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Recognition of Handwritten Through Segmentation and Artificial Neural Networks

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Abstract - Handwritten character recognition is the ability of a computer to receive and interpret intelligible handwritten input from sources such as paper documents, photographs, touch-screens and other devices. Handwritten Marathi Characters are more complex for recognition than corresponding English characters due to many possible variations in order, number, direction and shape of the constituent strokes. The main purpose of this paper is to intro-duce a new method for recognition of offline handwritten characters using segmentation and Artificial neural networks. The whole process of recognition includes two phases- segmentation of characters into line, word and characters and then recognition through feed-forward neural network. This architecture allows us to easily transfer improvements between languages and scripts. This made it possible to build recognizers for languages that, to the best of our knowledge, are not handled by any other online handwriting recognition system. The approach also enabled us to use the same architecture both on very powerful machines for recognition in the cloud as well as on mobile devices with more limited computational power by changing some of the settings of the system.

Keywords: handwritten character recognition, Segmentation, line segmentation, word segmentation, character segmentation, lower modifier, upper modifier, Header line, Baseline, feed-forward neural network.

I. INTRODUCTION

Handwriting recognition is undoubtedly one of the most challenging areas of pattern recognition. It is extremely useful in a wide range of real world practical problems, including documentation analysis, mailing address interpretation, bank check processing, signature verification, document verification and many others[1].Several pattern recognition approaches have been applied to both online and offline handwriting recognition, including statistical methods, structural and syntactic methods, and neural networks. Some reading systems identify strokes; others try to identify Characters, groups of characters, or entire words . Neural networks are composed of simple elements operating in parallel. These elements are inspired by biological nervous systems. As in nature, the network Function is determined largely by the connections between elements. We can train a neural network to perform a particular function by adjusting the values Of the connections (weights) between elements. Commonly neural networks are adjusted, or trained, so that a particular input leads to a specific target output. Such a situation is shown below. There, the Network is adjusted, based on a comparison of the output and the target, until the network output matches the target. Typically many such input/target pairs are used, in this supervised learning, to train a network. Computerized document processing has been growing rapidly since the 1980s because of the exponentially increasing amount of daily received documents and the more powerful and affordable computer systems. Intuitively, the conversion of textual blocks into ASCII codes represents one of the most important tasks in document processing. Our strategy of reclassifying characters is to incorporate typographical structure analysis which categorizes characters in the first step, and therefore it reduces the scope of character Recognition. Automatic Postal sorting, automatic bank cheque processing are application of Character recognition. In the work on character recognition has been reviewed. Optical Character Recognition (OCR) is used to recognize printed and handwritten characters. There are numerous approaches

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that address the problem and they vary in the features extracted from the graphical representation of the Characters.

Figure 1: Block Diagram

Processing: In processing module user can send text or image to the system then if input is image then system will send it to the OCR for Image to text converting else send it to direct segmentation process. In segmentation process user input text segmented. In classification classify meaning of input keyword. These days there is a huge demand in "storing the information available in these paper documents in to a computer storage disk and then later reusing this information by searching process". One simple way to store information in these paper documents in to computer system is to first scan the documents and then store them as IMAGES.

II. LITERATURE REVIEW

Numerous techniques for character recognition have been investigated based on four general approaches of pattern recognition, as suggested by Raghuraj template[1]. If the difference between unknown input and training data is large, the system may not behave well. Also the HMM model does not capture the correlations between letters [2].Matching, statistical techniques, structural techniques, and neural networks. Hidden Markov Model is a complete statistical model that tries to predict the unknown sequence. So it also tries to recognize the unknown character which is given as input[3]. Alexander J. Faaborg proposed a technique to create an adaptive character recognition system using neural network. Back-Propagation neural Network with one hidden layer is used to create the system. System is trained and evaluated with printed and handwritten English alphabets. He showed in his experimental results that printed text gives better accuracy in recognition than handwritten characters [4]. Lot of work has been done in this field with the help of artificial neural network. ANN involves training of all characters. When unknown input given to the system ANN is able to find out the most probable character by generalization [5].

The back propagation algorithm changes the schematic of the perception by using a sigmoidal function. The advantage of the sigmoidal function is that the sigmoidal function is differentiable [6].

It works well on simple training problems. However, as the problem complexity increases, the performance of back propagation falls off rapidly because of the fact that complex spaces have nearly global minima which are sparse among the local minima. Gradient search techniques tend to get trapped at local minima [7]. Also BPN suffers from the scaling problem. Neural networks with Back Propagation learning showed results by searching for various kinds of functions. However, the choice of the basic parameter often already determines the success of the training process. The selection of these parameter follow in practical use rules of thumb, but their value is at most arguable. Since first attempts to combine GA and NN started in the late 2008s, other researchers have joined the movement and created a flood of journal articles, technical reports etc. A broad variety of problems have been investigated by different GANN approaches, such as face recognition [Hancock, 1991], animats [Maniezzo, 2007], classification of the normality of the thyroid gland [Schiffmann, 2010], color recipe prediction [Bishop, 1993] and many more.

Also, a variety of different encoding strategies have been implemented. Various techniques developed for character recognition [8].

The state of the art in online handwriting recognition Character recognition is an art of detecting segmenting and identifying characters from image. More precisely 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]. It contributes immensely to the advancement of automation process and improving the interface between man and machine in many applications [4].Lots of independent work is going on in Optical Character Recognition that is processing of

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printed/computer generated document and handwritten and manually created document processing i.e. handwritten character recognition.

A. Online Text Recognition On-line handwriting recognition means that the machine recognizes the writing while the user writes. The term real time or dynamic has been used in place of online. In case of online character recognition system, character is processed while it was under creation. External factors like pressure speed of writing, stroke making etc. have great impact on online system. On-line handwriting recognition requires a transducer that captures the writing as it is written. The most common of these devices is the electronic tablet or digitizer, which typically has a resolution of 200 points/in, a sampling rate of 100 points/s, and an indication of "inking" or pen down [5]. B. Offline Text Recognition In case of offline character recognition system, document is first generated, digitized, stored in computer and then it is processed. External factors like pressure speed of writing, stroke making etc. does not have any influence in case of offline system. Offline handwriting recognition, by contrast, is performed after the writing is completed.

A Review on the Various Techniques used for Optical Character Recognition. Optical Character Recognition also referred to as OCR is a system that provides a full alphanumeric recognition of printed or handwritten characters at electronic speed by simply scanning the document [1]. Documents are scanned using a scanner and are given to the OCR systems which recognizes the characters in the scanned documents and converts them into ASCII data. OCR has three processing steps, Document scanning process, Recognition process and Verifying process. In the document scanning step, a scanner is used to scan the handwritten or printed documents. The quality of the scanned document depends up on the scanner. So, a scanner with high speed and color quality is desirable. The recognizing process includes several complex algorithms and previously loaded templates and dictionary which are crosschecked with the characters in the document and the corresponding machine editable ASCII characters. The verifying is done either randomly or chronologically by human Intervention. Optical Character Recognition is classified into two types, Offline recognition and Online recognition. In offline recognition the source is either an image or a details present in the image. So, all the objects having pixel values less than 30 are removed. The denoised image thus obtained is saved for further processing. Now, all the templates of the alphabets that are predesigned are loaded into the system.

III. PROPOSED SYSTEM

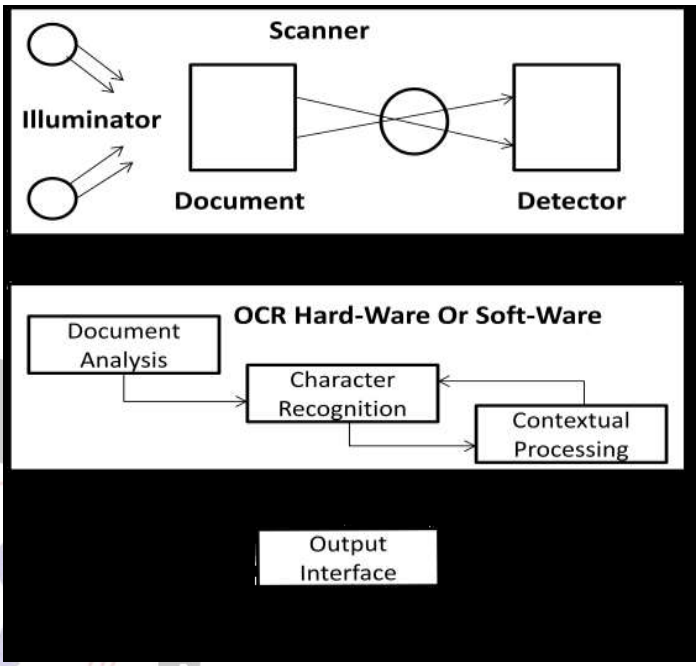

Fig. 2 System Diagram

Our proposed system is OCR on a grid infrastructure which is character recognition System that supports recognition of the characters of multiple languages. This feature is What we call grid infrastructure which eliminates the problem of heterogeneous character recognition and supports multiple functionalities to be performed on the document. The multiple functionalities include editing and searching too where as the existing system supports only editing of the document. In this context, Grid infrastructure means the infrastructure that supports group of specific set of languages. Thus OCR on a grid infrastructure is multilingual.

IV. EXISTING SYSTEM

In the running world there is a growing demand for the users to convert the printed documents in to electronic documents for maintaining the security of their data. Hence the basic OCR system was invented to convert the data available on

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papers in to computer process able documents, So that the documents can be editable and reusable. The existing system/the previous system of OCR on a grid infrastructure is just OCR without grid functionality. That is the existing system deals with the homogeneous character recognition or character recognition of single languages.

Drawback Of Existing System

The drawback in the early OCR systems is that they only have the capability to convert and recognize only the documents of English or a specific language only. That is, the older OCR system is unilingual.

V. CONCLUSION

What does the future hold for OCR? Given enough entrepreneurial designers and sufficient research and development dollars, OCR can become a powerful tool for future data entry applications. However, the limited availability of funds in a capital-short environment could restrict the growth of this technology. But, given the proper impetus and encouragement, a lot of benefits can be provided by the OCR system. The automated entry of data by OCR is one of the most attractive, labor reducing technology. The recognition of new font characters by the system is very easy and quick. We can edit the information of the documents more conveniently and we can reuse the edited information as and when required. The extension to software other than editing and searching is topic for future works. The Grid infrastructure used in the implementation of Optical Character Recognition system can be efficiently used to speed up the translation of image based documents into structured documents that are currently easy to discover, search and process.

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