

Optical Character Recognition, With Fault Finding Using Artificial Intelligent

¹Mishra Karan, ²Kansagra Payal

¹PG Research Scholar, ²Assistant professor

Department Of Electronics and Communication

Parul Institute of Engineering & Technology, Limda, Waghodia, Vadodara

¹Karanmishra022@gmail.com, ²Payal.k2006@gmail.com

Abstract - OCR itself is currently translating images handwritten typewritten or printed text into a format understood by machines for editing, indexing / search, and a reduction storage size. Optical Character Recognition is the mechanical or electronic translation of images of handwritten text, typed or printed machine editable text. Artificial neural networks are commonly used for performing character recognition due to their high tolerance for noise. An optical character recognition based on artificial neural networks (ANN). The ANN is trained using the genetic algorithm. With more we will introduce prediction algorithm which is used to predict the next character in particular the word for error detection and automatic correction.

Keywords - Neural network, genetic algorithm, image processing toolbox, matlab

I. INTRODUCTION

Definition of Character

Character is the basic building block of a language that is used to build the structures of a language. The characters are alphabets and structures are the words, lines and sentences, etc.[4]

Optical Character Recognition

Optical Character Recognition, or OCR, is the process of translating text images handwritten, typed or printed in a format understood by machines for editing, indexing / search, and a reduction in the size of storage. OCR who uses an artificial neural network as a backend to resolve the problem of classification. OCR is a field of research in pattern recognition, artificial intelligence and machine vision. Although academic research in the field continues, the focus on OCR has changed the implementation of proven techniques. The input for the problem is OCR scanned pages of text. To perform recognition character, our application must go through three major steps. The first is segmentation, i.e., given a binary image input, to identify individual glyphs (basic units representing one or more characters, usually congruous). The second step is feature extraction, namely, to calculate each glyph from a vector of numbers that serve as the input characteristics for ANN. This is the most difficult step to the extent there is no obvious way to obtain these characteristics. The final task is classification. In our approach, there are two parts to this. The first is the training phase, we manually identify the correct class several glyphs. One of the most classic Artificial Neural Network applications is the system of recognition of characters. This system is the basis for many types of applications in various fields, many of which we use in our daily lives. Cost effective and less time consuming, businesses, post offices, banks, security systems, and even robotics use this system as a base of operations.[1]

Scope of Study

The scope of this project is to build a system that automatically recognize the characters of input to the system, and also use an auto prediction and fault correction algorithm along with a robust OCR system.

Objective

The primary objective is to develop a recognition system that efficiently recognizes characters utilizing minimum processor time by using auto prediction and fault correction algorithm.

II. STEPS IN OPTICAL CHARACTER RECOGNITION

The purpose of the optical character recognition (OCR) is rating optical patterns (often contained in a digital image) corresponding to alphanumeric or other characters. The process of optical character recognition involves several steps including segmentation, feature extraction and classification

The Classification process

(Classification in general for any type of classifier) There are two steps in building a classifier: training and testing. These steps can be broken down further into sub steps

1. Training

Pre-processing: Processes the data so it is in a suitable form for

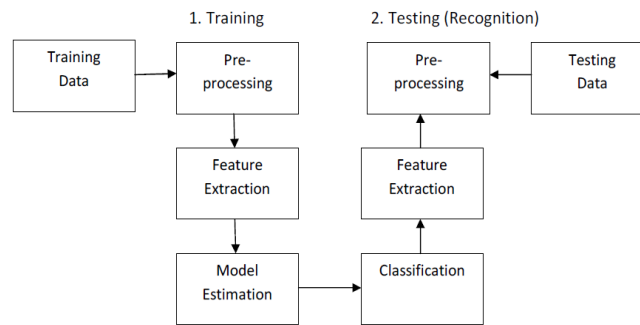


Figure: The pattern classification process

Feature extraction: Reduce the amount of data by extracting *relevant* information.

Model Estimation: From the finite set of feature vectors, the need to estimate a model for each class of the training data.

2. Testing

(a) *Pre-processing*:

(b) *Feature Extraction*: (both same as above)

(c) *Classification*: Compare feature vectors of different models and find the closest match.

OCR Pre-processing

These are the stages of pre-processing often performed OCR

1. *Binarization*: Usually presented with a grayscale image, thresholding is then simply a matter of choosing a threshold value.
2. *Morphological Operation*: Remove individual stains and holes in the characters, you can use the operator of the majority.
3. *Segmentation*: Verify connectivity shapes, label and isolate. Difficulties with characters that are not connected, for example the letters j, i, a semicolon or a comma (, , :) Or segmentation is by far the most important of the pre-processing appearance. It allows to extract the recognition function of each character. In the more complicated case of handwritten text, the segmentation problem becomes much more difficult than the letter tend to be connected to each other.

OCR Feature Extraction

Given a segmented (isolated) character, what are useful features for recognition?

1. Moment based features.

The 2-D moment of the character are

$$m = \sum_{x=0}^{W-1} 1 \sum_{y=0}^{H-1} x^p y^q f(x, y)$$

From the moments we can compute features like;

- (a) Total mass (number of pixels in a binarized character)
 - (b) Centroid- Center of mass
 - (c) Elliptical parameters
 - (i) Eccentricity (ratio of major to minor axis)
 - (ii) Orientation (angle of major axis)
2. Hough and chain code transform
 3. Fourier transform and series

OCR Classification

The main function of a system of pattern recognition is to make decisions on models of class composition with which it is confronted. In the context of an OCR system, recognition is facing a reasonable sequence of function for which it must determine the character classes.

III. COMPLICATION IN OCR

A number of methods have been developed to overcome imperfect image. Examples include:

1. Images with noise.
2. Images with colored text.
3. Images with rotated text.

1) Images with Noise

The image noise is objects with values of small size (compared to the area of own characters). To remove small amounts of noise, the area of each object is checked. If the value of the surface is below a threshold, the particle is assumed to be noise. Therefore, it is removed from the binary image. This threshold value is obtained on the basis of the analysis of the set of training data. The value of the minimum character area is first identified, then the threshold value is selected to be less than this value. Thus, all objects in an area less than the threshold can be considered noise.[2]

2) Images with colored text:



Converting an image with colored text to a binary image involves multiple thresholding processes. The image is first separated into the three primary color planes (Red, Green, and Blue). Each plane is thresholded separately, after which they are combined using binary addition.[2]

IV. ARTIFICIAL NEURAL NETWORK

An artificial neural network (ANN), commonly called the neural network (NN), or a mathematical model is a calculation model which is inspired by the structure and / or functional aspects of biological neural networks. A neural network consists of an interconnected group of artificial neurons and processes information using a connectionist approach to computation. In most cases, an ANN is an adaptive system that changes its structure based on external or internal information that flows through the network during the learning phase. Neural networks are modern statistical tools for modeling nonlinear data. They are usually used to model complex relationships between inputs and outputs or to find patterns in the data. An artificial neural network (ANN), usually called "neural network" (NN), or a mathematical model is a calculation model that attempts to simulate the structure and / or functional aspects of biological neural networks. It consists of an interconnected group of artificial neurons and processes information using a connectionist approach to computation. In most cases, an ANN is an adaptive system that changes its structure based on external or internal information that flows through the network during the learning phase.[1]

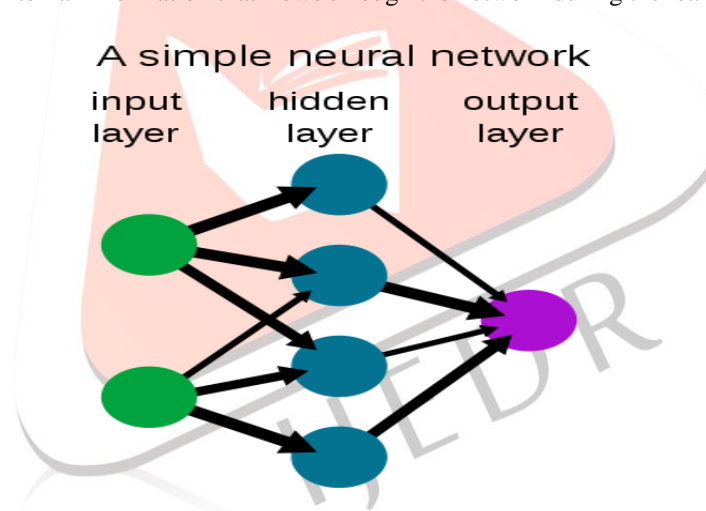


Figure: Artificial Neural Network

V. AUTO PREDICTION AND FAULT DETECTION ALGORITHM

As required by the current time, all documents and data must be connected online to a single user interaction server, there is a huge need for OCR. But there is always a problem of degrading paper wrongly typed and misspelled words, ink spread, missed characters when printing, etc. So, a prediction of the automobile and fault correction algorithm is necessary with a robust OCR system. In this algorithm, it is a prediction of the next letter, so many choices to be evaluated are indexed, then the probability of finding the right match is increased, and is faster. For example when "Apple" is playing, then after reading "AP", the system will predict P (as in apple / add / call etc.) or E (as in monkey), and does not go through the usual method of comparison with A - Z.

VI. ADVANTAGES

- 1. More Faster:** The system becomes faster. As there is a forecast of the next character if the system does not pass through the usual method of comparison with A – Z. So number of choice will reduce and system will become faster.
- 2. More Reliable:** Missed characters, ink spread, characters unprinted misspelled characters can be corrected. Thus, the system is very reliable.

VII. APPLICATION

Data Entry

This area covers technologies to enter large amounts of confidential data. Initially such documents reading machinery were used for banking applications. The systems are characterized by reading only a very limited set of printed matter, usually figures and some special characters symbols. They are designed to read data such as account numbers, customer identification, item numbers, amounts of money etc.[1]

Text Entry

The second branch of reading machines is the page readers text input, mainly used in office automation. Here is the character set restrictions are exchanged for constraints on police and print quality. Ment in reading machines are used to enter large amounts of text, ten in a word processing environment. These pages readers are in strong competition with the direct input key and the electronic exchange of data. This scope is a decreasing importance.[1]

Process Automation

This is actually the technology AutoPlay address for mail sorting. Therefore, the aim is to direct each letter in the collecting chamber independently of the fact that each character has been recognized correctly or not. The general approach is to read all the available information and using the postal code as a redundancy check.[1]

VIII. CONCLUSION

At the current stage of development, the software does perform well either in terms of speed or accuracy but not better. It is unlikely to replace existing OCR methods, especially for English text. Artificial neural networks are commonly used to perform character recognition due to their high noise tolerance. And Prediction and Fault detection algorithm will use to predict next character so the system will become more faster and efficient. The systems will have the ability to yield excellent results. The feature extraction step of optical character recognition is the most important. A poorly chosen set of features will yield poor classification rates by any neural network.

REFERENCES

- [1] Rakesh Bhujade, BLB , “Optical Character Recognition using Artificial Neural Networks” -International Journal of Science & Technology Vol.1, No. 2 (2010), 143-152 (ISSN 0976-3074)
- [2] Velappa Ganapathy, and Charles C. H. Lean, ‘Optical Character Recognition Program for Images of Printed Text using a Neural Network’ – IEEE 2006
- [3] Sheikh Faisal Rashid, Faisal Shafait and Thomas M. Breuel ,”Scanning Neural Network for Text Line Recognition” IEEE 2012
- [4] Inam Shamsher, Zaheer Ahmad, Jehanzeb Khan Orakzai, and Awais Adnan ,”OCR For Printed Urdu Script Using Feed Forward Neural Network” – WASET 2007
- [5] P.Vijayalakshmi and M.Sumathi ,”Design of Algorithm for Vehicle Identification by Number Plate Recognition” IEEE 2012
- [6] CHOMTIP PORNANOMCHAI, MONTRI DAVELOH , “Printed THAI Character Recognition by Genetic Algorithm” IEEE 2007
- [7] Walid A. Salameh Princess Summaya ,”Online Handwritten Character Recognition Using an Optical Back propagation Neural Network” by University for Science and Technology, Amman, Jordan