A Neural Network Based Efficient Technique for Handwritten Digit Recognition System

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Abstract- In this paper, we present a new neural network based method for handwritten character recognition. The experimental results show that our proposed method achieves 98 percent accuracy in handwritten character recognition.
In this paper, we present an overview of existing handwritten character recognition techniques. All these algorithms are described more or less on their own. Handwritten character recognition is a very popular and computationally expensive task. We also explain the fundamentals of handwritten character recognition . We describe today's approaches for handwritten character recognition. From the broad variety of efficient techniques that have been developed we will compare the most important ones. We will systematize the techniques and analyze their performance based on both their run time performance and theoretical considerations. Their strengths and weaknesses are also investigated. It turns out that the behavior of the algorithms is much more similar as to be expected.

INTRODUCTION:

Character recognition is process of detecting and recognizing characters from input image and converts it into ASCII or other equivalent machine editable form[1,2,3]. HDR has major contribution to the advancement of automation process and improving the interface between man and machine in many applications [4]. haracter recognition is one of the most interesting and fascinating areas of pattern recognition and artificial intelligence [5], [6]. In [10], Rajbala et al have discussed various types of classification of feature extraction methods like statistical feature based methods and structural feature based methods etc. Tirthraj Dash et al have discussed HCR using associative memory net (AMN) in their paper [12]. I.K.Pathan et al have proposed offline approach for handwritten isolated Urdu characters in their wok mentioned in [13]. Rajib et al have proposed Hidden Markov Model based system for English HCR in their literature [8]. They have employed global as well as local feature extraction methods. Gradient features based method is discussed in [14] by Ashutosh et al. Experiment is carried out on Hindi, third most popular language in the world. Velappa et al have proposed multiscale neural network based approach in [15]. Neural networks like Feed forward back propagation neural network requires long training time to memorize and generalize all input feature vectors [10]. And still there are good chances of misclassification. Generalization problem can be overcome by using multi scale neural network [11]. In literature [16], T.Som et al have discussed fuzzy membership function based approach for HCR. Character images are normalized to 20 X 10 pixels. Rakesh kumar et al [17] has proposed

single layer neural network based approach for HCR to reduce training time. Characters are written on A4 size paper in uniform box. Segmented characters are scaled to 80 X 80 pixels. Each 0 is replaced by -1 for better training. Diagonal based feature extraction work is mentioned in [19], which is improved by Sharma et al, discussed in [20].

STRUCTURE OF PROPOSED SYSTEM:

OCR is the acronym for Optical Character Recognition. This technology allows a machine to automatically recognize characters through an optical mechanism. Human beings recognize many objects in this manner our eyes are the "optical mechanism." By reviewing these variables, we can understand the challenges faced by the technologist developing an OCR system. The ultimate objective of any OCR system is to simulate the human reading capabilities so the computer can read, understand, edit and do similar activities it does with the text.
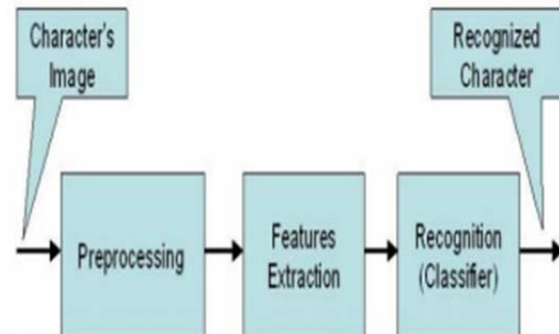

Figure 1: structure of the proposed system

Block diagram of the typical OCR system. Each stage has its own problems and effects on the overall system's efficiency. Thus, to tackle the problems, either by solving each particular problem.OCR system by integrating all stages to one main stage, and this is what our research proposes. This thesis presents new structure of OCR system which relies on the powerful proprieties. The algorithm is designed and tested in the related sections.

COMPONENTS OF OCR SYSTEM

CHARACTER ACQUISITION:

Acquiring the handwritten digit is the first and foremost step in our proposed methodology. In our proposed methodology, we have used scanner to acquire the handwritten digits. Others can also use video camera, digital still image camera, paintbrush to acquire image.

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PREPROCESSING

Preprocessing is the second step in our proposed handwritten digit recognition system. The main objective of the preprocessing is to enhance the quality of recognition. In the preprocessing step, the handwritten digit is transformed in a digit, which is much more similar to the class they belong. But it must be clear that at this stage no recognition activity is performed. The preprocessing step is closely related to the feature extraction step. In this step, normalization, digitization and thinning is applied on the handwritten digits.

Normalization is the most important activity in the preprocessing stage. During the normalization, the handwritten digit is linearly mapped on a plane using the interpolation or the extrapolation. The size of the character is controlled in such a way that it fills the plane. The basic objective of normalization is to simplify the classification & also to increase the accuracy or efficiency.

In digitization, the digit is converted into the binary form by using the binarization method. In this method, 1 represents region and 0 represents no region.

FEATURE EXTRACTION

Feature extraction is the most important step in handwritten digit recognition. In this step, the important features are extracted so that one object can be distinguished from the others. Special points such as junction points & the end points are extracted when the image is stored in the matrix form.

Classification:

Neural Network is used for the classification task.

CONCLUSION:

In this paper, we surveyed a large number of methods of optical character recognition. We analyzed the advantages and drawbacks of various OCR methods. We also proposed a modified back propagation method. It is used in neural network. The proposed method computes error rate efficiently. It results in increasing the accuracy of neural network. Our proposed neural network based method is providing 100 percent accuracy in OCR.

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