

Analysis & Identification Images of Handwritten Digits and Characters Using Linear Vector Quantisation Artificial Neural Network

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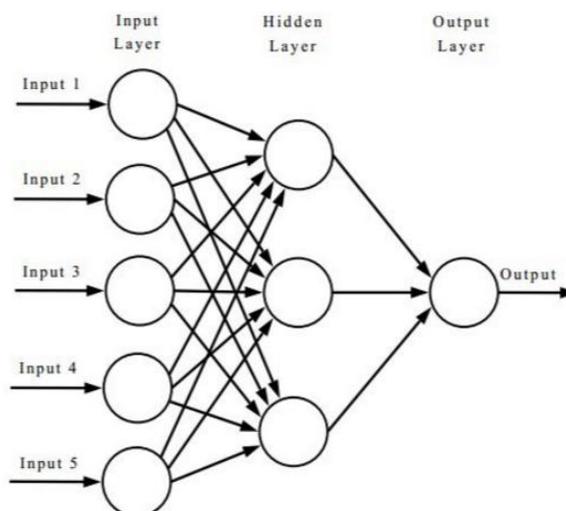
Abstract: Recognition of digits and character similarly to the brain we simulate a software which acts like a human brain. The digits and characters are written in different styles so it is necessary to recognise and classify it with machine learning vector quantisation neural network characterised under artificial neural network. After this process the recognised images of Digits and character goes under the process of training and testing. After the network creation digits and characters are trained using training dataset vector and testing is applied. In this process the pre processing ,segmentation and edge detection feature extraction is isolated to each other and resizing the digit and accordingly for better accuracy and better resizing images of hand written digits and characters.

Keywords: Artificial Neural Network, Learning vector quantisation, Image processing, Image segmentation

1. INTRODUCTION

The digits and characters are written in different styles so that it is necessary to recognize and classify with the help of machine learning technique. This study relates for creating a learning vector quantisation of digit and character images which are segmented from the set of other digits and character. Segmentation is process of dividing image into elements and give this image as a input to the network for training and testing. Individual digits and characters are used as a input vectors which are required for creating learning vector quantization network. Linear vector quantisation is the method to perform classification input vectors given by the users. There are two layers which are competitive and linear layer, in this layer classes are altered to classify targets. Network is created on the basis of necessary parameters. Neural network also known as a artificial neural network which works similar to the human brain. In the neural network simulate software so that

they can function interconnected brain cells called a neuron. To recognise pattern and decision making purpose. Neural network architecture consists three layers called input layer, hidden layer, output layer in input layer received information at one end and other end output layer is respond to information. These layers are connected to each other through biases or weights. In between input layer and output layer hidden layer is present.



2. RELATED WORK

Haug et.al and T.kohonal developed a developed a classifier which requires a final stage of supervised training in used in classifier. When compared to back propagation LVQ classifier have similar error rates but offer train faster and requires more memory and computation time during classification.[1]

Cheng-Lin Liu proposed a pattern recognition technique. Pattern recognition method characters are compared with processing steps such as feature extraction and classification. Neural networks are flexible in implementation and their performance are affected by the human factors.[2]

Nagre proposed the number plate reaction and recognition using back propagation and learning vector quantisation neural network and compared the result of both types. Extracted characters are converted to features and are trained to check the performance.[3]

Sonali B.maind and Priyanka wankar describe the artificial neural network and working of artificial neural network. They also describes the training phases of ANN.ANN can capture many kinds of relationship it allows the user to quickly and relatively easily model phenomenon which otherwise may have been very difficult to explain.[4]

Ritika verma introduced the improved techniques of character recognition using neural network will exhibits outcomes of noise reduction and image quality improvement, with different noise level which will qualify to be suitable for image processing and pattern matching.[5]

3. SIGNIFICANCE AND SCOPE

Identification of Handwritten digits are introduced and implemented in many applications. In this topic, we have applied ANN and supervised learning to classify the images of handwritten digits separately and analyzed recognition accuracy which is achieved by using learning vector quantization with distributed target classes to the input vectors at the time of network initialization. LVQ is the feed forward network with connected weights to the inputs constituting two layers namely competitive and linear layer with competitive neurons connected to the linear neuron. Artificial neural network is an interconnected group of natural or artificial neurons that uses mathematical or computational model for information processing. The LVQ network is constructed by giving proper argument, assigning appropriate number of neurons to both competitive and linear layers. Neural network mainly known as a Artificial neural network (ANN)works similar to human brain the idea, behind neural network is to simulate software

4. METHODOLOGY

A] Preprocessing-

Pre-processing consist of RGB to gray conversion in which colour is converted to gray scale image, filtering in which median filter is used to remove noise in the image and in normalisation input image shape, size are normalised this is shown in figure.

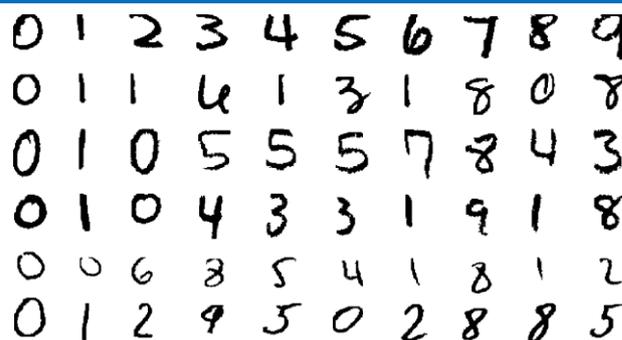


Fig: Examples of Test digit data

1. RGB to Gray Conversion: It Consist conversion from RGB image to the gray image.

2. Filtering: Filtering is used for reducing noise content in image and enhance input image. Median filter is used to remove 'Salt and paper' noise.

3. Normalisation: Normalisation is an important preprocessing technique in character recognition technique. Pre-processing consist of RGB to gray conversion in which colour is converted to gray scale image, filtering in which median filter is used to remove noise in the image and in normalisation input image shape, size are normalised this is shown in figure

B] Converted to Input Vectors-

1. Input vector matrix

Different handwritten digits and characters inputs are converted into the input vector matrix to give as a input to the network for the further process.

C] Segmentation

Segmentation is the process of partitioning a digital image into multiple segments that is assigning a label to every pixel. Result of image segmentation is a set of segments that collectively cover the entire image or set of contours extracted from image. After segmentation the digit or character is cropped from the segmented image for training process.

D] Artificial Neural Network

1. Training

Back propagation is like pattern net it use to output close approximations to training target vectors when the corresponding training input vectors are presented. After creating the network which is then trained which means that weights are adjusted for competitive layer producing performance result.

4. Block Diagram Of System

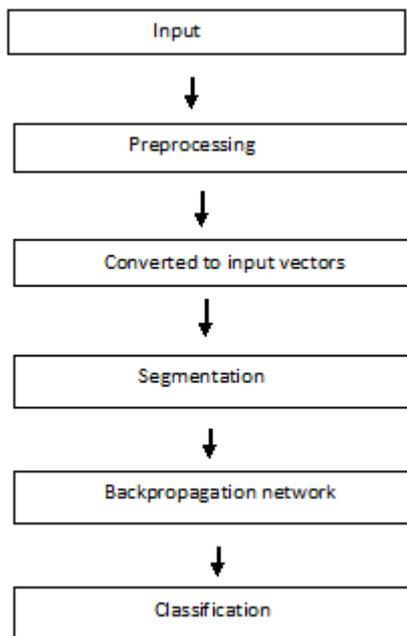


Fig 1: Block Diagram of system

5. WORKING MECHANISM

1. The data which is entered into the GUI is in the form of image containing digits are randomly selected for the recognition purpose. Size of the input values are specified as 42×35 pixels and different sizes gives varied results.

2. Initially, digit images are loaded along with the labels describing which digit is recognized by the user interface.

3. Recognise the numbers individually which are further transform into different elements that means it converted into input vectors.

4. The LVQ network constructed the by giving proper argument assining appropriate number of neurons.

5. Input of elements of the desired image is converted into training data which is 80% and testing data which is 20% is retrieved and accuracy is measured comparing both training data and input data on the basis of the targets allocated to each training set. The performance of

training data will be used to equate with testing data and biases are adjusted accordingly.

6. In character recognition the following process is applied on the character.

Input image-convert to gray scale-set the gray threshold level-text.txt file open for write-load

templates-separate lines in a text-label and count connected component-resize the letters-delay-applied specified expression to input i.e. conversion of image to text-sentence finish break the loop-see variables line by line-break-end-text file open

Result:

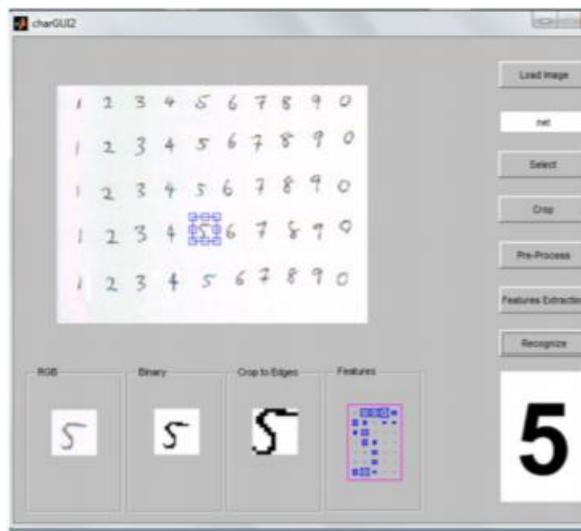


Fig 2: Recognition of 5 Digit

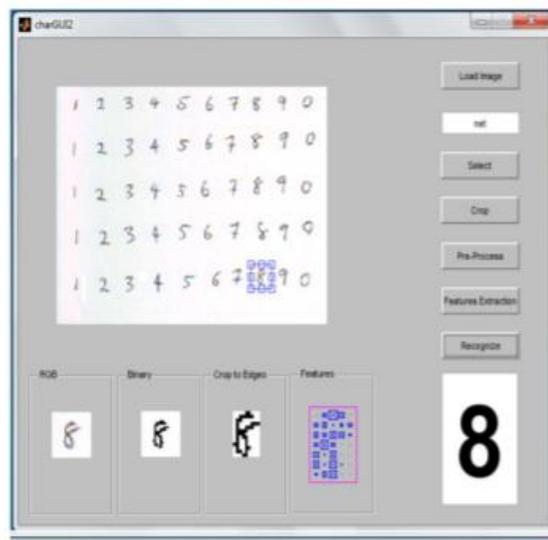


Fig 3: Recognition of 8 digit

Character	Pixel size	Recognition in text
A	42*24	A
R	42*24	R
Q	42*24	Q

Fig 3: Output table for character recognition

6. Conclusion

Identification of Handwritten digits are introduced and implemented in many applications. In this paper applied ANN and supervised learning to classify the

images of handwritten digits separately and analyzed recognition accuracy which is achieved by using learning vector quantization with distributed target classes to the input vectors at the time of network initialization. LVQ is the feed forward network with connected weights to the inputs constituting two layers namely competitive and linear layer with competitive neurons connected to the linear neurons. Various challenges occur in recognizing the handwritten characters due to different writing styles, shapes and size such problems are difficult to achieve but researches have applied different techniques to solve these kind of issues and still cannot be overcome completely and further study has to be done in this field.

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