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A Texture Descriptor for the Detection of License Plates from Vehicle Images

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ABSTRACT
As the number of accidents and traffic rule violations are increasing, Identification of vehicles has become a difficult task. In most cases, vehicles are identified by their license plate numbers which are easily readable by humans but not by machines. For machines, a number plate is just a dark spot that is within a region of image. So, it is necessary to design a mathematical system which is able to perceive and extract what we want from captured image. This paper aims to identify the vehicle number plates under difficult image conditions such as high/low contrast, foggy and distorted conditions. It proposes an efficient descriptor for the license plates detection system and intends as a means for the discovery of number plates of approved and pirated vehicles.
Index terms– License plate detection(LPD), Automatic number platerecognition(ANPR), Local Binary Pattern(LBP), Contrast limited adaptive histogram equalization(CLAHE), Numberplate extraction(NPE), Character segmentation(CS), MATLAB**.**

1. INTRODUCTION

Nearly everything in the present world is going automatic. Plates in general are fluently readable by mortal due to their high position of intelligence, on the contrary it becomes an extremely delicate task for the computers to do the same. We've put together this design to increase the convenience of vehicle license plate recognition by using image processing technology. This technology can be used insecurity and business operations and numerous attributes like(illumination, blur, background color, focus color)etc, which pose a problem.

The License Plate Recognition(LPR) is delicate because the variations and the number plate norms aren't rigorously rehearsed. Each bone is espousing a different style leading to carrying variation in parameters like size of number in the plate and characters, position of number plate, type of fountain used, background(white background with black letters fornon-commercial vehicles and green background with white letters for marketable vehicles, red background with black letters for military vehicles), different parcels for the plates, which makes the task of number plate localization veritably delicate.

License plate Recognition(LPR) is the capacity to capture photographic videotape or images from license plates and transfigure the optic data into digital information in real- time. Also known as Automatic Number Plate Recognition(ANPR), LPR is an extensively used technology for vehicle operation operations similar as Ticketless Parking(off- road and on- road), Tolling, ITS, stolen vehicles discovery,

smart billing and numerous other operations in Europe and getting a trend in the Americas. By bringing the license plate digital information(among other data similar as vehicle's direction and speed) to the blend.

Fig 1: Examples of difficult conditions for License Plates

2. LITERATURE REVIEW

During the last few years, the development of LPD system has been studied, still it has been a challenging task for detecting and recognize License Plate Numbers. Thetypical ANPR process is as shown below,

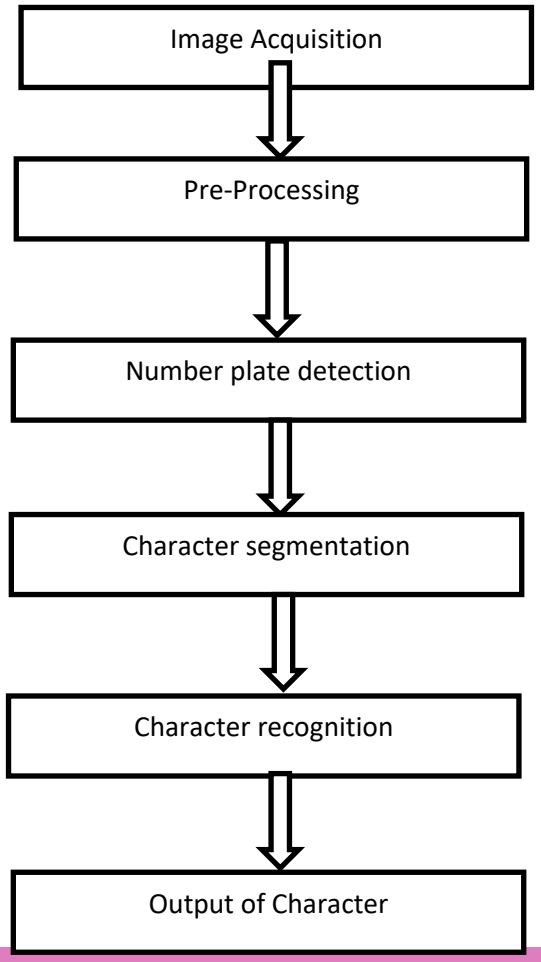

Fig 2: Typical ANPR Process

In **[1]**,proposes the ML-ELBP descriptor to extracts different LP features, CLAHE and gaussian filter for detect the number plate in difficult Conditions.

Kashyap [2] uses OCR Scheme for reading the image from the vehicle. and Some morphological Operations are performed on the image. But it is not suitable for the different Orientations.

Molina, Diaz [3] Uses variable distanced images. These are extracted by using adaptive System, gentle boost algorithm to detect the images.

Another group of researchers in **[4]** developed and implemented the number plate Recognition Using OCR and some preprocessing steps.

In this paper, we proposed a new descriptor for the vehicle images, which is based on LBP and CLAHE, some Morphological operations are applied on various datasets. The system Recognition rate is effective for real time.

3. METHODOLOGY

An LPD system consists of these stages:

1.Image Pre-processing

2.Feature Extraction

LBP (local binary pattern) technique is used where the descriptors are based on global and local features. The Image pre-processing stage is to enhance vehicle images for better performance while preparing for the detection and in the featureextraction stage the LBP descriptor is employed to extract features from a given input image.

LBP is a robust texture descriptor.In LBP the pixel values are from segmented images are compared with the central pixel value to compute a threshold depending on the threshold,the features are extracted.In this method, the window is divided into a number of cells and the pixel is compared with its neighborhood pixels. If the pixel value is greater than or equal to the center value,the cells are assigned as 1 otherwise depending on the pixel values with the corresponding LBP codes thehistogram is calculated.

A vehicle number plate is considered as input image, system should extract that number from the image and search the database for that recognized number plate. It should be able to recognize the number plates even in low light or shadow like conditions etc.

Local Binary Pattern:

LBP is a simple yet very efficient texture operator which labels the pixels of an image by thresholding the neighborhood of each pixel and considers the result as a binary number and the main characteristics of LBP are:

• Low calculation cost.

• Resistance to fluctuations in image gray scale values.

$\boldsymbol{LBP = \sum_{n=0}^{N-1} S(gp - gc) * 2^n}$ **gc** – intensity of centre pixel value;**gp** – intensity of neighbouring pixel value with index p

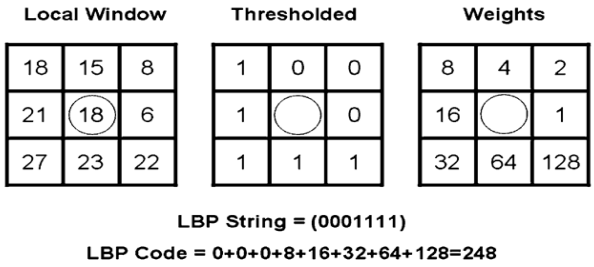

Fig3: LBP algorithm calculation

4. PROPOSED BLOCK DIAGRAM

The proposed system consists of various steps as shown below:

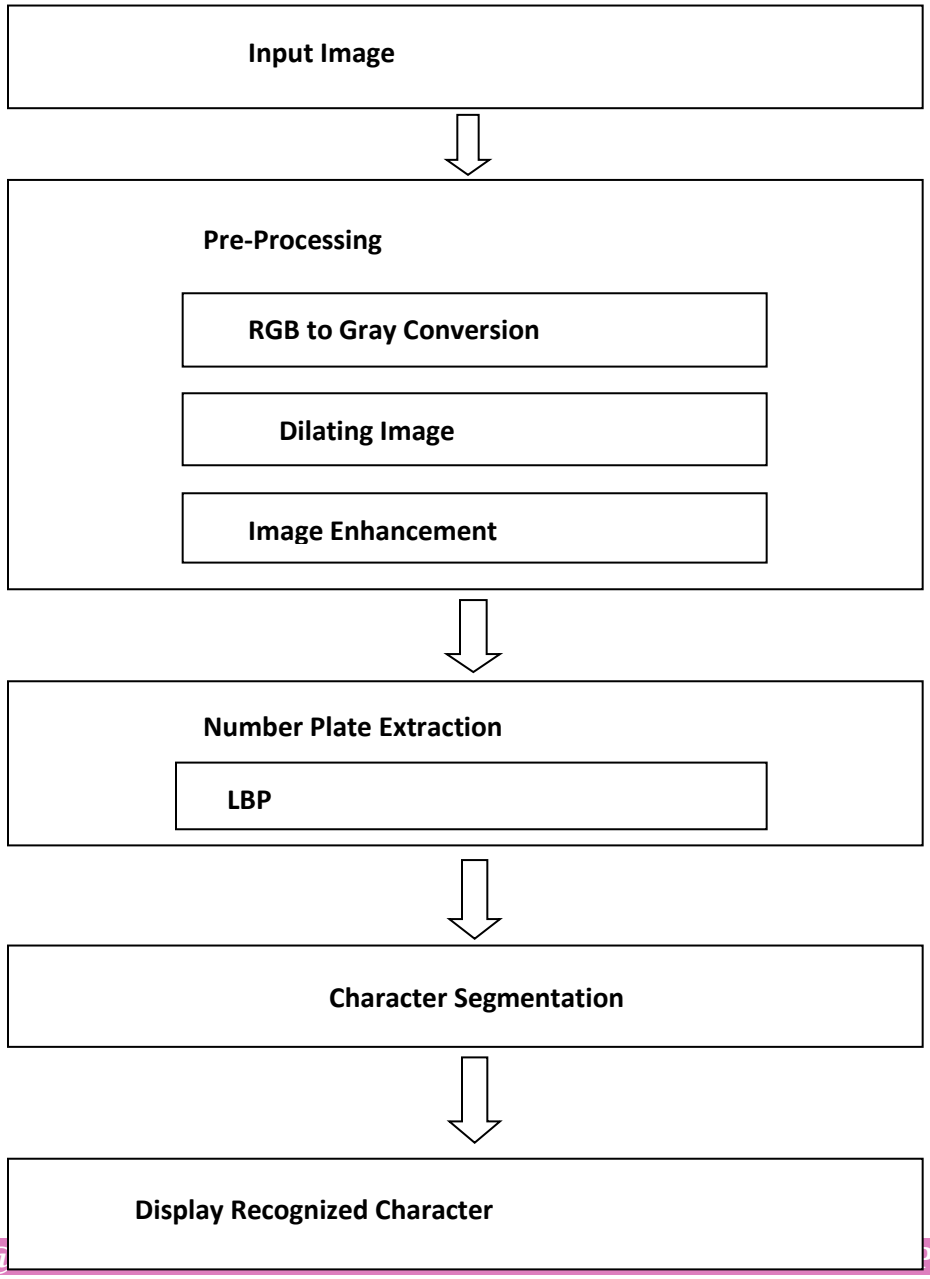

Fig 4: Flow Diagram of LPD System

For the Detection of license plate,an input image is taken where its quality depends on different properties of the camera, light conditions, size of the object and the distance from which the image is taken.

Three basic steps are performed in pre-processing:

• RGB to Gray conversion

•Dilating the image

•Image Enhancement (CLAHE)

The input image is converted into a gray scale image by using the below formula:

$$Gray(i,j)=0.3 \times R(i,j) + 0.59 \times G(i,j) +0.11 \times B(i,j) \quad (2)$$

In feature extraction the given input image is extracted by using LBP and the segmentation of characters takes place which will display the recognized characters with a bounding box.

5. RESULTS

Fig 5: Input Image

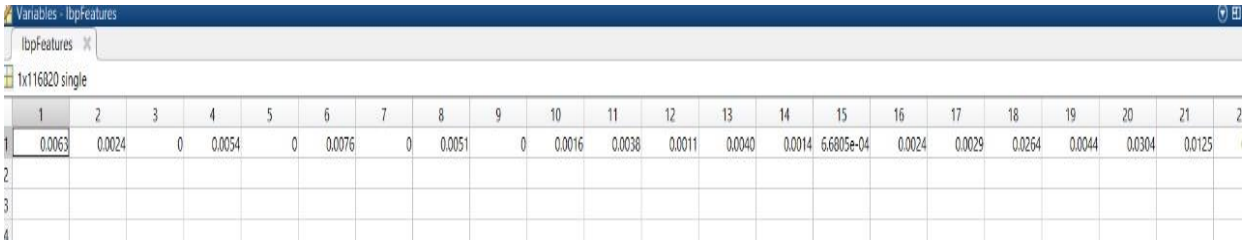

Fig 6: LBP Extraction

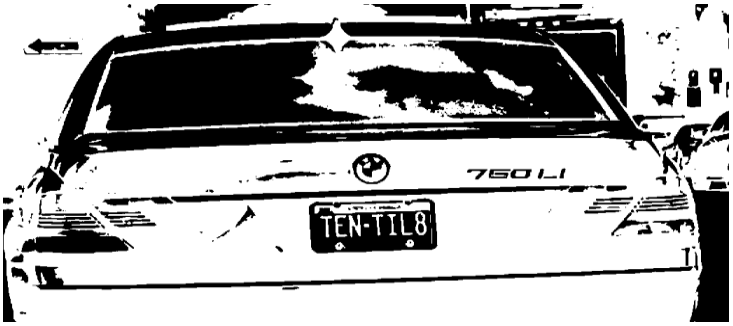

Fig 7: Binary Image

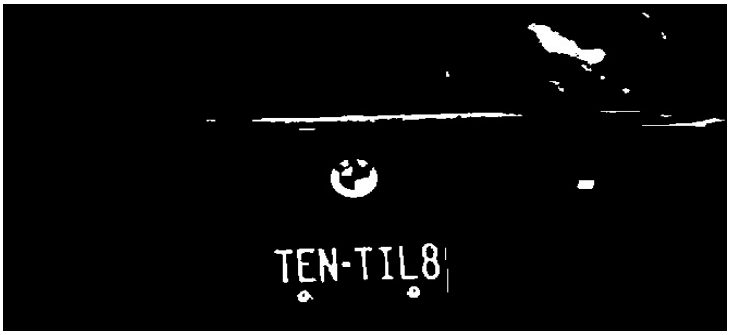

Fig 8: Extracted Number Plate

Fig 9: Recognized Number Plate

The following table shows the sizes and threshold values of various input images,

IMAGES	SIZE (in pixels)	THRESHOLD VALUE

Image 1	1920×1080	0.447
Image 2	1600×1200	0.4706
Image 3	648×486	0.3412
Image 4	616×144	0.3765
Image 5	269×187	0.3922

Table 1: Various Sizes & Threshold values of Input images

6. CONCLUSION

An efficient and automatic authorized identification system for the vehicle's number plate is designed and helps in the detection and recognition. It is used for many safety and security reasons such as observing and examining the roads traffic to prevent unacceptable behavior, highway tolling systems, security and parking management systems.

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