Automated Toll system with number plate Detection and Collection

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Abstract-This system is defined automated toll collection technique where collection of tolls can be done automatically using image processing technique where we can detect the number plate of a vehicle and there by deduct whether the toll amount is paid or not. The vehicles number plate images and videos are maintained in the database, with the help of those images the image processing technique will be implemented to extract the registration number of the car from the number plate, with the help of this extraction the details of the vehicles owner will be take from the database and particular amount will be deducted, thereby we can find whether the amount is paid or not. In order to overcome the biggest issues of vehicle congestion and time consumption, this system is used. The main motivation of this system is to provide a base for building automatic number plate detection using image processing for toll collection at toll checkpoints. This system will help to save time as well as help to reduce congestion at toll checkpoints.

Keywords-character recognition, character segmentation, Number plate detection, Toll collection, Vehicle number recognition.

I. INTRODUCTION

Automatic Number Plate Recognition system is an important technique, used in Intelligent Transportation System. It is an advanced machine vision technology used to identify vehicles by their number plates without direct human intervention. The system work is generally framed into the steps: Number plate extraction, character segmentation and character recognition. From the entire input image, only the number plate is detected and processed further in the next step of character segmentation. In character segmentation phase each and every character is isolated and segmented. Based on the selection of prominent features of characters, each character is recognized, in the character recognition phase. This system is important in the area of traffic problems, highway toll collection, borders and custom security, premises where high security is needed. Previous works are Vehicle Number Plate Detection (VNPD) system algorithm based on template matching. They have devised an efficient method for recognition of Indian vehicle number plates.

II. IMAGE PROCESSING

It refers to process real world images digitally by a computer. It is a broad topic which includes studies in physics, mathematics, electrical engineering, computer science. It studies the conceptual foundations of the acquisition and deployment of images and in detail the theoretical and algorithmic processing as such. It also aims to improve the appearance of the images and make them more evident in certain details that you want to note.

IP Processes

The capture or acquisition is the process through which a digital image is obtained using a capture device like a digital camera, video camera, scanner, satellite, etc...

The preprocessing includes techniques such as noise reduction, contrast enhancement, enhancement of certain details, or features of the image.

The description is the process that gets convenient features to differentiate one object from another type, such as: shape, size, area, etc...

The segmentation is the process which divides an image into objects that are of interest to our study.

The recognition identifies the objects, for example, a key, a screw, money, car, etc...

The interpretation is the process that associates a meaning to a set of recognized objects (keys, screws, tools, etc...) and tries to emulate cognition.

III. AUTOMATIC NUMBER PLATE RECOGNITION

Introduction to The Topic

Due to the mass integration of information technology in all aspects of modern life, there is a demand for information systems for data processing in respect of vehicles. Therefore, several techniques have been developed

recognition and recognition systems are license plates used today in many applications.

These functions are implemented in patterns which is called "ANPR Systems" (Automatic Numbers Plate Recognition).

Algorithm Used in The Software

1. Location license plate, responsible for finding and isolating the plate in the image. It should be located and extracted from the image for further processing.
2. After the number plate is located and extracted from the image, it can be transformed into a standard format for brightness and contrast.
3. Orientation and plate size, offset angles that make the plate look "crooked" and adjust the size.
4. Segmentation of individual characters is present in plate.
5. Optical Character Recognition (OCR) for each image we segmented individual character. The output of the recognition of each character is processed as ASCII code associated with the image of the character. By recognizing all successive images of the characters are completely read the license plate.

IV. OBJECTIVES AND TOOLS USED

Matlab, Development Tool

MatLab offers a wide range of specialized support programs, called Toolbox, which significantly extend the number of features built into the main program. The MatLab Toolbox provides a set of functions that extend the capabilities of the product for application development and new algorithms in the field of image processing and analysis. The Image Processing toolbox handles four basic types of images: indexed images, intensity images (grayscale), binary images and RGB images. MatLab stores most images as two dimensional arrays (matrices) in which each element of the matrix corresponds to the intensity of a pixel in the image. Some images, such as color images (RGB), require a three dimensional array where the first plane in three dimensional space represents the red intensity of the pixels, the background represents the intensity of green pixels and the third plane represents the intensity of blue pixels. These are files with the extension ".m" used to work with MATLAB functions and scripts.

Project Objectives

The project´s objective is to develop a character recognition system for a license plate of a car using the

techniques and tools that best suit this purpose and allow doing it in an easy and comfortable way.

1. Find a method with acceptable results for the correct location of the area of the license plate.
2. Build a system that given an image region where plate can be found, to determine the character of the same.
3. Recognize each character we have extracted above by OCR system. Simultaneously, other objectives emerge the theoretical study of the techniques of digital image processing and creation of databases for recognition by template matching.

V. STEPS IN EXTRACTION

Morphological Operation

Morphological image processing is a type of processing in which the spatial form or structures of objects within an image are modified. The intensity map is a binary picture containing scattered pixels marking bright items and individual pixels that are noise. In addition, the edge map can contain much noise from small irrelevant edges. To get rid of some noise and to get the marked pixels around the plate connected, two algorithms called dilation and erosion are used. These algorithms are also called morphological operators.

Laplace Transformation

The basic requirement in the definition of digital Laplacian is that the coefficients associated with the central pixel are positive and coefficients associated with the external pixels are negative. Because the Laplacian is aderivative, the sum of the coefficients must be zero. So the answer is zero whenever the point at issue and its neighbors have the same value. The Laplacian responds to transitions in intensity, and this is rarely used foredge detection. For as is a second order derivative of the Laplacian is too sensitive to noise, produces double edges and is unable to detect the direction of the edge.

Optical Character Recognition

OCR is the mechanical or automatic conversion of images of kinds, the handwritten or printed text into machine encoded text, whether from a scanned document, a picture of a document, the scene photo or from a subtitle text super imposed on an image. It is widely used as a form of data entry from printed paper of the data records, passport documents, invoices, bank etc..

NN CLASSIFIER

Among the various methods of supervised statistical pattern recognition, the Nearest Neighbor rule achieves consistently high performance, without a priori assumptions about the distributions from which the training examples are drawn. It involves a training set of both positive and negative cases. A new sample is classified by calculating the distance to the nearest training case; the sign of that point then determines the classification of the sample. The k-NN classifier extends this idea by taking the k nearest points and assigning the sign of the majority. It is common to select k small and odd to break ties (typically 1, 3 or 5). Larger k values help reduce the effects of noisy points within the training data set, and the choice of k is often performed through cross-validation.

VI. DESCRIPTION

Proposed Method

System Overview

VII. FIGURES AND TABLES
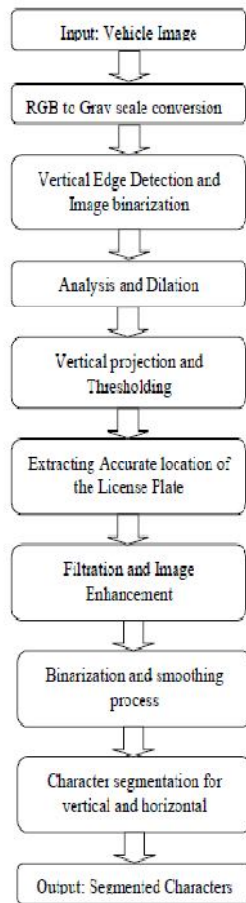
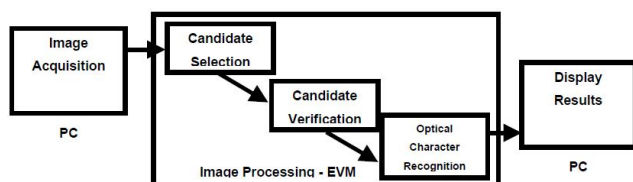Fig 1.1Input image

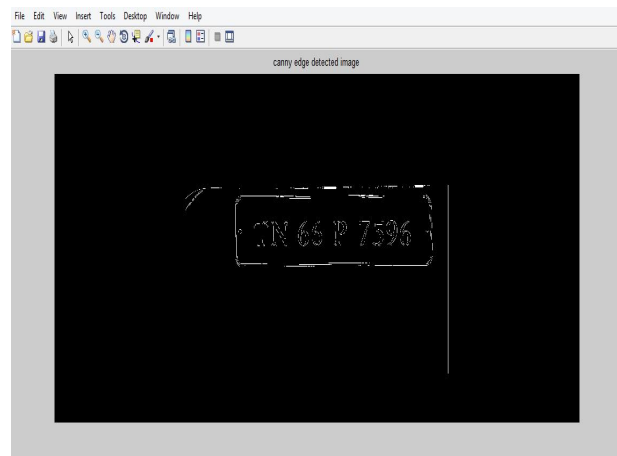Fig 1.2 Rbg2gray image

Fig 1.3 Combined mask image
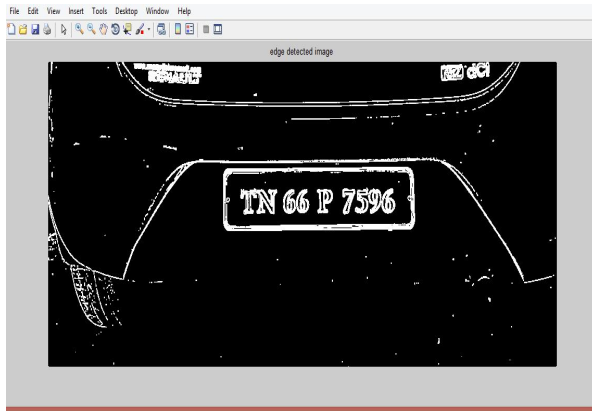

Fig 1.4 Canny edge detected image

Fig 1.5 edge detected image

Fig 1.6 Image with localize license plate

Fig 1.7 localize the cropped image

TABLES

Memory Allocation

On-chip:

Variable Name	Description	Type	Dimension	Size (bytes)
list	list of candidates	unsigned short	200x2	800
result	result of verification	unsigned short	1x3	6
region	candidate storage	unsigned char	23x79	1817
charTemp[26]	alphabet templates	signed char	21x10	212
numTemp[10]	numerical templates	signed char	21x10	212
licTempFrame	license plate template	unsigned char	24x79	1896
fftCol	result of fft of vertical sum	float	1x2048	8192
fftRow	result of fft of hor. sum	float	1x2048	8192
			Total	21327

Tab 1.1

On-board:

Variable Name	Description	Type	Dimension	Size (bytes)
gframe	gray scale picture	unsigned char	480x640	307200
bwframe	binarized picture	unsigned char	480x640	307200
bwsob	Sobel output	unsigned char	480x640	307200
			Total	921600

Tab 1.2

VIII. CONCLUSION

The proposed system uses less cost to implement and require fewer changes to the current system. It provides the tracking system for theft vehicle which is secured and highly reliable. E-toll system can help to achieve proper traffic management, appropriate toll collection and improves security. Thus a system used as an Automated Toll collection booth, based on image processing saves the time at toll booth, minimizes the fuel consumption during the ideal condition of the vehicle. In turn we can save the environment from emission of extra carbon monoxide (CO_2). Hence we can save our country. Also it serves in providing the detecting system for theft vehicle which is secured and highly reliable can be achieved. It can be used to overcome all drawbacks with the current system such as time and human efforts.

REFERENCES

[1] Rama Takbhate and Prof. S.D.Chavan. "Automated toll booths system" Vol.1.Issue3.IJRSCSE, July 2014, pp.69-76.

[2] Kannan Subramaniam."Number plate detection with application to elecronic toll collection system "Vol. 1, Issue-1.IJIRCCE, March 2013, pp.144-148

[3] F. Faradji, A. Hossein Rezaie, M. Ziaratban "A Morphological Based License Plate Locating System," IEEE International Conference on Image Processing (ICIP), pp 57-60, 2007.

[4] A. Tahir, H. Adnan Habib, M. Fahad Khan "License Plate Recognition Algorithm for Pakistani License Plates," Canadian Journal on Image Processing and Computer Vision Vol. 1, No. 2, pp 30-36, April 2010.