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A REAL TIME VEHICLE NUMBER PLATE RECOGNITION SYSTEM USING DIGITAL IMAGE PROCESSING

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Abstract- Digital image processing is the use of computer algorithms to perform image processing on digital images. This technique plays vital role in number plate recognition systems where images are mainly concerned. Number plate recognition is the technology to convert digital images of vehicle's number plates into electronic text. At first LPR should identify the number plate and it has to be as precisely localized as possible and the extracted image is further processed. The processing involves normalization of the image (adjusting contrast and brightness values of the image), character segmentation (the individual characters are distinguished from the whole image), Optical character recognition and geometrical analysis. The data's are compared with that of the database present in the PC and if it matches, the vehicles are considered to be the PC and if it matches, the vehicles are considered to be authorized and allowed into the secured area. This technique is also used in in apartment, toll collection and in traffic controls.

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INTRODUCTION

LPR (License Plate Recognition) is an image-processing technology used to identify vehicles by their license plates. This technology is used in various security and traffic applications. According to this technology when vehicle approaches the gate, the LPR unit automatically "reads" the license plate registration number, compare predefined list and opens the gate if there is a match. License plate recognition system is a mass surveillance method that uses Optical Character Recognition on images to read the license plate in vehicles. This technology is gaining the popularity in security and traffic installation. The system uses illumination and a camera to take the image of the front of the vehicle, and then image processing software analyzes the images and extract the plate information. This data is used for data collection and for opening the gate if the vehicle is authorized and keep time record on the entry. The LPR system significant advantage is that the system can keep an image record of the vehicle.

Elements of Typical LPR System:

LPR systems normally consist of the following units: **Camera**:- Takes image of a vehicle from either front or rear end.**Illumination: -**A controlled light that can bright up the plate, and allows day and night operation. In most cases the illumination is Infra-Red (IR) which is invisible to the driver.**Frame Grabber:-**An interface board between the camera and the PC that allows the software to read the image information. **Computer:-**Normally a PC running Windows or Linux. It runs the LPR application that controls the system, reads the images, analyzes and identifies the plate, and interfaces with other applications and systems.**Software:-**The application and the recognition package.**Hardware:-**Various input/output boards used to interface the external world (such as control boards and networking boards). **Database:-**The events are recorded on a local database or transmitted over the network. The data includes the recognition results and (optionally) the vehicle or driver-face image file.

Working of Typical LPR System

When the vehicle approaches the secured area, the LPR unit senses the car and activates the illumination (invisible infra-red in most cases) as shown in Figure below. The LPR unit takes the pictures from either the front or rear plates from the LPR camera. The image of the vehicle contains the license plate. The LPR unit feeds the input image to the system. The system then enhances the image, detects the plate position, extracts the plate, segments the characters on the plate and recognizes the segmented characters, Checks if the vehicle appears on a predefined list of authorized vehicles, If found, it signals to open the gate by activating its relay. The unit can also switch on a green "go-ahead" light or red "stop" light. The unit can also display a welcome message or a message with personalized data. The authorized vehicle enters into the secured area. After passing the gate its detector closes the gate. Now the system waits for the next vehicle to approach the secured area.

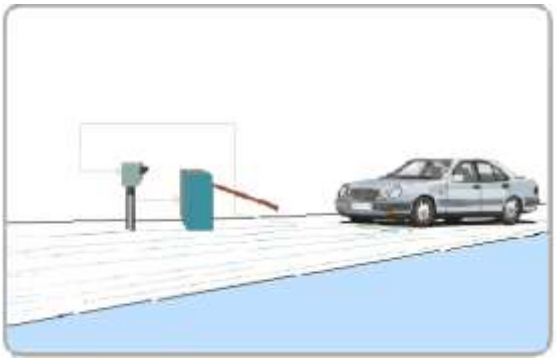


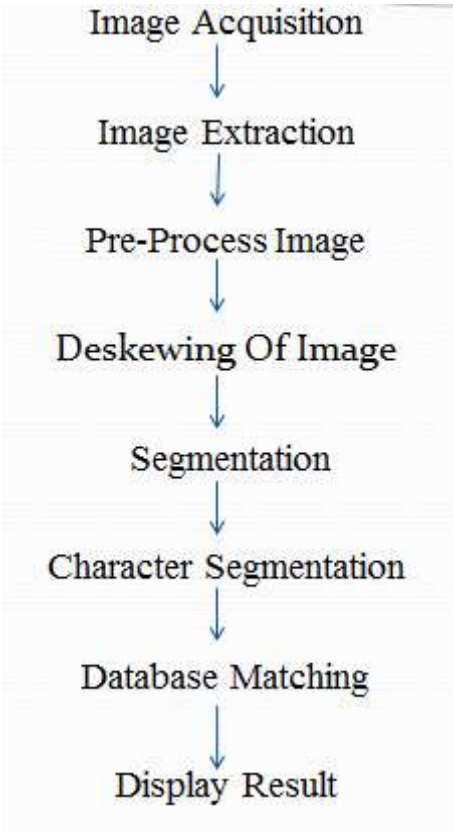
Figure 1:- A car approaching a license plate recognition system

Structure of the Proposed System:

The system presented is designed to recognize license plates from the front and rear of the vehicle. Input to the system is an image sequence acquired by a digital camera that consists of a license plate and its output is the recognition of characters on the license plate. The system consists of the standard four main modules in an LPR system, viz. Image acquisition, License plate extraction, License plate segmentation and License plate recognition. The first task acquires the image. The second task extracts the region that contains the license plate. Thethird task isolates the characters, letters and numerals (total of 10 digits), as in the case of Indian License Plates. The last task identifies or recognizes the segmented characters.

METHODOLOGY:

The proposed system consists of the following tasks.



1] Image Acquisition

This is the first phase in an LPR system. This phase deals with acquiring an image by an acquisition method. In our proposed system, we used a high resolution digital camera to acquire the input image. The input image is 1200 x 1600 pixels.

2]License Plate Extraction

License Plate Extraction is a key step in an LPR system, which influences the accuracy of the system significantly. This phase extracts the region of interest, i.e., the license plate, from the acquired image. The proposed approach involves "Masking of a region with high probability of license plate and then scanning the whole masked region for license plate".

3]Pre-processing the Image

This image is converted to a binary image over a suitable threshold, as binary images are easier and simpler to process compared to RGB images.

4]Image Enhancement

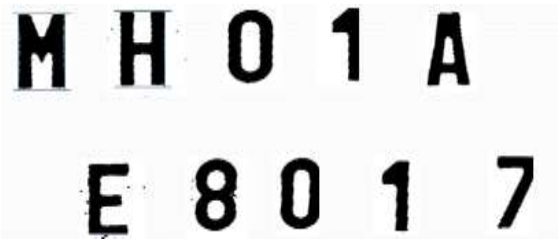
In this system, Dilation is followed by Erosion. The effects of each technique on the binary image.Dilation is performed to eliminate noise in the black and white image. When erosion is performed on the dilated image, the image that was shrunk by dilation was expanded, enhancing the major components of the image. (This enhancement occurs on the characters as they are black).

5]Deskewing Of Image

The image in previous slide is skewed.If the image is processed like this it may show improper result.To avoid this and to get better result,the image has been deskewed and the result shown in fig.

6] License Plate Segmentation

License Plate Segmentation, which is sometimes referred to as Character Isolation takes the region of interest and attempts to divide it into individual characters. In the proposed system segmentation is done in the OCR section.

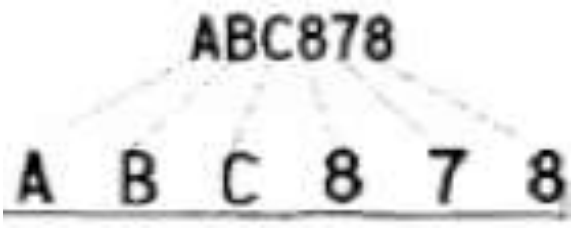


7] License Plate Recognition

The last phase in LPR system is to recognize the isolated characters. After splitting the extracted license plate into individual character images, the character in each image can be identified. There are many methods used to recognize isolated characters. In the proposed system we are using Optical Character Recognition.

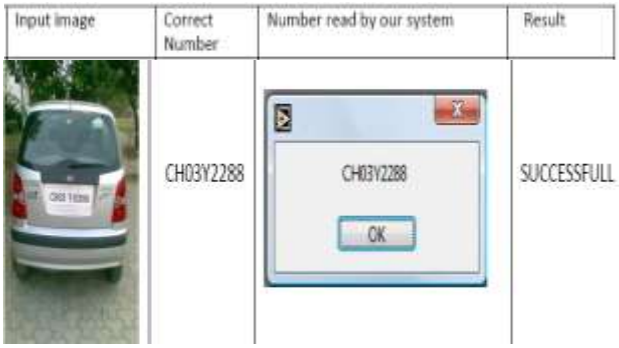
8] Database Matching

Template Matching Algorithm. Simple character recognition system.Compare the individual image containing character of the number plate with a predefined library image.It consists of 26 letters of alphabet and 10numeric digits.



Result

9] Displaying Result



APPLICATIONS:

1] Parking - the plate number is used to automatically enter pre-paid members and calculate parking fee for non-members (by comparing the exit and entry times). The optional driver face image can be used to prevent car hijacking.

2]Access Control - a gate automatically opens for authorized members in a secured area, thus replacing or assisting the security guard. The events are logged on a database and could be used to search the history of events.

3]Tolling - the car number is used to calculate the travel fee in a toll-road, or used to double-check the ticket.

4] Stolen cars - a list of stolen cars or unpaid fines is used to alert on a passing 'hot' cars. The 'black list' can be updated in real time and provide immediate alarm to the police force. The LPR system is deployed on the roadside, and performs a real-time match between the passing cars and the list. When a match is found a siren or display is activated and the police officer is notified with the detected car and the reasons for stopping the car.

ADVANTAGES:

1] The technology concept assumes that all vehicles already have the identity displayed (the plate!) so no additional transmitter or responder is required to be installed on the car.

2] Since some systems use infrared cameras we get a clearer image of the plates.

CONCLUSION:

Thus even though this LPR system has many advantages there are also some disadvantages which can be overcome by using high resolution cameras which can take images when object is moving and under shade. The character recognition algorithm can be improved to accept all types of number plates to get a good result.

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