DESIGN OF VEHICLE NUMBER PLATE DETECTION SYSTEM

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ABSTRACT

Design of vehicle Number Plate Detection is an image processing technology which uses number (license) plate to identify the vehicle. The objective is to design an efficient automatic authorized vehicle identification system by using the vehicle number plate. The system is implemented on the entrance for security control of a highly restricted area like military zones or area around top government offices e.g. Parliament, Supreme Court etc. The developed system first detects the vehicle and then captures the vehicle image. Vehicle number plate region is extracted using the image segmentation in an image. Optical character recognition technique is used for the character recognition. The resulting data is then used to compare with the records on a database so as to come up with the specific information like the vehicle's owner, place of registration, address, etc. 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.

Keywords- Number Plate Detection; vehicle identification; optical character recognition; Character Recognition

I. INTRODUCTION

With increasing number of vehicles on roads, it is getting difficult to manually enforce laws and traffic rules for smooth traffic flow. Toll-booths are constructed on freeways and parking structures, where the car has to stop to pay the toll or parking fees. Also, Traffic Management systems are installed on freeways to check for vehicles moving at speeds not permitted by law. All these processes have a scope of improvement. In the center of all these systems lies a vehicle. In order to automate these processes and make them more effective, a system is required to easily identify a vehicle. The important question here is how to identify a particular vehicle? The obvious answer to this question is by using the **vehicle's number plate.**

Vehicles in each country have a unique license number, which is written on its license 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 license plate of a vehicle and

extract the characters from the region containing a license 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, and portable.

Various license plate detection algorithms have been developed in past few years. Each of these algorithms has their own advantages and disadvantages. This project described the method in which license plate is detected using confidence related predictions. As multiple detections are available for single license plate, post-processing methods are applied to merge all detected regions. In addition, trackers are used to limit the search region to certain areas in an image. It suggests a different approach of detection using binarization and elimination of unnecessary regions from an image. In this approach, initial image processing and binarization of an image is carried out based on the contrast between characters and background in license plate. After binarizing the image, it is divided into different black and white regions. These regions are passed through elimination stage to get the final region having most probability of containing a number plate.

II. PROPOSED WORK

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 a YCbCr 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. This one

RGB Format and YCbCr Format:

These are two formats in which image can be studied. It depends on the application for which we are using images.

RGB Format:

In case of an RGB image, each pixel is represented by three different components R, G and **B.** Each of these components requires at least 8 bits for their storage. In general, a single pixel may require upto 8 * 3 bits for itsstorage. An example of a representation of single pixel in RGB format.

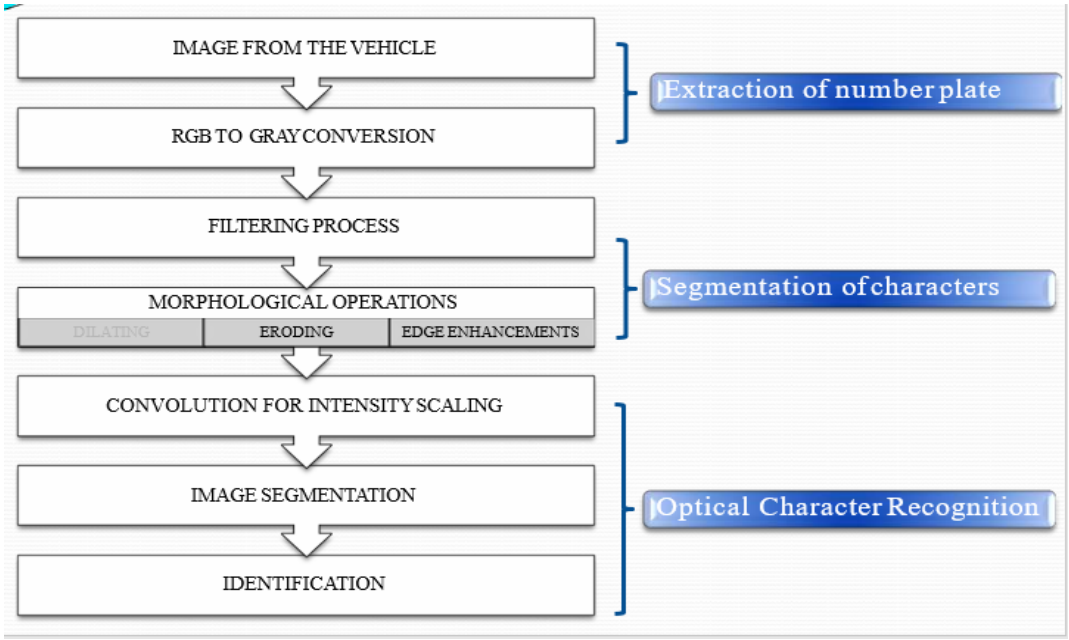
YCbCr Format:

In contrast to RGB format, the YCbCr format is available with various kind of interleaving. For example, a 4:2:2 YCbCr format suggests that a single pixel is represented by two components, Y and C. Cb and Cr components are interleaved among the pixels. So, if one pixel is represented by a combination of Y and Cb, the adjacent pixel will be represented by a combination of Y and Cr. Even if the Cb and Cr components are interleaved, its effect is not visible to human eye.

There are five main algorithms that the software needed to identify a license plate: THIS ONE

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.

Flowchart



III. SOFTWARE USED

MATLAB IMPLEMENTATION

Here we describe the implementation of License Plate Detection algorithm using MATLAB. MATLAB is a very powerful software tool used to implement the tasks that require extensive computation. It provides easy and quicker implementation of algorithms compared to C and C++. The key feature in MATLAB is that it contains a rich library functions for image processing and data analysis. This makes MATLAB an ideal tool for faster implementation and verification of any algorithm before actually implementing it on a real hardware. Sometimes, debugging of errors on actual hardware turns out to be a very painful task. MATLAB provides an easy approach for debugging and correction of errors in any algorithm. Other than this, MATLAB contains many features including workspace, plot, imread, imhist, imshow, etc. for data analysis and image processing, which makes it a better choice over other software languages like C and C++.

Considering the above advantages, the writer of this project initially implemented an algorithm for License Plate Detection using MATLAB. The algorithm initially used various inbuilt functions and implemented few user defined routines related to image processing.

IV. CONCLUSION

- Each independent function does not exceed an error 8%. For all 200 images the error is 17%.
- The total elapsed time of recognition is 2161.36 seconds.
- The average time of recognition of each image is 10.80 seconds.
- The plate status, environmental conditions and the hardware used to catch of pictures are deterministic important factors for the proper functioning program.
- A good image preprocessing almost guarantees a successful recognition.

Future Work

- To improve the success of program is needed small improvements at each stage.
- The image must be centered, fixed and evenly illuminated during the catch.
- Differentiate car color of image under study, i.e. to adapt the preprocessing at car color because of several problems appear in the plate location when the cars are white and silver. Also is possible to do an adaptive mask depending of picture.
- Improve the choice of level to threshold and not lose information about the shape of the characters found. Through an adaptive threshold that divides the image into subimages and chooses the most appropriate level in each case, this solution is associated with a significant increase in execution time.
- Once characters are segmented the main mistake is that these are distorted or incomplete. Adding a process of reconstruction and the calculation of Hough transform increases the success rate.

- There are several solutions that can be applied but keep in mind what you want to sacrifice, if the run time, the quality of image objects, the degree of difficulty of implementation or the hardware and quality cost, between other.

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