

Enhanced Character Recognition using Deep Neural Network- A Survey

Desai Hinduja, R. Dheebhika and T. Prem Jacob

Abstract—The idea has been popped up suddenly 50 years ago. Neural Computing is a separate science and is very extensive. Sample recognition problems are solved by using Neural Networks. Character Recognition is one among those. The implementation of the Neural Network is easy for obtaining the solution for this problem. Artificial Intelligence uses techniques that gives Computer the capability to learn with data and without being explicitly programmed. The neural network recognizes characters, numbers and some special symbols. The solution is obtained by using MATLAB's Neural Network Toolbox. The accuracy of the output depends on the resolution of the input to the neural network.

Index Terms—Neural Network, BPN Network, OCR, CNN, Artificial Intelligence.

I. INTRODUCTION

MANY improvements are occurring in the area of Deep Learning. OCR is one of the active areas in where Deep Neural Network is used. Recognition of handwriting is not much difficult process for humans. It is a complicated process in case of computers. The reason is that handwriting varies between person to person and there are various characters.

OCR is the fascinating area where the pattern recognition and image processing is used. The real time application of OCR includes Automatic number plate recognition, transforming the handwritten document into the structural text form, etc. The aim of OCR is to identify the digits, characters and special symbols. There are various steps which are to be carried out. They are Pre-processing, Scale region Detection, Segmentation, Classification. In this process, we can use MATLAB toolbox which help us to identify the parameters. OCR is an electronic or mechanical conversion of typed images or, printed text or handwritten into machine encoded text. It is used as data entry from the data records of the printed paper, whether passport documents, printouts of static-data, bank statements, computerized receipts, documentation or mail.

Desai Hinduja ,R. Dheebhika and T.Prem Jacob are with Satyabama Institute of Science and Technology, Chennai.
{email:hindujadesai20@gmail.com, dheebhika@gmail.com }

The rest of this paper Section II is discussed about the Literature review ,Methodology is briefly explained in Section III ,Result are explained in Section IV and finally Concludes the paper in Section V.

II. LITERATURE REVIEW

In the optical character recognition system, many techniques are determined to realize the centre of character recognition. Though, there are many papers and studies which describes the methods for conversion of text from the document into readable form by the machine. In the process of Optical character recognition, the computer automatically understands the image of script which is handwritten and convert into the classify character [1].

The ability to reduce staff involvement to increase the productivity and to store text effectively are the main advantage in this Optical Character Recognition System. In this paper, the data is taken from the faded or poorly printed documents which are blurred. Using 53,342 noisy character images inception V3 network is trained. The result shows that the error rate is reduced overall to 21.5% and achieved good recognition accuracy on text images which is poor in quality compared to existing OCRs [2].

This paper proposes a simple color and size invariable character recognition system to recognize alphanumeric characters based on ANN. Using feed-forward neural network this system is proposed. It has two layers. Input layer and output layer. The recognition process contains the following steps. They are pre-processing, normalization, network establishment and recognition. This system gives better result for when the letters and numeric digits are trained and tested separately. When they are tested together it gives satisfactory result [3-8]. Neural Networks are being used in different kinds of pattern recognition. Handwriting varies from person to person. Therefore, it is tedious to recognize handwritten characters. In handwritten character recognition, Neural network plays an important role. In this paper, for English character recognition the developmental outcome shows that the way used gives better recognition accuracy and reduced training time [9].

In the normal optical character recognition systems, an optical scanner digitizes input characters. For reducing the

noise and normalizing the image, every character is placed and divided into segments and the outcome of the image which is a character is processed inside the pre-processor. To classify, certain characteristics are extracted from the character. Many different techniques exist as feature extraction is critical and each has its own potency and weakness. The characters that are identified during classification are collected to rebuild the initial symbol strings and to detect and correct errors context may then be applied.

This paper proposes that using handheld devices documents which contains camera captured images containing texts can be recognized using Optical Character Recognition (OCR) system. Initially, the text regions of the image are extracted and skew corrected. After binarizing these regions, they segmented into lines and characters [10]. In the recognition module the characters are passed. The maximum recognition accuracy of 92.74% is obtained when captured using cell phone camera. This technique consumes low memory and computationally efficient and hence applicable on handheld devices [11].

III. METHODOLOGY

A. Feed Forward Backpropagation

The feature of backpropagation algorithm is the acquired error. The error that is obtained by the neural networks get along its output. The difference between output value and the real value is equal to the obtained error. In the output, the backpropagation algorithm reduces the error. The layers of Neural network is shown in Fig. 1.

Backpropagation algorithm functions using some small repeated steps. Using the pre-initialized weights, an output value is generated. Mean square error value will be calculated using the output values. The required output value is compared with the obtained output value. This process will be followed for all the samples and minimizes the error. This method doesn't process precisely but it learns to solve satisfactorily.

B. Convolutional Neural Network (CNN)

Neural Network is a set of algorithms which are designed to recognize the patterns. CNN has many applications in the field of natural language processing, image recognition, video recognition and recommender system. It is very good at image recognition and biologically inspired neural network. In this network, the much essential layer is convolutional layer. It is used for performing convolutional operation. Next layer is pooling layer. This layer is useful for larger images. The trainable parameters of this layer are large. This layer is useful for reducing size of the image. The original size of the images is 128x128 pixels. The image size is reduced to 28x28 to decrease the time taken for training neural network. The accuracy

ranging to 94% is acquired after training the neural network model.

C. Back Propagation Neural Network (BPN)

With mathematical foundation, the back propagation neural network process is used to train a multi-layer ANN. The intention of Back Propagation Neural network (BPN) is training the neural network. The patterns which are taken as input is balanced between them. Using this BPN, the method is classified into 2 parts. The training section and the recognition section. The work flow Shows in Fig. 2.

D. Deep Neural Network (DNN)

DNN is a neural network with more than two layers. These layers connected with other nodes called interconnected nodes. These layers communicate with each other using the hidden layers. The actual processing is carried out through the weighted connections. These hidden layers are connected to the output layer.

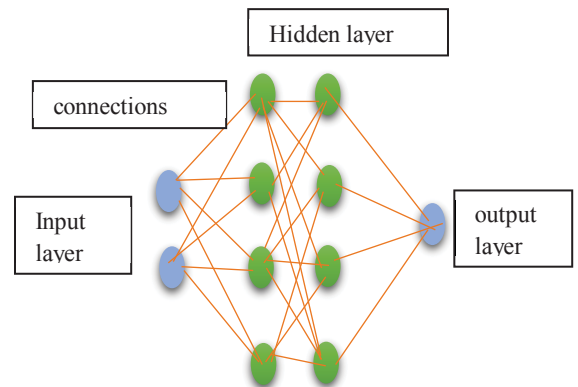


Fig. 1. Layers of Neural Network

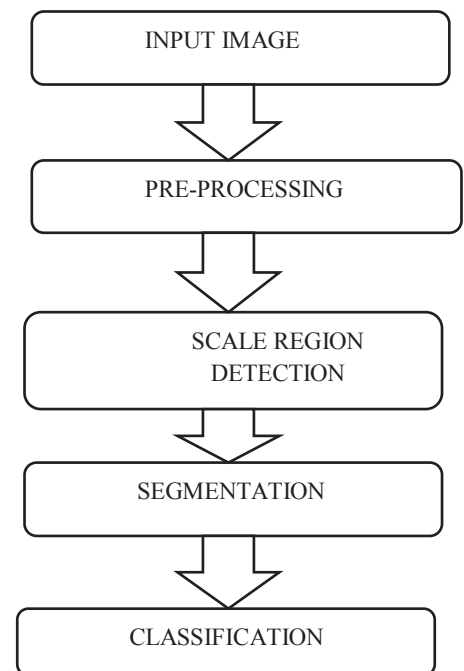


Fig. 2. Flow chart of Work Flow

IV. RESULT

By plotting into graph, the image is divided as lines and the sum of pixel is calculated. From the histograms final text can be predicted.

V. CONCLUSION

In this paper, we studied various algorithms which has been already implemented. Using these algorithms, recognition of characters has been done but still having some chances for the improvements in the existing accuracy and efficiency. In order to obtain an accurate result, successful method should be used and this can be done with the help of Deep Neural Network. In future better algorithms can be used which would yield better results.

REFERENCES

- [1] Jyoti Dalal and Sumiran Daiya "Image Processing Based Optical Character Recognition Using MATLAB" International Journal of Engineering Sciences & Research Technology, ISSN: 2277-9655, CODEN: IJESS7, Dalal et al., 7(5): May, 2018
- [2] Tan Chiang Wei, U. U. Sheikh, Ab Al-Hadi Ab Rahman. "Improved Optical Character Recognition with Deep Neural Network", 2018 IEEE 14th International Colloquium on Signal Processing & its Applications (CSPA 2018), 9 -10 March 2018
- [3] Shyla Afroge, Boshir Ahmed, Firoz Mahmud. "Optical character recognition using back propagation neural network", 2016 2nd International Conference on Electrical, Computer & Telecommunication Engineering (ICECTE), 2016.
- [4] Swati Tomar and Amit Kishore "A Review: Optical Character Recognition" International Journal of Engineering Sciences & Research Technology, ISSN: 2277-9655, CODEN: IJESS7, Tomar et al., 7(4): April, 2018.
- [5] P. Kakkar and U. Dutta, "A Novel approach to Recognition of English Characters using Artificial Neural Networks", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol 3, Issue 6, June 2014.
- [6] K Prasad, D. C. Nigam, A. Lakhotiya and D. Umre, "Character Recognition using MATLAB's Neural Network Toolbox", International Journal of u- and e- Service, Science and Technology, Vol. 6, No. 1, February, 2013.
- [7] M. F. Kader and K. Deb, "Neural network based English alphanumeric character recognition", International Journal of Computer Science, Engineering and Applications (IJCSA) Vol.2, No.4, August 2012.
- [8] A. F. Mollah, N. Majumder, S. Basu and M. Nasipuri, "Design of an Optical Character Recognition System for Camera based Handheld Devices", IJCSI International Journal of Computer Science Issues, Vol. 8, Issue 4, No. 1, July 2011.
- [9] A. Pal and D. Singh, "Handwritten English Character Recognition using Neural Network", International Journal of Computer Science & Communication, Vol. 1, No. 2, July-December 2010, pp. 141-144
- [10] Prem Jacob, T; Pravin, A; Asha, P. Arduino Object Follower with Augmented Reality. International Journal of Engineering & Technology, [S.I.], v. 7, n. 3.27, p. 108-110, aug.2018. ISSN 2227-524X, doi:http://dx.doi.org/10.14419/ijet.v7i3.27.17665.
- [11] Dr. T. Prem Jacob, Implementation of Randomized Test Pattern Generation Strategy, Journal of Theoretical and Applied Information Technology 10th March 2015. Vol.73 No.1.