

Handwritten Character Classification and Recognition using Neural Network

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Abstract— Character recognition is the one of the emerging and developing techniques in the field of computer vision and artificial intelligence. one of the ability of humans are recognition, i.e., a person or a character or a thing etc. Characters from a written document can be easily recognized by humans accurately. But the same task is difficult for a machine. Different languages have different types of pattern i.e., they are different from one another. Each character in a language is differing in their patterns, curves, shapes and orientation. So to recognize a character by a machine is difficult. For that we have to train that system to recognize a character. For the character recognition we process the input image, find its features, put classification scheme and train the system using neural network to recognize the character. For this mat lab image processing tool box and neural network tool box are used. It helps to improve the interface between man and machine in numerous applications.

Index Terms—: Character Recognition, handwritten characters artificial neural network.

I. INTRODUCTION

Image processing is the manipulation of images using computer in terms of human fascination with visuals. With the development of technology there are several digital techniques to manipulate the images. Image processing is using in several areas like medical filed, printing technology, face detection, biometric processing etc. In the field of artificial intelligence image processing have a significant role. There are several researches are going on for the development of self-thinking and self-learning machines. In that field character recognition have an important role. But it is difficult to do such a task by a machine. For the recognition we have to train that system to classify and recognize a particular character. The character recognition involves several steps like acquisition, noise removal, segmentation, feature extraction, classification and recognition.[1]

For the training of the system artificial neural network is using. Neural network are similar to that of biological neural systems[2]. It is highly interconnected neural systems with parallel computing. For the pattern recognition and the classification highly parallel distributed neuron networks are using. These artificial neural network systems have ability to solve problems due to its self-learning and self-organizing feature. It has highly distributed parallel architecture with large

number of nodes and connections. One node is connected to another and is associated with a weight. The neural networks involve the tasks like to determine the network properties node properties and the system dynamics.

II. SCOPE OF THE WORK

Character recognition is the one of the research areas in the field of artificial intelligence. So it has significant role for developing a self-thinking machine. There are several character recognition schemes are available, but each have certain limitations. Most of the recognition schemes recognize only character in fixed font or printed text only. It is difficult recognize a hand written document by a machine accurately. Classical methods in pattern recognition do not as such suffice for the recognition of visual characters due to different person have different mode of writing. Their writing patterns, writing styles and shape of the characters are also different[3]. Several applications including address recognition in post office, bank cheque processing, document reading require handwriting recognition systems. So researches are going in the field of character recognition for better accuracy.

III. PROPOSED SYSTEM

Character recognition is the conversion of image of handwritten or printed text into machine encoded text. The recognition of characters from scanned images of documents has been a problem that has received much attention in the fields of image processing, pattern recognition and artificial intelligence. In general, images are often corrupted by impulse noise in the procedures of image acquisition and transmission. The noise may seriously affect the character recognition. Hence, an efficient denoising technique becomes a very important issue in image processing. Many image denoising methods have been proposed to carry out impulse noise suppression. Some of them employ the standard median filter or its modifications. However, these methods affect both noisy and noise-free pixels. To avoid the damage on noise-free pixels, an efficient filtering method is used. Otherwise it affects further image processing operations. There are several operations includes in the proposed hand written character recognition system shows in Fig.1.

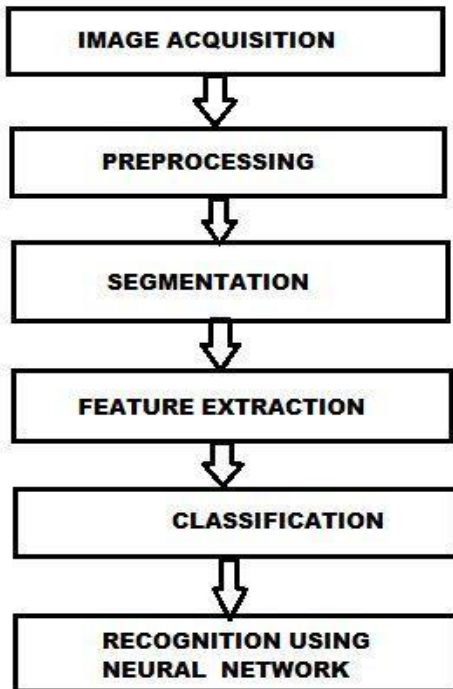


Fig.1. Schematic Diagram of Character Recognition System

A. Image Acquisition

First step in the image processing is image acquisition. To recognize a character from image, system requires a scanned image as an input image. Image should have in a specific format like .BMP, JPEG, JPG etc. Input image is shown in Fig.2.

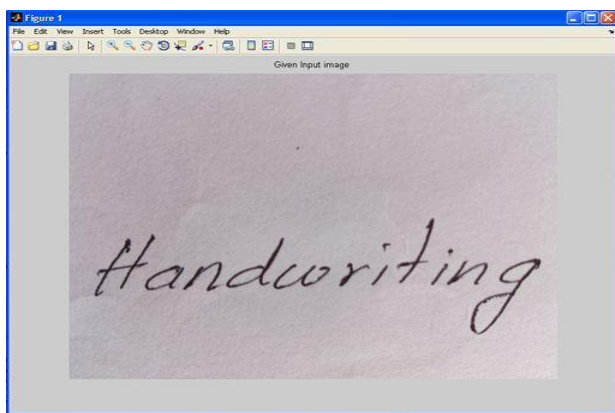


Fig.2. Input image

B. Pre-Processing

The pre-processing of an image consists of several steps. The role of pre-processing is to segment the interesting pattern from the background. Noise removal, smoothing and normalization should be done in this step. Impulse noise is one of noise that affects the input image during the image acquisition.[4] Impulse noise degrades the image quality and information details in the image and it affects further image processing such

as segmentation and edge detection. So a standard median filter is used for noise filtering. After this binarization of image is done. Impulse noise present in the image in the form of black and white spots. Median filter is used for the filtering of impulse noise. Binarization process converts a gray scale image into a binary image. Binary image is shown in Fig.3. Here the pixels have only two values 0 or 1 i.e. black pixels are valued as 0 and white pixels are valued as 1.



Fig.3 Binary Value of Input Image

C. Segmentation

In Segmentation sub divides an image into its constituent regions or objects. Level of sub division depends on the problem being solved. That is segmentation should stop when the objects or region of interest in an application have been detected. Segmentation is mainly edge based segmentation and region based segmentation. For segmentation different detection methods like point detection, line detection, edge detections are done. Thinned and edge detected image is shown in Fig.4.

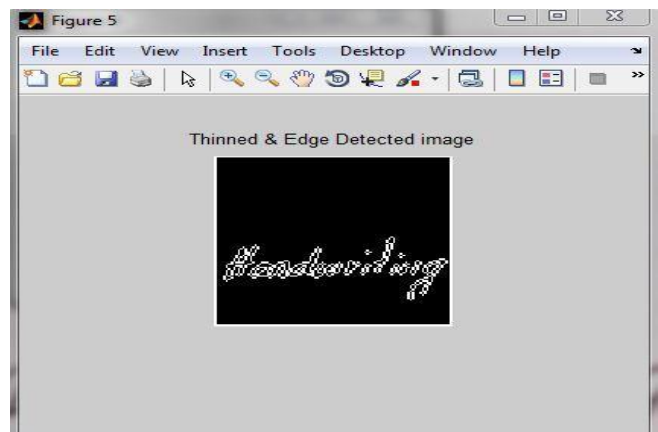


Fig. 4. Thinned and Edge Detection

D. Feature Extraction

In this stage, the features of the characters that are crucial for classifying them at recognition stage are extracted. It is a special form of reduction. When input algorithm is very large at that time it is reduce the data. If the features extracted carefully

chosen it is expected that the features set will extract the relevant information from the input data in order to perform the desired task using this reduced representation instead of the full size input. In feature extraction, finding the edges of handwritten characters using canny edge detection.

E. Classification And Recognition

Classification and recognition is the important section in the hand written character recognition system. For this artificial neural networks are used. Artificial neural networks are self-learning and self-organized network systems that are similar to that of biological neural network system. These highly parallel distributed network systems are mainly used for the pattern classification and recognition.[5] In the pattern recognition the neural network system is trained to identify the most similar pattern from the data base that similar to the input image. Neural network system consists of several layers of neurons that are inter connected to each other. To activate a neural system input image is given to the input layer and a weight is assigned to each input node. All the node are connected each other so input node will activate the other nodes. It will continue until the output node will activate. After train neural network, the system is ready to recognize the input hand written images. In the proposed system several input images are trained and successfully recognize several hand written characters in different styles. The output from the proposed system is given in the Fig 6 and Fig 7

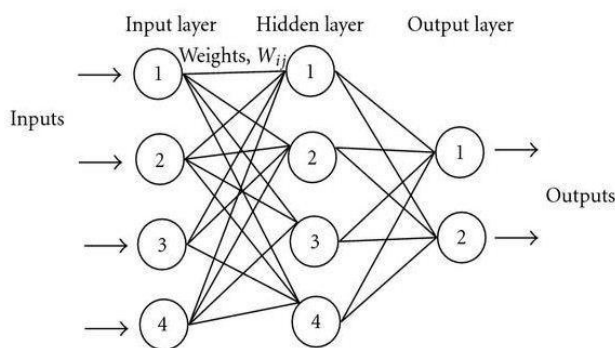


Fig.5. Artificial Neural Network

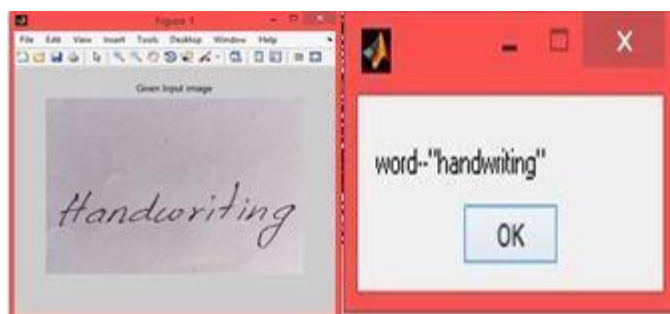


Fig.6. Input and Output of Character Recognition

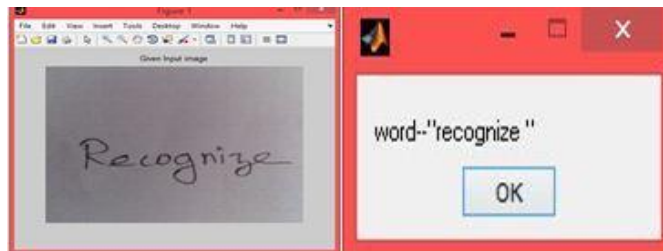


Fig.7. Input and Output of Character Recognition

IV. TOOLS REQUIRED

For the hand written character recognition matlab image processing tool box and neural network toll box are used. For preprocessing image processing tool box and for the classification and character recognition neural network tool box is used.

V. CONCLUSION

Proposed syystem sucessfully recognize different hand written words .characters are trained with artifical neural network and it gives an accuracy of 90%. This method is very useful at a great extent for better hand written character recognition. This proposed method will exhibits outcomes of noise reduction and image quality improvements with different noise levels which will qualify it to be suitable for image processing and pattern matching.

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