

Vehicle Number Plate Detection System for Indian Vehicles Using Back Propagation Neural Network

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ABSTRACT

Vehicle Number Plate Detection is an authentic time fixed systems for the identification of alphanumeric characters directly from vehicle number plates. It plays an important role in numerous applications like road traffic observation, detection of purloined vehicles, toll plaza payment on roadways or viaduct, parking lots etc. There are many algorithms developed for the detection of number plates but they require lot of time and expertise before giving results. In proposed work new method for the recognition of number plates is devised. Different parameters are calculated like accuracy, MSE. Parameters for both the work which is of base paper and proposed methods are compared in last.

Keywords: vehicle number plate recognition, number plates, pre-processing, neural networks, character segmentation, optical character recognition.

1. INTRODUCTION

Automatic number plate recognition (ANPR) is a system that captures the image or video by the use of camera for the recognition of number plates. This process comprises of lot of techniques such as image-detection, image-processing, and pattern recognition. At a Police Scientific Development Branch in the UK, the idea of ANPR was put forward in 1976. Prototype systems were working by 1979. A1 road and the Dartford Tunnel were the first roads in United Kingdom to get the services of ANPR. In case of stolen car first arrest was made in 1981. It plays a key role in various real-life applications. For example-toll collection, traffic law enforcement, parking area access control, and road traffic monitoring.

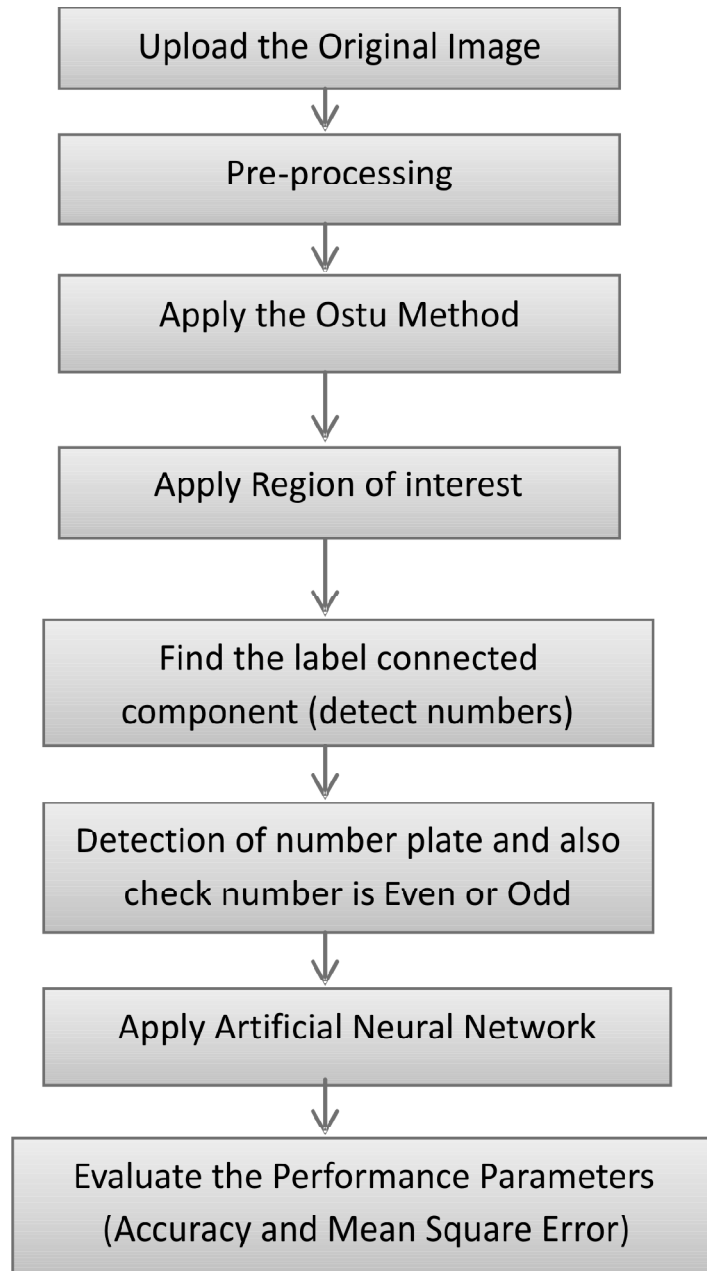
Manual monitoring is error prone because of weak and unreliable human memory. Thus, there is a need of mechanism such as an automated vehicle recognition system for handling this task efficiently. Due to the variations in Number Plates from region to region. Whenever ANPR is developed it is region specific. An Indian number plate contains following ten characters in order. State code is a set of two alphabets. Followed by a state code there is a combination of two digits and alphabets for district information. At last a four digit actual registration number. When a number from the number plate is correctly detected, the complete information about the vehicle and its owner can be retrieved.

2. PRESENT WORK

In our work firstly base paper is implemented then from that a new technology was proposed with which the Accuracy and MSE values are improved.

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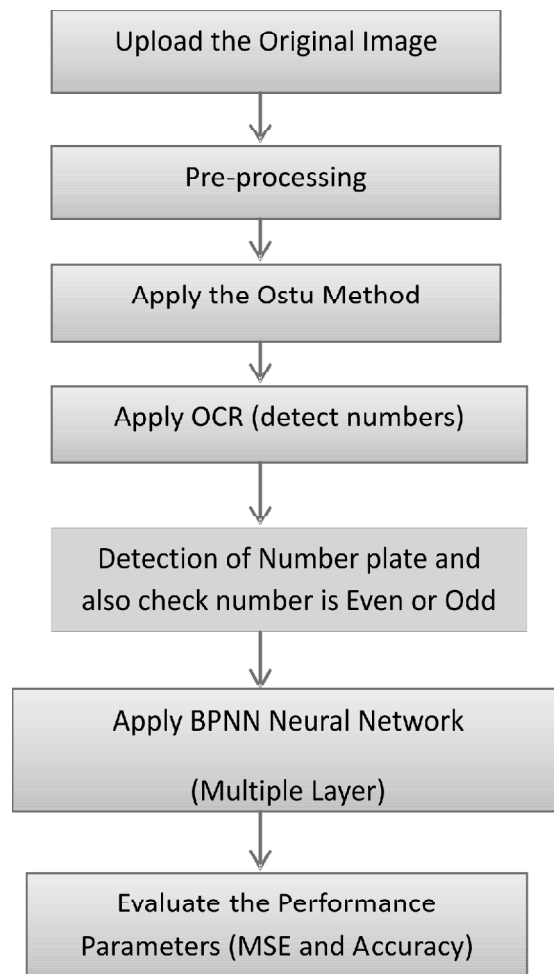
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Firstly, image is uploaded and then pre- processing is done which includes conversion to gray-scale, removing noise from an image for that median filter is used. Then segmentation (detection of regions) is done using Ostu method which is used to identify the high dimension which means image should be of high quality and its regions can be detected. For Ostu method threshold value is used. When threshold value is selected firstly image is taken in black and white for that morphological method is used with which the edges are detected and after that output according to threshold is given.

Then image needs to be cropped, then ROI (region of interest), method that calculate the segmented part on which further processes has to be done. Label connect component is used for detection which means detect each individual alpha-numeric character. Then identify number is Even or Odd. Artificial Neural network is used, firstly system is trained and then testing is done. Each neuron works is divided into three layers i.e., input, hidden and output layer. In training system is trained with all steps used above, in testing verify the methods and calculate the parameters like MSE and Accuracy. In artificial neural network one neuron work at one time.

PROPOSED METHODOLOGY



In proposed methodology all starting steps are same till Ostu Method but OCR is used in place of Label Connect Component. It is previous technique that is why OCR is used for recognition of number plate .Back Propagation neural network is used instead of artificial neural network, it is fast as compare to ANN as each neuron send its information simultaneously instead of one by one. As simultaneous transfer of data is there so it is difficult to check from which neuron the information comes. So weight is assigned to each information.

3. LITERATURE REVIEW

Lots of research in this field has already been done and advancements are still made in it. Referring to various transactions, books and conference papers lot of information is obtained from previous works, advancements that can be done are also discussed in these papers.

- 1) Hanit Karwal *et al.*, in 2015 work on , “Vehicle Number Plate Detection System for Indian Vehicles” in this three basic modules namely image pre-processing, candidate area extraction and character recognition. In pre-processing, the image is being loaded and converted to gray, followed by some de-noising techniques. In candidate area extraction, detection of number plate area and segmentation of characters is carried out. In character recognition, template matching and retrieval of characters is performed. Character recognition can also be performed by neural network but it needs periodical training for better efficiency.
- 2) Norizam Sulaiman *et al.*, in 2013 work on, “Development of Automatic Vehicle Plate Detection System” in this pre-processing includes three techniques and these are crop, filter and morphology

techniques. Work is done for non-moving vehicles. For future work, same work can be done for moving vehicles including for buses also and improving the incapability of system for differentiating between number '1' and '7' needs to be done.

- 3) M.A. Massoud *et al.*, in 2013 illustrate a work which is named as "Automated new license plate recognition in Egypt" Work is done in three different parts: plate region extraction, recognition of characters, and communication of database. Video stream was one of the foremost vital benefits of this method. It did not need any extra sensor input like infrared sensors.
- 4) Priyanka Prabhakar *et al.*, in 2014 described their work as "A Novel Design For Vehicle License Plate Detection and Recognition" It uses Hough transform and horizontal projection profile, each of them have economical and quick hardware deployments. Both extraction and segmentation of characters are performed simultaneously. Thereby reducing the computational overheads as well as introduce parallelism into the design for making it more efficient with respect to time. More work in this direction is required to that include all complex cases and also minor rotations. Thus a robust real time system can be developed at lesser cost.
- 5) Kumar P and Kumar.P.V has composed paper in (2010) on "An Efficient Method for Indian Vehicle License Plate Extraction and Character Segmentation", Techniques in this follow this pattern (1)Extracting the Plate region with the use of edge detection algorithm and vertical projection methods.(2) In segmentation part filtering, thinning,vertical and horizontal projection are used. Atlas, (3) Chain code is used for recognition of the characters with different parameters.
- 6) Chetan Sharma and Amandeep Kaur has composed paper in (2011) on "Indian Vehicle License Plate Extraction and Segmentation", in which image Pre-processing is done by histogram equalization (2) Extraction of license plate region is by edge detection algorithm (canny operator) and Plate Area Detection is done with the help of various morphological operations (3) Segmentation of characters is done by: connected component, bounding box method, Median filter.
- 7) Wengang Zhou, Houqiang Li, Yijuan Lu, Member and Qi Tian has composed paper in (2012) on "Principal Visual Word Discovery for Automatic License Plate Detection", (1) detects license plate region by using vertical or horizontal edge based method (2) Pre-processing is also needed so first convert image to binary and then eliminate noise using morphological operations (3) Character segmentation is done by thresholding methods (4) Feature extraction and character recognition is done with the help of Euler number formation.

4. SIMULATION RESULTS

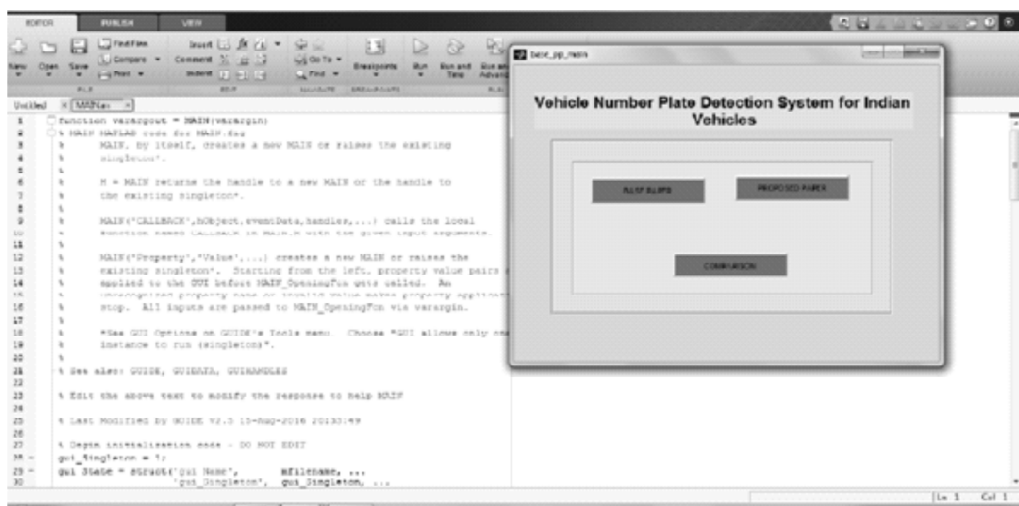


Figure 4.1: GUI of the whole system



Figure 4.2: GUI of the existing system

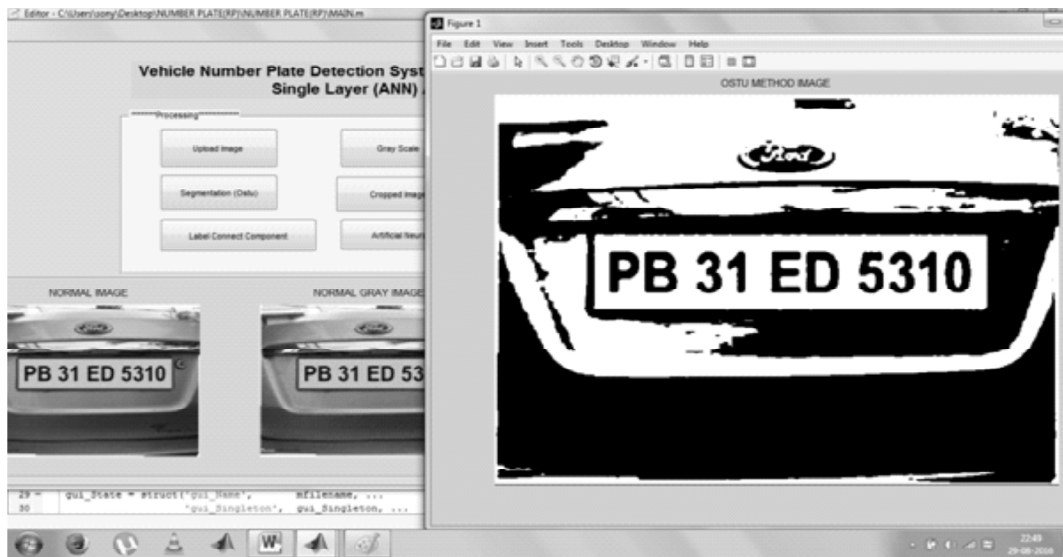


Figure 4.3: Ostu image (segmentation is done with Ostu method)

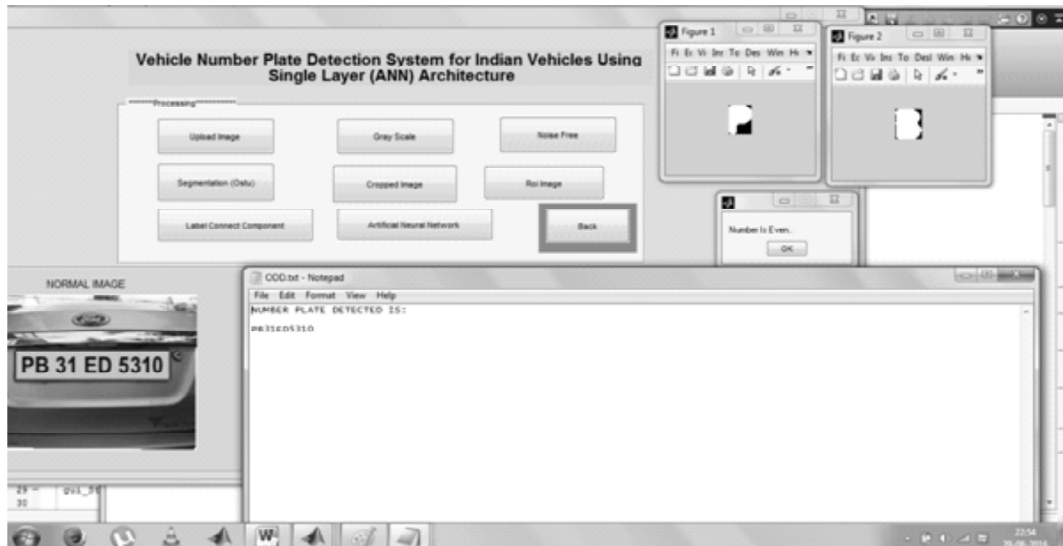


Figure 4.4: Label Connect Component and also Detection of number plate

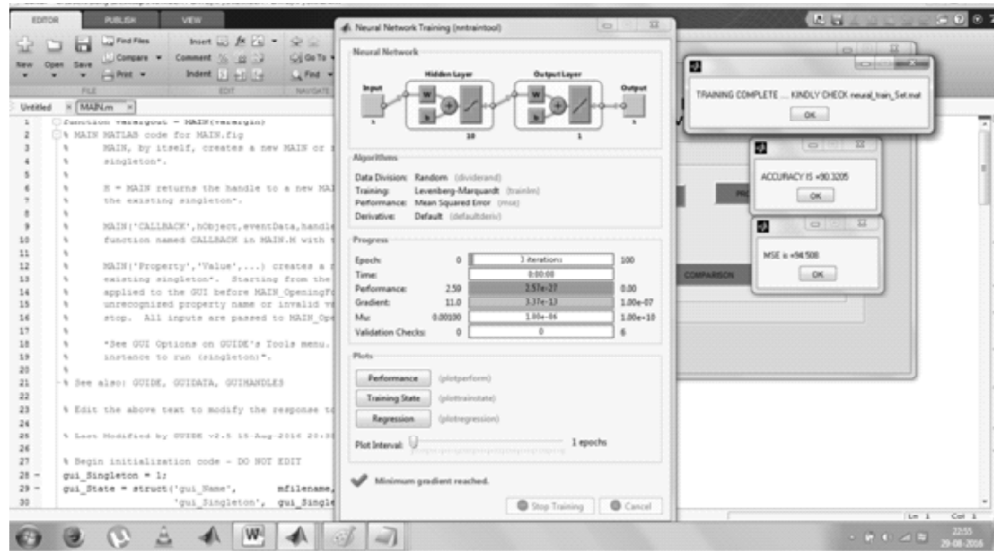


Figure 4.5: Neural Network for testing and also calculation of parameters like accuracy and MSE

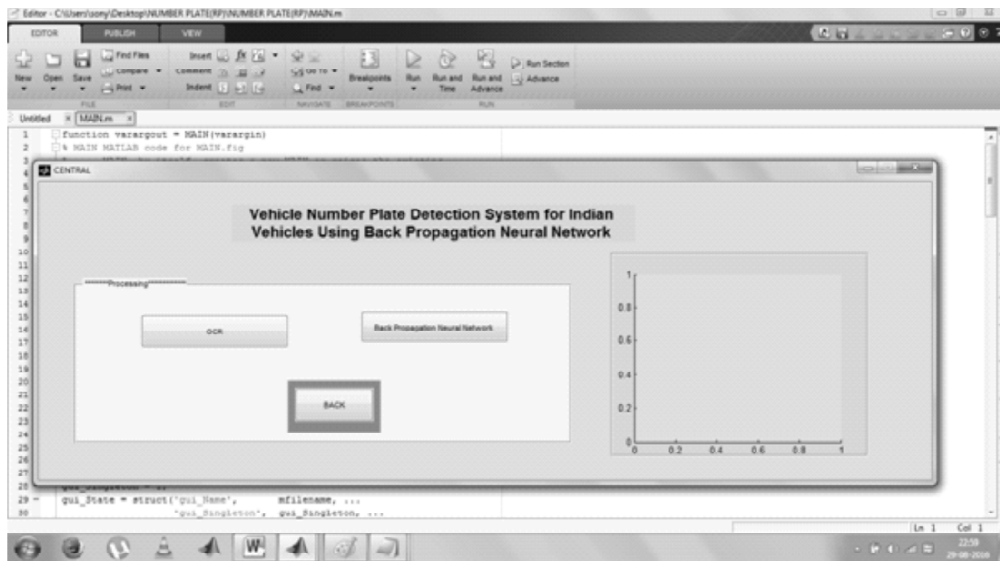


Figure 4.6: GUI of the proposed methodology

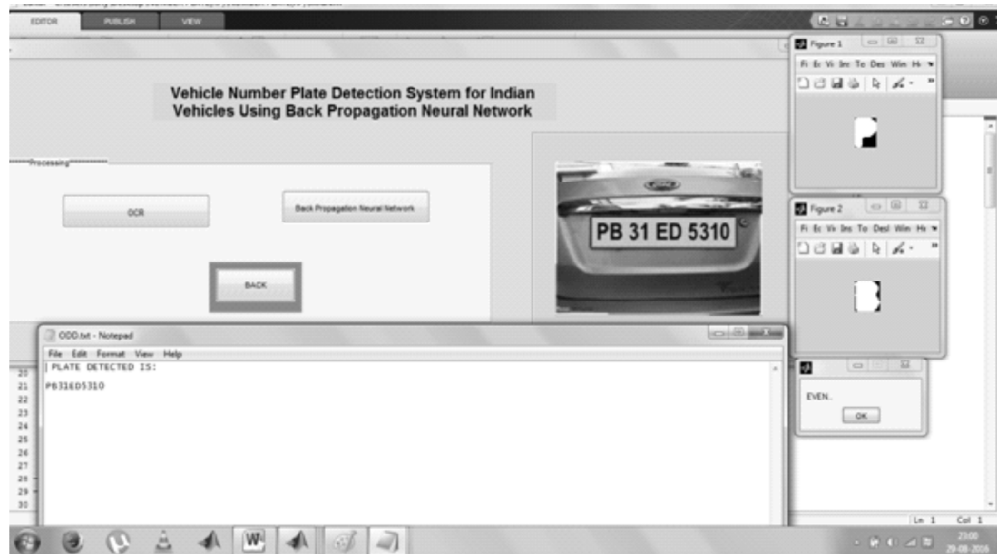


Figure 4.7: OCR for recognition of number plate

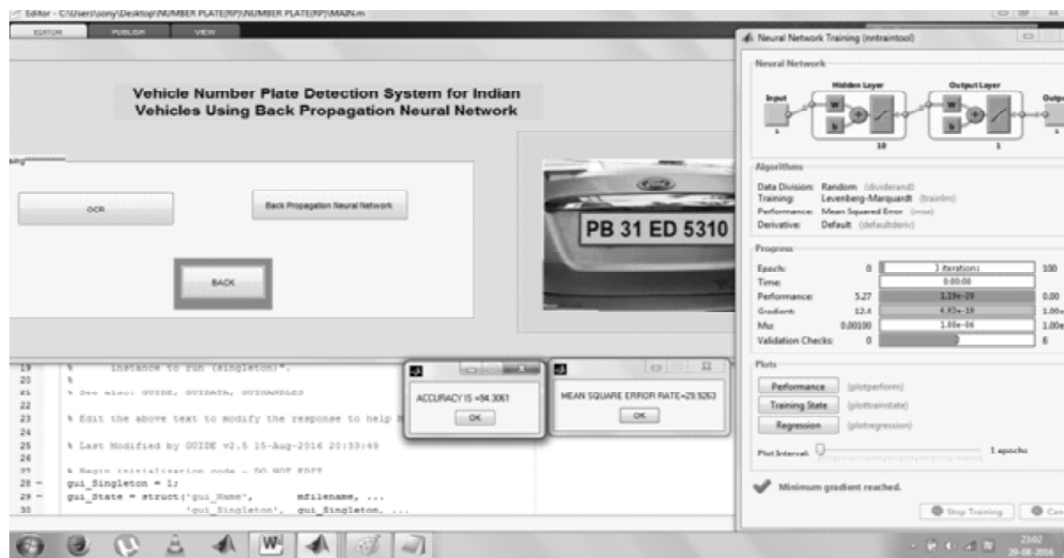


Figure 4.8: Back Propagation Neural Network for testing and also calculation of parameters like MSE and accuracy

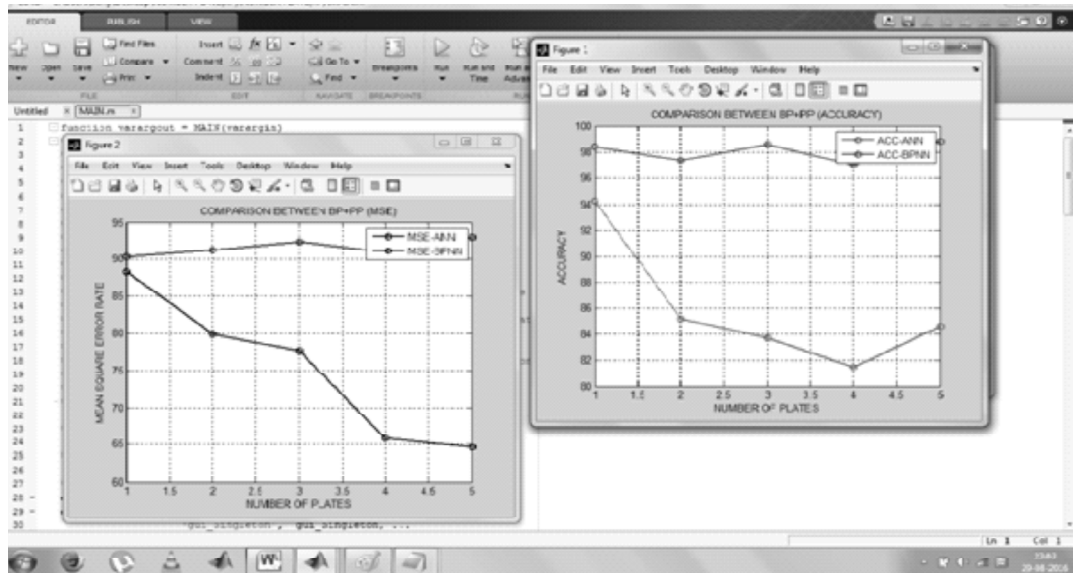


Figure 4.9: Comparison between both the existing and proposed techniques in reference with Accuracy and MSE

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