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# License Plate Recognition using Hopfield Neural Networks

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**Abstract-**Vehicle Number Plate Recognition system has gained wide popularly with the continuous increase in the number of vehicle related offences. Its research is becoming challenging and interesting day by day. VNPR is designed to help in recognition of number plates of vehicles .Number plate recognition is the term used to unique identify road vehicles without human intervention. VNPR system is a step by step process involves image enhancements and binarization , segmentation of text using Hope Field Neural network and comparing information with already stored information .The objective of the paper is to successfully located standard number plate and recognizing . VNPR system is not region specific and is based on segmenting characters from image by using Hope field Neural Network .

## I. INTRODUCTION

The vehicle number plate is the combination of numeric or alphanumeric code that uniquely recognizes the vehicle by using Hopfield Neural Network .Number plate identification plays important for maintaining laws and traffic rules. This system can be used in many areas like toll plaza, traffic lights, car parking, highways, bridges, security areas and border areas .it has ability to identify the number plate and recognizes the number plate automatically while passing vehicles traveling down roadway. Vehicle number plate is used to traffic related application like stolen vehicles, airport gate monitoring and speed monitoring. This system has three main parts: vehicle number plate extraction, character segmentation and character identification.

. Number plate extraction is first stage where vehicle number plate is detected. The detected number plate is pre-processed to eliminating false object or remove the noise and then the result is passed to the segmentation part to separate individually characters from the extracted vehicle number

plate. The segmented characters are normalized standard size and passed to proposed algorithm..At end segmented characters are recognized using Hopfield neural network. The final output must be in the form of string of characters and stored in file.

Further, the vehicle tracking system (VTS) finds the use of vehicle no. plate identification as an important tool in confirming the details of the vehicle under tracking. In general, the system consists of: Image acquisition and preprocessing, Vehicle plate extraction from vehicle body, character segmentation and character recognition engine.

In the presented scheme, the algorithm is developed in modular style i.e. the output of any module may cascade to any of the algorithm to work on. This enables to design the algorithm at different stages uniquely and make the application independent of one another. The modular design also enables to change any of the stage designed in different algorithm by just in plug and play manner.

## II. RELATED WORK

**Singh Gurjinder pal et al . (2015) d**escribed Number plate identification using image processing methodology is used for extracting and identify vehicle by reading through number plate.

Identification is an essential area in the development of intelligent traffic management systems and surveillance. Given the current security situation in the world due to various conflicts, this is one of the areas where there is an urgent need for the development of devices that could be used in variety of situations to ease the security concerns [1].

**Jitendra Sharma et. al. (2014**) described a new methodology for 'License Plate Recognition' based on wavelet transform function. This proposed methodology compare with Correlation based method for detection of number plate. Testing result shows that better performance in comparison of correlation based technique for number plate recognition. This method is modified the Matching Technique for number plate recognition by using Multi-Class RBF Neural Network Optimization [2].

**Vijay Laxmi et. al. (2014)** defined, Haar wavelet and back propagation neural network are used for license plate detection and feature extraction of license plate characters. The proposed system has been implemented in MATLAB [ 3 ].

**Lulu Zhang et.([2013)** described a license plate is regarded as the unique identification of a vehicle, which makes the license plate recognition (LPR) an indispensable operation in intelligent transportation systems (ITS). Plate characteristics, like the length-to-width ratio, the size of a character, etc. are utilized in the character segmentation phase. In the recognition phase, a back propagation (BP) neural network is trained for the character recognition. 800 images taken from various scenes under different conditions are used to evaluate the accuracy of the proposed framework. [ 4].

 **Meenakshi1,R. B. Dubey2 et. al. (2012)** Prospsed system uses neural network character recognition and pattern matching of characters as two character recognition techniques. In this approach multilayer feed- forward back-propagation algorithm is used. The performance of the proposed algorithm has been tested on several car plates and provides very satisfactory results [ 5 ].

**Seyed Hamidreza et.al (2011**) This paper presentd a real time and robust method of license plate detection and recognition from cluttered images based on the morphology and template matching [ 6].

**Rajesh Kannan Megalingam et. al. (2010)** proposed a system which is capable of extracting the license plate region from the vehicle's image taken from its rear end. The system consists of a digital camera, software to interface the camera with the software module and the software module which extracts and recognizes the license plate number. [7].

### III. ALGORITHM

The proposed work deals with extraction of textual information from the number plate of vehicles moving on roads based on image processing techniques and retrieval of details of the vehicle from the data base management system. The image of the moving vehicles number plate is grabbed by either using CCD cameras installed on traffic light points or portable/hand held digital cameras with traffic cops.

The grabbed image is made noise free and thresholded to give binary image with white as background and black as textual content. Using segmentation techniques, the text characters are extracted one-by-one. The text characters are identified on the basis of their pixel color value i.e. black or white. Finally, the characters are compared with the standard shape of the character for its confirmatory test. After, all the characters are identified from the number plate; a text file of the

same is generated and fed as input to the data base management system for retrieval of the details of the vehicle under monitor. Finding the position of a license plate in a vehicle image is considered to be the most crucial step of the recognition system, and this in turn greatly affects the recognition rate and overall speed of the whole system.

## IV.  IMAGE PREPROCESSING

The proposed work is based on implementation of image processing techniques in order to identify the texts on vehicle's number plate. The novelty lies in the fact that the image enhancement technique used in the system enables the faithful enhancement of the texts from the background without loss of any textual information. For, we propose to use a maximum entropy algorithm for binarizing the input image. This way we get a clearly segmented image between foreground and the background.

This is one level of segmentation i.e. based on color information. Further the image is brought under textual segmentation where each text character is segmented based on connectivity criterion. Once the texts are segmented individually, they may be recognized by applying the text identification techniques using Hopfield neural network.

The presented studied work in identification of text from the number plate suffers from the draw back of same color of vehicles and number plate i.e. if the vehicle rear side is also of yellow in color and number plate is already in yellow. The main problem is to extract or localize the no. plate form the image irrespective of vehicle base color. This may be covered by using the derivative of color intensity on boundaries.

Block Diagram of the Proposed System
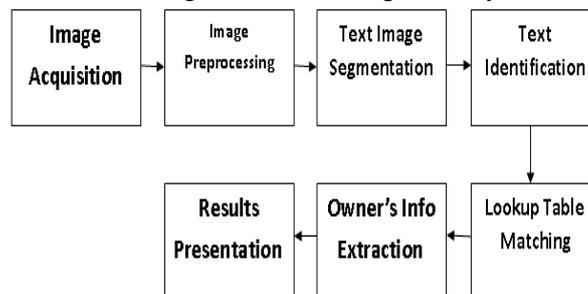


The block diagram shown above gives a generic b=view of the proposed system. Due to modular approach used in design of the system, each block may be inserted or modified just in as plug and play manner. The important step that is altogether separate from the system is the data base of the owners of vehicle and it may be either online or offline.

Normally, the data base is maintained in different fields using the MS Access. The data base access must be made to the authorised user and must be password protected. The modification rights must be reserved with the administrator and that too in different tiers.

Integrity and confidentiality of the data base is of prime priority and should be taken care of in proper channel.

**Flow Chart**

```
            ┌─────────────────────┐
            │       Start         │
            │    Acquisition      │
            └─────────┬───────────┘
                      │
         ┌────────────▼────────────┐
         │ Acquire Vehicle's Images│
         │   using CCD camera      │
         └────────────┬────────────┘
                      │
         ┌────────────▼────────────┐
         │ RGB to Gray Scale       │
         │     Conversion          │
         └────────────┬────────────┘
                      │
         ┌────────────▼────────────┐
         │  Image Binarization     │
         │  using Maximum Entropy  │
         │      Algorithm          │
         └────────────┬────────────┘
                      │
         ┌────────────▼────────────┐
         │ False Object Elimination│
         └────────────┬────────────┘
                      │
         ┌────────────▼────────────┐
         │ Segmentation of Texts   │
         │ using neighbourhood     │
         │     connectivity        │
         └────────────┬────────────┘
                      │
         ┌────────────▼────────────┐
         │ Pixel Pattern for       │
         │ Hopfield NN for         │
         │ character identification│
         └────────────┬────────────┘
                      │
         ┌────────────▼────────────┐
         │ Identification of Text  │
         │  and storing in a file  │
         └────────────┬────────────┘
                      │
         ┌────────────▼────────────┐
         │ Compare the text string │
         │  with the look up table │
         └────────────┬────────────┘
                      │
         ┌────────────▼────────────┐
         │ Archive the vehicle     │
         │ owner's information     │
         │ from look up table      │
         └────────────┬────────────┘
                      │
            ┌─────────▼───────────┐
            │        End          │
            │    Acquisition      │
            └─────────────────────┘
```
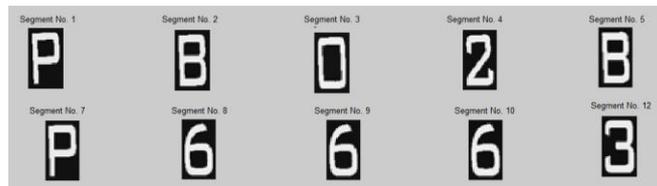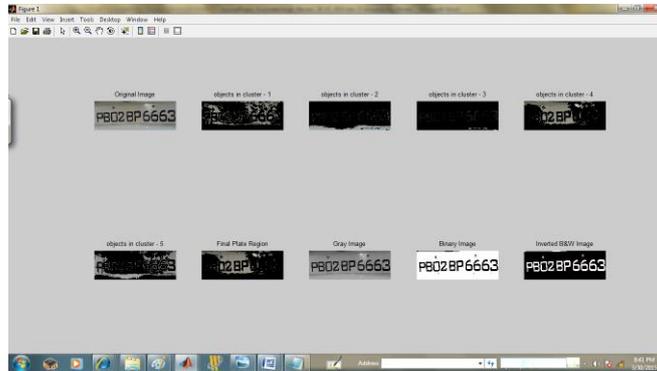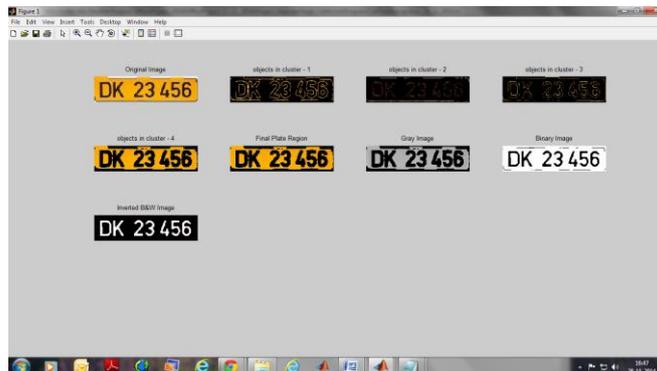
## V. RESULTS







**Vehicle RC Plate Analysis**

----------------------------------------

File Path = F:\ ProgramResults.TXT
Image Path = F:\\2.jpg
 No. of Segmented Parts =   10
Extracted Character -->  P B 0 2 B P 6 6 6 3

```
             Vehicle RC Plate Analysis
      ----------------------------------------
      File Path = F:\ ProgramResults.TXT
          Image Path = F:\\3.jpg
       No. of Segmented Parts =   7
     Extracted Character -->  D K 2 3 4 5 6
```

The invalid characters i.e. that are not in data base or the features does not correlate with any of the character

## VI. CONCLUSION

The proposed work is based on implementation of image processing techniques in order to identify the texts on vehicle's number plate. The novelty lies in the fact that the image enhancement technique used in the system enables the faithful enhancement of the texts from the background without loss of any textual information. For, we propose to use a maximum entropy algorithm for binarizing the input image. This way we get a clearly segmented image between foreground and the background.

This is one level of segmentation i.e. based on color information. Further the image is brought under textual segmentation where each text character is segmented based on connectivity criterion. Once the texts are segmented individually, they may be recognized by applying the text identification techniques using Hopfield neural network.

## VII. FUTURE SCOPE

The algorithm designed here may be used for different language characters if trained for the input neurons of the same. Further, the same may be used for different road signs and then transforming into the text pertaining to the road signs. Other application may be in the field of text based application where auto conversion of image to text is required.

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## Author's Profile

The [1]author is pursuing his M.Tech. (CSE) thesis work in image processing from ACET, Amritsar (Punjab) India. His field of interest is in image processing based application development.