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NUMBER PLATE LOCALIZATION AND IMAGE PROCESSINGUSING MATLAB

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ABSTRACT

In last couple of decades, the number of vehicles has increased drastically. With this increase, it is becoming difficult to keep track of each vehicle for purpose of law enforcement and traffic management, and security purposes. License Plate Recognition is used increasingly nowadays for automatic toll-collection, maintaining traffic activities, law enforcement, and managing parking spaces. Many techniques have been proposed for plate detection, each having its own advantages and disadvantages. The basic step in Number Plate Detection is localization of number plate. The main purpose of this Paper is to detect a number plate from an image provided by a camera. An efficient algorithm is developed to detect a number plate in certain luminance conditions. This algorithm extracts the number plate data from an image and provides it as an input to the stage of Car Number Plate Recognition.

The approach mentioned in this paper is a histogram based approach. This approach is a very basic one and has an advantage of being simple and thus faster. Initially, Number plate localization is implemented using MATLAB and verified for its functionality. Once the functionality is verified, the algorithm can be enhanced and it can be implemented for various aforementioned purposes or more as well it can be used for real time image processing on video processing tools. By implementing this algorithm on a video processing tool, we eliminate need of computers and thus think of portable implementation of such application. In this approach, a digital camera is used to capture video and feed it to the computer system. The software processes each frame individually and provides the co-ordinates of location with maximum probability of having a number plate. Later, this information is used for recognizing actual number of the Number plate.

I. INTRODUCTION

Vehicles in each country have a unique license number, which is written on its Number plate. This number distinguishes one vehicle from the other, which is useful especially when both are of same make and model. An automated system can be implemented to identify the number plate of a vehicle and extract the characters from the region containing a number plate. The license plate number can be used to retrieve more information about the vehicle and its owner, which can be used for further processing. Such an automated system should be small in size, portable and be able to process data at sufficient rate. This task is quite challenging due to the diversity of plate formats and the non-uniform outdoor illumination conditions during image acquisition. Therefore, most approaches work only under restricted conditions such as fixed illumination, limited vehicle speed, designated routes, and stationary backgrounds.

II. FUNDAMENTALS OF IMAGE PROCESSING

An image is used to convey useful information in a visible format. An image is nothing but an arrangement of tiny elements in a two-dimensional plane. These tiny elements are called Pixels. A large number of pixels combine together to form an image, whether small or large.

Each pixel represents certain information about the image, like color, light intensity and luminance. A large number of such pixels combine together to form an image. Pixel is the basic element used to describe an image. Mostly, each pixel in an image is represented in either RGB (Red Green Blue) format or YCbCr format. In case of an RGB image,

all the three components, namely R, G and B combine together to convey information about the color and brightness of a single pixel. Each component consumes certain memory space during image processing.

In case of aYCbCr image, each pixel in an image is represented as a combination of Y and Cb/Cr values. Here, Y stands for luminance, which describes light intensity, and Cb/Cr stands for chroma component, which describes color information for an image. Over the time, it has been found that YCbCr components of an image convey sufficient amount of information compared to its counter parts RGB, with less amount of memory space. This is a major advantage nowadays, as most of the applications require sufficient information at very high speed and less storage.

III. IMPLEMENTATION OF LICENSE PLATE DETECTION

The detection algorithm implemented in this paper consists of steps like capturing a frame, extracting Y component, removing of noise, dilation, processing of image and region of interest extraction. A given image consists of a luminance (Y) and a chrominance (C) component. The luminance component mainly represents the gray scale of a pixel. This information is essential in further processing using this algorithm. The chrominance component is not essential, as the algorithm is independent of such information. The Y component is extracted from the frame and stored in a two dimensional array.

After this, the Y components are processed for noise removal. In this paper, a linear filter is applied for noise removal. Each pixel in an image is set to the average value of its neighboring eight pixels. Thus, any spontaneous noise component in the captured frame is removed. This helps in reducing any false processing of the frame. Once the noise is removed, the frame is dilated. In the process of dilation, each pixel is set to a value equal to the maximum value of the neighboring pixel. Dilation mainly helps in sharpening the edges in an image and connects the broken lines in an image. Thus, the quality of captured image is improved.

After improving the quality of an image, the next step is to process the image for finding the edges. The image is processed row-wise and column wise to check for edges. Based on the difference of values between neighboring pixels, histograms are created. These histograms represent the sum of differences between pixel values, both row-wise and column-wise. The histograms are then smoothened by passing it through a low-pass filter. After smoothening, the histogram is further passed through a band pass filter to filter out the unnecessary values in histograms. The threshold used for the filter is a dynamic threshold, which is equal to the average of all the histogram values, for rows and for columns.

Applying dynamic threshold has an advantage that it makes algorithmindependent of the light conditions and background color for an image. Next step in the process is Segmentation of an image. In this step, all the unnecessary regions from the image are removed. A list of regions having highest probability of containing a license plate is made. All these regions are then processed to find a single segment having highest probability of containing a number plate. Thus, this is the overall algorithm implemented for license plate detection.

Basic Working of the System

The basic working comprises of the following steps-

1. Take binary image.
2. Sum of white or black pixels in each row and column.
3. Finding peaks and valleys in row histogram or column histogram.

Brief overview of the system

1. Takes image of the car and searches for the number plate in the image.
2. Once the probable number plate area is located it is given to OCR.
3. If OCR doesn't recognize the characters from the image number plate area is searched again from the image.
4. If characters are recognized then number plate search is terminated.

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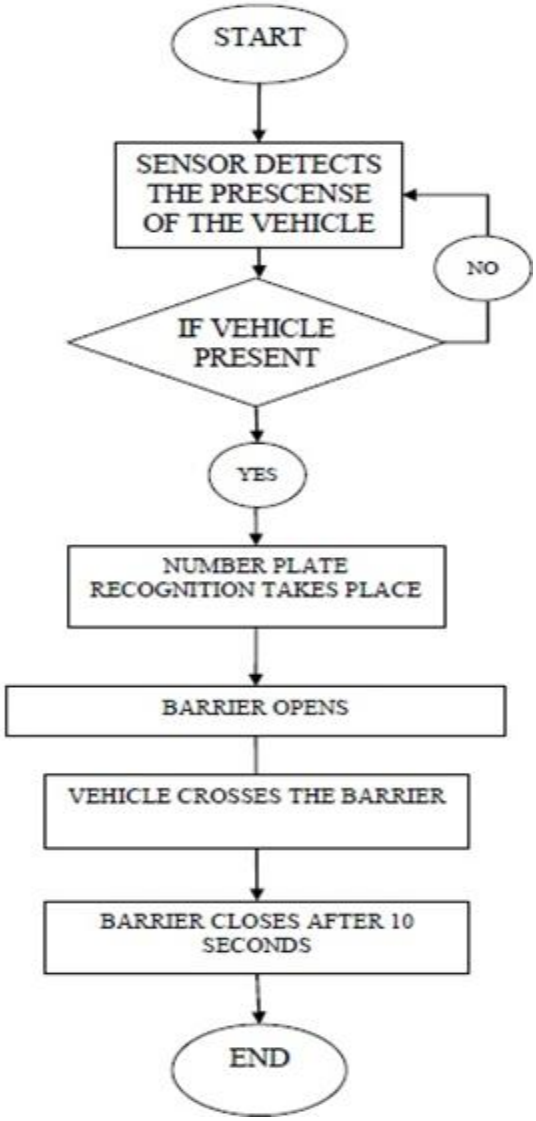
5. Using signature technique to break the vehicle image into smaller image pieces.
6. One of these image pieces will be number plate.
7. Breaking image into pieces was the main issue

HARDWARE COMPONENTS

1. THE POWER SUPPLY
2. MICROCONTROLLER (ATMEGA328)
3. MOTOR AND MOTOR DRIVER CIRCUIT
4. IR SENSOR
5. BUZZER
6. WEB CAM
7. COMPUTER



Flow Chart

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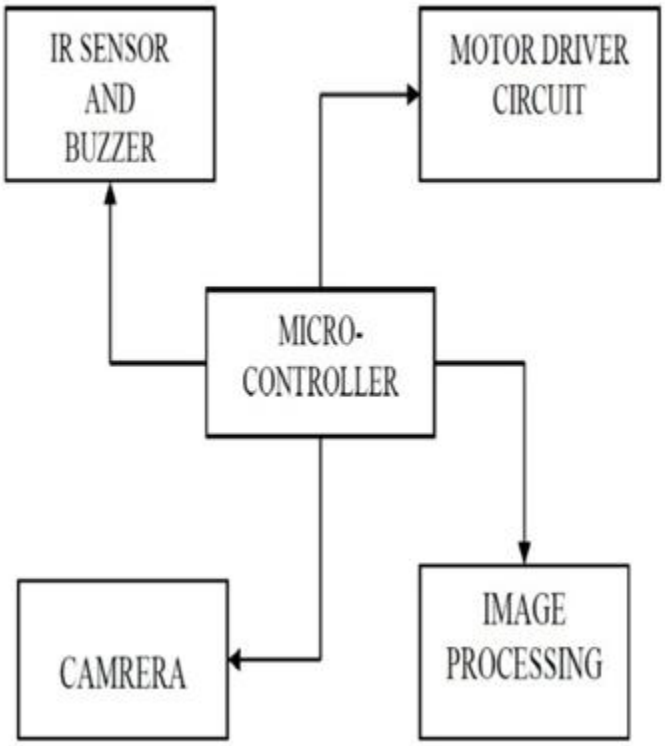

Block Diagram

Different processes undertaken for recognition

Original Image captured

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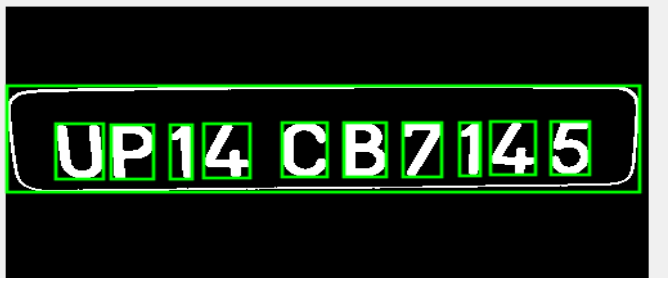
Original Image Converted to Black and White

Inverted binarised image



Character Recognition with the help of template images

IV. APPLICATIONS

1. The method can be used to recognize the number plate of a vehicle and categorically recognizing and segmenting characters methodically.
2. It can be used for border security to monitor the vehicles and creating a data base of vehicles crossing border.
3. Can be used in closed campuses or private parking for creating secure parking spaces.
4. There are many modifications which can be done and it can be interfaced with different system to create a better prototype.

V. CONCLUSION

This approach is a very basic one and has an advantage of being simple and thus faster and more efficient. The image of a vehicle is given as an input from the camera. Extracted image of the number plate can be seen on a computer system or it can be stored it in a database for verification purpose. The scope of this paper is to detect the number plate from the given image and observe the output. This paper can work as a base for future improvements in the field of image processing, especially in license plate extraction and plate number recognition. It's a very basic approach to the problem but still produces the appropriate results. MATLAB based number plate recognition system

provides automated access of the content of the number plate for computer systems managing databases and processing information of vehicle movements. The system is implemented and simulated in MATLAB, and it performance is tested on real image. It is observed from the experiment that the developed system successfully detects and recognize the vehicle number plate on real images.

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