Literature Review

1. Handwritten Kannada CharacterRecognition based onKohonen Neural Network

Vishwaas M, Arjun M M, Dinesh R

In general, Online Handwriting Recognition refers to the dynamic movement of a Digitized pen on touchpad which simply involves collection of a sequence of x-yco-ordinates used to describe the online handwriting data. This paper presents a novel approach for online handwriting recognition of Kannada characters by combining Direction based Stroke Density principle(DSD) with Kohonen Neural Network(KNN). DSD principle forms the basis for feature selection whereas the subsequent Classification stage is carried out by KNN. The proposed method has been tested for 49 characters and 10 numerals of Kannada Language with 20 different handwritings resulting in an accuracy of 94.4%.This method is simple to implement and realize, also it is computationally efficient.

1. Kannada Handwritten Document Recognition using Convolutional Neural Network

Asha K, Krishnappa H K

In this paper, character recognition system for documents written in Kannada language is proposed. Paper provides the technical details of design and implementation of proposed. Convolutional Neural Network (CNN) model is used for the implementation and Chars74K dataset is used for training the model. System has achieved accuracy of 98% for the document containing non-overlapping lines of characters.

1. An Artificial Neural Networks Approach t Hand-writing Recognition

W L Goh, D P Mital, H A Babri

This paper explores the use of ANN (Artificial Neural Networks) in handwriting recognition. The ANN approach has been found to be very suitable for hand-written character recognition as it provides fast feature extraction and classification. Using the EBP (Error Back Propagation) algorithm networks of relatively small sizes (ones requiring modest memory requirements) which can be trained in a reasonably short time were used. The recognition accuracy of the system has been found to be more than 97 ‘YO with a response speed of about 1 character per second.

1. An Off-Line Cursive Handwriting Recognition System

Andrew W. Senior, Member, IEEE , and Anthony J. Robinson, Member, IEEE

This paper describes a complete system for the recognition of off-line handwriting. Preprocessing techniques are described, including segmentation and normalization of word images to give invariance to scale, slant, slope and stroke thickness. Representation of the image is discussed and the skeleton and stroke features used are described. A recurrent neural network is used to estimate probabilities for the characters represented in the skeleton. The operation of the hidden Markov model that calculates the best word in the lexicon is also described. Issues of vocabulary choice, rejection, and out-of-vocabulary word recognition are discussed.

1. A Handwritten Character Recognition System Based on Acceleration

Chun Yuan\* Shiqi Zhang\* Zhao Wang\*\*

In this paper, an handwritten character recognition system based on acceleration is presented. The character recognition system using a 3-dimensional (3D) accelerometer, includes three procedures: original signal detection, signal processing (preprocessing and quantization) and recognition/classification. In quantization procedure, Trajectory Orientation (TO) and Curve Feature (CF) are adopted and compared. In recognition procedure, Fully-connected Hidden Markov Model (HMM) and Left-Right HMM are both implemented and compared. The system, in the recognition of 10 Arabic numerals, achieves the Correct Rate(CR) of 99.05% and the Total Correct Rate (TCR) of 94.76%.

1. Handwritten Character Recognition Using Deep-Learning

Rohan Vaidya1 , Darshan Trivedi1 , Sagar Satra , Prof. Mrunalini

In this paper we present an innovative method for ofﬂine handwritten character detection using deep neural networks. In today world it has become easier to train deep neural networks because of availability of huge amount of data and various Algorithmic innovations which are taking place. Now-a-days the amount of computational power needed to train a neural network has increased due to the availability of GPU’s and other cloud based services like Google Cloud platform and Amazon Web Services which provide resources to train a Neural network on the cloud. We have designed a image segmentation based Handwritten character recognition system. In our system we have made use of OpenCV for performing Image processing and have used Tensorﬂow for training a the neural Network. We have developed this system using python programming language.

1. Ofﬂine Handwritten Character Recognition Using Neural Network

Anshul Gupta, Chitralekha Mahanta, Manisha Srivastava

Character Recognition (CR) has been an active area of research in the past and due to its diverse applications it continues to be a challenging research topic. In this paper, we focus especially on ofﬂine recognition of handwritten English words by ﬁrst detecting individual characters. The main approaches for ofﬂine handwritten word recognition can be divided into two classes, holistic and segmentation based. The holistic approach is used in recognition of limited size vocabulary where global features extracted from the entire word image are considered. As the size of the vocabulary increases, the complexity of holistic based algorithms also increases and correspondingly the recognition rate decreases rapidly. The segmentation based strategies, on the other hand, employ bottom-up approaches, starting from the stroke or the character level and going towards producing a meaningful word. After segmentation the problem gets reduced to the recognition of simple isolated characters or strokes and hence the system can be employed for unlimited vocabulary. We here adopt segmentation based handwritten word recognition where neural networks are used to identify individual characters. A number of techniques are available for feature extraction and training of CR systems in the literature, each with its own superiorities and weaknesses. We explore these techniques to design an optimal ofﬂine handwritten English word recognition system based on character recognition. Post processing technique that uses lexicon is employed to improve the overall recognition accuracy.

1. HandwrittenEnglishWordRecognitionbasedonConvolutionalNeuralNetworks

Aiquan Yuan, Gang Bai, Po Yang, Yanni Guo, Xinting Zhao

This paper presents a novel segmentation-based and lexicon-driven handwritten English recognition systems. For the segmentation, a modiﬁed online segmentation method based on rules are applied. Then, convolutional neural networks are introduced for ofﬂine character recognition. Experiments are evaluated on UNIPEN lowercase data sets, with the word recognition rate of 92.20%.

1. Handwriting recognition using Deep Learning in Keras

Shefali Arora, M.P.S Bhatia

Nowadays, deep learning is playing an important role in the domain of image classification. In this paper, a Python library known as Keras, is used for classification of MNIST dataset, a database with images of handwritten images. Two architectures – feed forward neural networks and convolutional neural networks are used for feature extraction and training of model, which is optimized using Stochastic Gradient Descent. This paper gives an overview of multi-class classification of these images using these models, and their performance evaluation in terms of various metrics. It is observed that convolutional neural networks achieve a greater accuracy as compared to feedforward neural networks for classification of handwritten digits.

1. Handwritten Character Recognition Based on BP Neural Network

Xin Wang, Ting-lei Huang, Xiao-yu Liu

This paper researches on the issue of computer recognition to the handwritten character images , including lowercase letters and Arabic numerals. In this paper, we preprocess on characters in order to unified the basic features. And then, we apply the basic method of making the grids to extract the features of chacrater, and classify the respectives. At last, we apply the latest heuristic modifications of Backpropagation algorithm to recognize the handwritten characters successfully. The basic datas of this research are testing and debugging on visual studio 2005, a large number of test experiments’ datas show that the discrimination of heuristic modifications of Backpropagation algorithm is up to 95 percentage, further improving validity and correctness of this latest algorithm.

Research Gap

* System will be designed in way to ensure that offline Handwritten Recognition of Kannada characters.
* Use of Neural Network for classification .
* Large number of training data set will improve the efficiency of the suggested approach.

Objectives

Automation of pattern recognition helps to speed up processing time as well as to automate processes without human intervention. Character recognition systems are a subset of pattern recognition. Characters can be in the handwritten or printed form. Handwriting recognition is defined as the task of transforming a language represented in its spatial form of graphical marks into its symbolic representation .