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Short Communication

Handwritten character recognition using diagonal feature extraction method and MLFFN having back propagation algorithm

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Abstract

This paper is a new work of authors in the field of Handwritten Digital Recognition. The authors had proposed a methodology for extraction of handwritten characters. The characters are from the English Language. The paper tries to give a way to do the work. It also shows a brief description of the work done in the field of Feature Extraction. The major emphasis of the paper is on the algorithm for feature extraction and then the topology and learning methodology used for classification.

Keywords: Backpropagation, MLFFN (multilayer feed-forward network).

Introduction

With the easiness associated with the availability of the computing resources need of the masses has taken a great leap. Now people they are looking for systems that are going to do the work in an automated manner. Soft-Computing is an emerging field of Computer Science and Engineering. The field has opened an area which resolves various practical problems of the mankind. There are various examples where human beings are supposed to make an identification of handwritten characters. The areas include education, banking, research etc. In this paper we will be identifying a way to develop an automated handwritten digits recognizer.

Soft-computing: Soft-Computing is a field that deals with the various technologies. Soft-Computing includes the techniques which resemble living beings interpretation and decision making framework. In this paper we are concerned with the implementation of Artificial Neural Network. Artificial Neural Network is concerned with the models which are having analogy with the neuronal behavior towards the stimulus. Artificial Neural Network comprises of three basic elements i.e. the Individual Neuron, Network Topology and Learning Algorithms. It is the network architecture that is having the inherent capability to modify the learning element when a pattern is not recognized after training the topology with a learning technique[1-9].

Problem statement: Handwritten Character Recognition is a vibrant field of research. Looking to the need of processing the image having handwritten character's in a wide range of applications starting from banks to various commercial places, the author's of the paper tried to present a model using the Artificial Neural Network Paradigm. Artificial Neural Network is a great machine learning technique that is analogous to the neurophysiology related to mankind. In the paper we tried to solve the problem of handwritten characters using soft-computing landscape.

Work already done: A few state of the art approaches that use hand written character recognition for text identification have been summarized here[10-15]: i. Handwritten Character Recognition using Neural Network proposed by Chirag I Patel, Ripal Patel, Palak Patel aimed to recognize the characters in a given scanned objects using the models present in Artificial Neural Network. ii. Handwritten Character Recognition Using Gradient Feature proposed by Ashutosh Aggarwal, Rajneesh Rani, Renu Dhir used gradient measures for feature extraction. iii. Character Recognition Using Matlab's Neural Network Toolbox proposed by Kauleshwar Prasad, Devvrat C. Nigam, Ashmika Lakhotiya and Dheeren Umre focused on recognition of English alphabets using MATLAB's toolbox. iv. Neural based handwritten character recognition proposed by Hanmandlu M., Murali Mohan K.R., Kumar H. used the sector method for feature extraction. v. A feature extraction technique based on character geometry for character recognition proposed by Dinesh Dileep used a geometrical approach for feature extraction. vi. A Review of Gradient-Based and Edge-Based Feature Extraction Methods for Object Detection proposed by Sheng Wang used the computer vision paradigm for object detection.

Critical analysis: Different mathematical approaches lead to the solution of the problem. Matrix based MATLAB is a very good tool for making out an implementation of image based problem. Gradient based approach reduces the error with ever iteration of the ANN learning. Generally a simple method to make out implementation although suffers from limitations.

Methodology

To recognized the handwritten data from document, there are number of steps which are involved while recognition, firstly the document is scanned using scanner. This scanned document is converted into image. Then image is pre-processed with set of valuable steps and convert it into a character/script as per the environment.

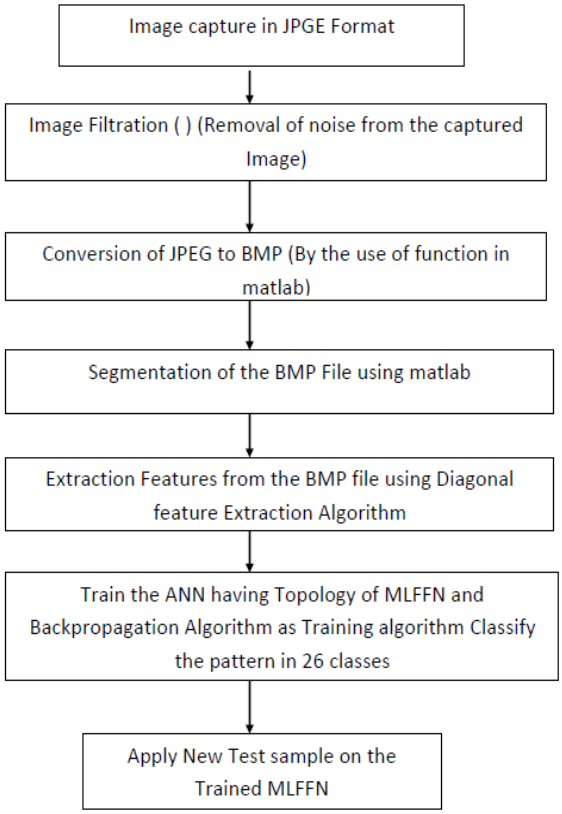

Figure-1: Flow Chart of Proposed Work.

The scanned image undergoes number of valuable pre-processing steps so as to increase the ratio of recognition of the handwritten document. The proposed methodology uses some techniques to remove the background noise, and features extraction to detect and classify the handwritten text.

The proposed method comprises of 4 phases: i. Pre-processing. ii. Segmentation. iii. Feature Extraction. iv. Classification and Recognition.

Implementation: Figure-2 of the section shows the implementation window where the real time input can be supplied to the user intractable window to have character recognition. The implementation is done in MATLAB.

Results and discussion

The Confusion Matrix obtained as a result of the overall implementation of Figure-3 shows the behavior of the implementation.

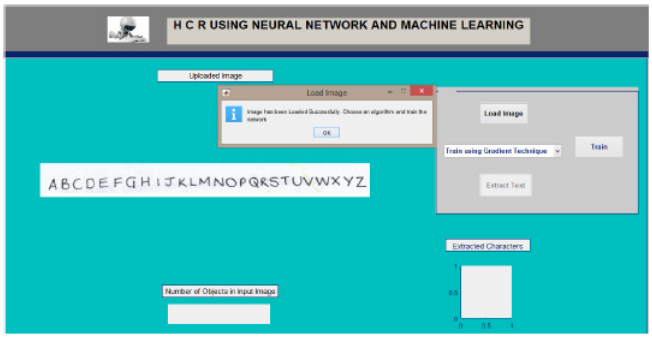

Figure-2: Implementation Window.

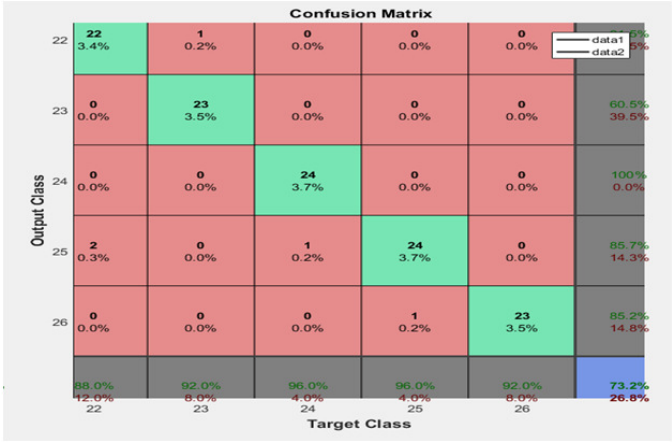

Figure-3: Confusion Matrix.

Conclusion

Using a model that uses MATLAB as the tool for making an implementation the problem of handwritten digital recognition could be solved. MATLAB proved to be an excellent tool as it is easy to use and provide wide range of functions that makes the problem of image processing a simple one. Although the requirement of hardware resource is a major limitation associated with the tool and the usage in the above context. A hybrid model could be constructed using the diagonal feature extraction and some other image processing technique which uses the same segmentation principle.

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