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An Efficient Method for Indian Number Plate Recognition

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Abstract: ***Number Plate Recognition (ANPR) became a very important tool in our daily life because of the unlimited increase of cars and transportation systems, which make it impossible to be fully managed and monitored by humans. On rising population and on growing need of the people, there is a big rise of using vehicles for the last decades. This increase in the number of vehicles must control from the perspective of security and management. However, controlling a huge amount of traffic is a major problem to be solved. In order to maintain traffic problem and controlling a crime and various agencies working in the field of Indian license plate recognition system. We found some general problem. Here we mention problem***

- ***Rate of recognition low.***
- ***Creation of template.***
- ***Recognition time is very high.***
- ***Standard deviation error of most of the method nearer.***

Yet, it's a very challenging problem, due to the diversity of plate formats, different scales, rotations and non-uniform illumination conditions during image acquisition.

The objective of this paper is to develop an accurate and automatic number plate recognition system. In this paper we propose a license plate recognition technique for the improvement of the recognition rate and recognition time for recognition of the number and the character of the vehicle license plate. We proposed a new technique of Neural Network for Vehicle license plate recognition. The Neural Network generates less recognition times and improves the recognition time of the license recognition system. Our work shows better performance as compare to the correlation method which is one of the efficient techniques for matching. Therefore, the standard deviation error reduces which comes from the data lost during the pre-processing in the recognition process.

Keywords: Edge Detection, Segmentation, Neural Networks, correlation method, Radial Basis Function.

I. INTRODUCTION

The Technology for these systems has advanced over the generation. Now whole network of traffic cameras are being organized across cities continually monitor vehicles on street roads. A ILPR system may be located on the side of or above a roadway, at a toll booth, or at another type of entrance way at an acceptable height .Indian License plate recognition (ILPR) is an image technology used to identify plates for their vehicles. This technology is gaining popularity in security and traffic facilities.

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The purpose of ILPR was to build a system capable of automatically recording of the license plate numbers of passing vehicles travelling down a roadway. The License plate recognition system (LPRS) was introduced in 1976 at the police scientific development branch at the United Kingdom (UK). It is similar to the Automatic number plate recognition (ANPR). However, it has achieved must greater interest during the last few decades along with the upgrading of the digital cameras and increased in computational capacity. The Purpose of this Automatic license plate recognition system is to impact illicit drug trafficking on the regional stability of the metro city in particular in combination with other present destabilizing factors. It is simply the ability to automatically extract and recognition of the vehicle license number plate's character from a captured image. It is essentially consist of frame grabber or camera that has the ability to grab an image, find the location of the number in the figure and take out the character of an instrument of character recognition to convert the pixel into easily readable character. It can also be used in highly sensitive areas like military zones or area above top government head offices. The detection of the stolen vehicle can be done in an efficient manner by using ANPR system installed on the highways. This system is computationally economical compare to other ANPR system [1] [2]. In the recent years, Intelligent Transportation System (ITS) has a strong impact in people life as their capacity is to get better transportation protection and mobility and to enhance productivity through the use of advanced technologies. It is made up of 16 types of technology based systems. The License Plate Recognition System (LPRS) is a vital part of the Intelligent Transportation System (ITS) [3] and shows its application.

1.1. License Plate Recognition Concepts

License plate recognition (LPR) is becoming an established technology. The License plate recognition is an automatic system that is able to recognize a license plate extracted from an image device. The License Plate recognition system (LPRS) is normally made up of four parts, where each of the process contains sub process.

- LP image collection
- LP Location
- Character Segmentation
- Character Recognition

1.2. Artificial Neural Network

Artificial Neural Networks (ANN) is computational models that try to mimic our body's biological neural networks and can easily adapt to change.

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This mathematical model consists of interconnected artificial neurons (nodes) that can receive one or more inputs and sums them to produce a prediction (output). To determine a neural network that is an accurate predictor, appropriate weights for the connections must be determined. The most widely used method to determine the optimal connection weights is called back propagation. This method was introduced by Rumelhart, Hinton, and Williams [4] and through their work artificial neural network research gained recognition in machine learning. Back propagation utilizes a mathematical algorithm called gradient descent which iteratively adjusts a function's parameters to minimize the squared error function of the network's output. If the function has several minima the gradient descent method might not find the best one. The sigmoid function is used to calculate the output of each network layer and is defined as follows:

$$f(x) = \frac{1}{1+e^{-x}}$$

Fig 1

The Squared Error Function is Defined as Follows:

$$E = \frac{1}{2}(y - f(x))^2$$

Fig 2

Where *f(x)* is the network's prediction obtained from the output unit and *y* is the instance's class label.

1.3. Radial Basis Function

The second type of feed forward neural network is the Radial Basis Function Neural Network. Radial Basis Function (RBF) Neural Networks in which the activation of a hidden unit is determined by the distance between the input vector and a prototype vector. A Radial Basis Function (RBF) neural network includes of 3 layers: an input layer of the source connected through that environment, a hidden layer and an output layer with linear nodes.

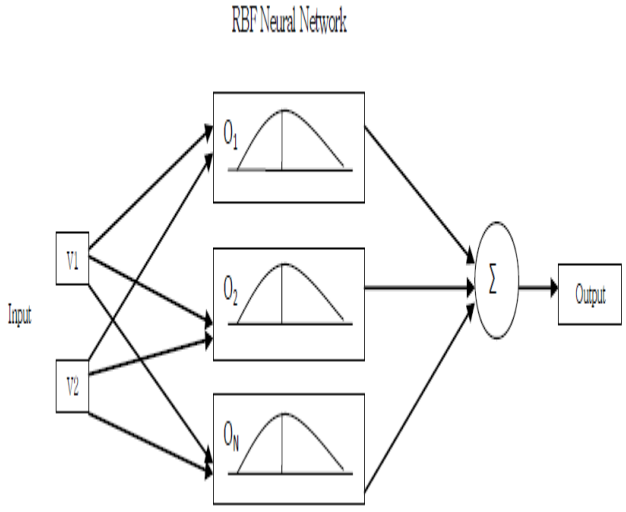

Fig 3

The neurons in the hidden layer contain Gaussian transfer functions whose outputs are reciprocally proportional to the distance from the middle of the neuron [6] [7].

II. PROPOSED ILPR SYSYEM

The proposed method works in two sections:

1) Pre-processing of number plate image and
2) Character recognition of number plate.

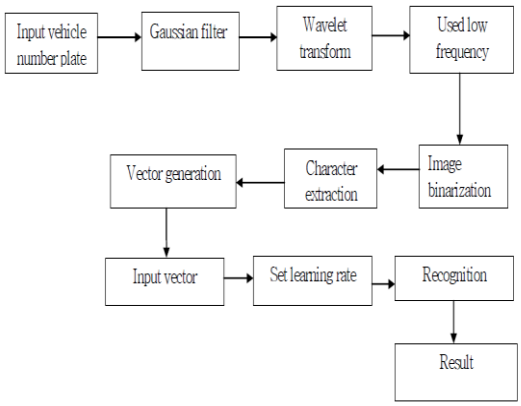

Fig. 4 Basic working LPR model

There are three basic types of Indian number-plate , three main types Indian number-plates, which are: (a) black character, yellow background and black rectangular frame; (b) white character, blue background and white rectangular frame; (c) red or black character, white background and black rectangular frame. Each front-view number-plate consists of a character string including eight characters. Indian number-plate characters can be divided into four classes:(a) Indian characters, (b) letters, (c) digits, and (d) dot ("•"). Indian character is either province initial or army service initial (in there are thirty province and ten army service). The width and height of each character area are respectively 45cm and 90cm (except the radius of dot "•" is 5cm), and the interval between neighbouring character areas is 12cm. here we draw the flow chart of number plate pre-processing.

III. LITERATURE SURVEY

The License plate recognition systems have established a lot of interest from the research community. Much research has been done on Chinese, Dutch, Indian and English license plates. A characteristic feature of research work in this area is being limited to a particular region, city, or country. This is due to the lack of equivalence among different license plates. This section gives an overview of the research carried out so far in this area and the techniques employed in developing an LPR system.

3.1. Related Work on LPR With RBF Neural Network

"Nureddin A. Abulgasem, Dzulkili Mohamad, Sitit Zaiton Mohamad Hashim" in "Automatic License Plate Detection and Recognition Using Radial Basis Function Neural Network" [6] deals in the field at the license plate recognition system as Automatic vehicle license plate detection and recognition (ALPR) is a important technique in most of traffic related application and is extremely popular and active research topic in the research domain.

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Many methods, techniques and algorithms have been developed for Automatic License Plate Detection and Recognition.

"Bo Li, Zhi-yuan Zeng, Jian-zhong Zhou, Hua-li Dong" in "An Algorithm for License Plate Recognition Using Radial Basis Function Neural Network" [7] deals in the field of the license plate recognition system as a variety of License Plates (LP), Sobel edge detector was used to detect the vertical edge. So as to get rid of the invalid edge concerning the characteristics of edge gray scale Jump and edge density, so the regions having features of License Plate was potted subsequent to it by horizontal and vertical Projections and mathematical morphology (MM) operation the License Plate region was searched. After it by color-reversing judgment was conducted by color analysis, and binarization was completed based on core region in License plate."Baoming Shan" in "Vehicle License Plate Recognition Based on Text-line Construction and Multilevel RBF Neural Network" [1] deals in the field of license plate recognition as a License plate localization and character segmentation and recognition are the research hotspots of vehicle license plate recognition technology. In license plate localization part, Otsu binarization is operated to get the plate-candidates regions, and a text-line is built from the candidate regions. The location of the license plate will be determined according to the text-line construction result and the characteristics of the vehicle license plate character arrangement. And then the locally best adaptive binarization is utilized to make more accurate license plate localization. After the localization of license plate, the segment method of vertical projection information with prior knowledge is used to split characters and the statistical features are extracted. After that the multilevel classification RBF-NN is used to identify characters using the feature vector as input. The method shows that this method can recognize characters precisely and improve the ability of license plate character recognition effectively. Local adaptive binarization and text-line construction are control to localize the license plate

"A. Akoum, B. Daya, P. Chauvet" in "Two Neural Network for License Number Plates Recognition" [21] deals in the field at the license plate recognition 30 system as it is able to identify a license plate extracted from an images device. Such a system in helpful in many fields and places: parking places, private and public entrance, airport entrance, border control, and theft and vandalism control.

IV. EXPERIMENTAL RESULTS

In this we have analyze the performance of the License plate recognition system using Radial basis function Network. We tried to reduce the complexity of the detection and recognition of the license plate. The result of this experiment are based on the performance of the radial basis feed forward network. The recognition rate are reduced as we have seen the performance of the system improves comparing to the two neural network, back propagation network, Learning Vector Quantization Neural Network, Multiple threshold approach and etc.Here we are also comparing our proposed method to correlation method which is one of the efficient techniques for matching. Recognition time, training time and recognition rate are the key parameters of any automatic number plate recognition system. So here we are doing some comparative study which is shown by tabular and graph form.

Table 1. for Training Time

Training Time		
	Correlation Based	**Neural Network**
Car 1	3.4569	0.67554
Car 2	2.4569	0.67554
Car 3	3.4569	0.67554
Car 4	2.4569	0.67554

Graph-1 for Training Time

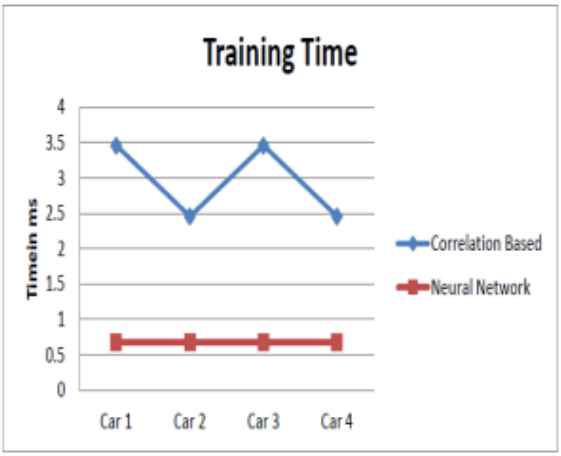

Table-2 for Recognition Time

Recognition Time		
	Correlation Based	**Neural Network**
Car 1	1.3456	0.57386
Car 2	1.3456	0.67386
Car 3	2.3456	0.67386
Car 4	1.3456	0. 67386

Graph-2 Recognition Time

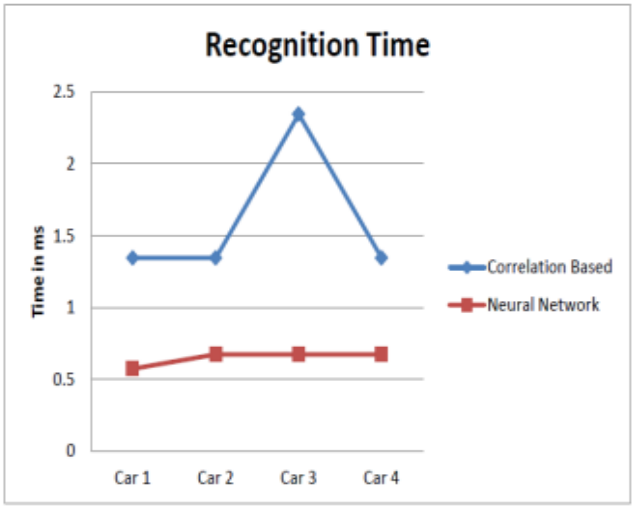

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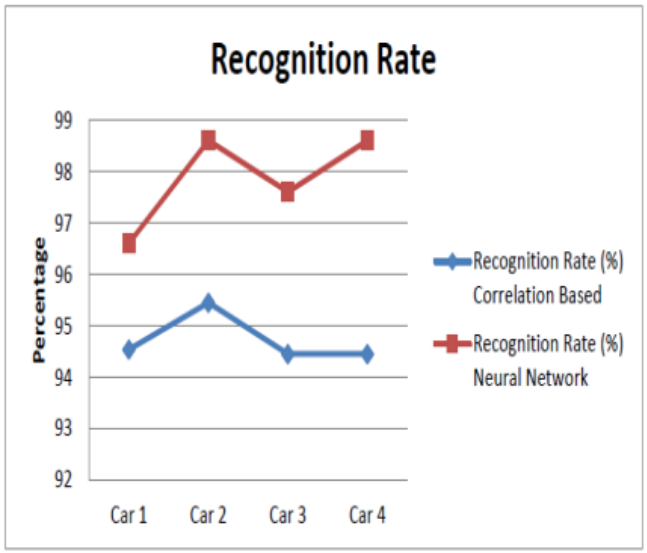
Table-3 for Recognition Rate

Recognition Time		
	Correlation Based	**Neural Network**
Car 1	94.54	96.61
Car 2	95.45	98.61
Car 3	94.45	97.61
Car 4	94.45	98.61

Graph-3 for Recognition Rate



V. CONCLUSION

The process of vehicle number plate recognition requires a very high degree of accuracy when we are working on a very busy road or parking which may not be possible manually as a human being tends to get fatigued due to monotonous nature of the job and they cannot keep track of the vehicles when there are multiple vehicles are passing in a very short time .To overcome this problem, many efforts have been made by the researchers across the globe for last many years. A similar effort has been made in this dissertation to develop an accurate and automatic number plate recognition system. In this dissertation we propose a license plate recognition technique for the improvement of the recognition rate and recognition time for recognition of the number and the character of the vehicle license plate. We proposed a new technique of Neural Network for Vehicle license plate recognition. The Neural Network generates less recognition times and improves the recognition time of the license recognition system. Our work shows better performance as compare to the correlation method which is one of the efficient techniques for matching.

Therefore, the standard deviation error reduces which comes from the data lost during the pre-processing in the recognition process.

FUTURE WORK

Future work direction of our Research can be carried out for the different cases including the following specifications. We need to reduce the processing time i.e. if we take sampled car data set for the processing to recognize one car than to handle 2000 cars is difficult task. Pattern should be correctly segmented. If we are able to reduce the processing time than we can do recognition and Detection Process with Face Detection process simultaneously.

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