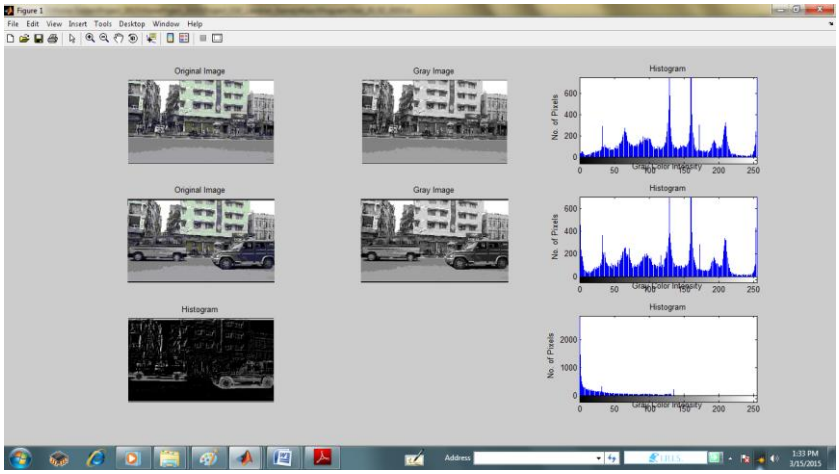


Fig. 2 Snap shot of the output

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AUTHOR PROFILE

Ms. Kamaljit Kaur is pursuing her M.Tech. in ECE from CGC-COE, Landran, Punjab, INDIA. Her field of interest is in digital image processing based system development and integration.

