

ABSTRACT

In today's world advancement in sophisticated scientific techniques is pushing further the limits of human outreach in various fields of technology. One such field is the field of character recognition commonly known as OCR (Optical Character Recognition). In this fast paced world there is an immense urge for the digitization of printed documents and documentation of information directly in digital form. And there is still some gap in this area even today. OCR techniques and their continuous improvisation from time to time is trying to fill this gap. This project is about devising an algorithm for recognition of hand written characters also known as HCR (Handwritten Character Recognition) leaving aside types of OCR that deals with recognition of computer or typewriter printed characters. A novel technique is proposed for recognition English language characters using Artificial Neural Network including the schemes of feature extraction of the characters and implemented. The persistency in recognition of characters by the Artificial neural network was found to be more than 90% of times.

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CHAPTER - 1

INTRODUCTION

1.1 INTRODUCTION OF MODEL

This project, 'Handwritten Character Recognition' is a software algorithm project to recognize any hand written character efficiently on computer with input in an image format . Character recognition, usually abbreviated to optical character recognition or shortened OCR, is the mechanical or electronic translation of images of handwritten, typewritten or printed text (usually captured by a scanner) into machine-editable text. It is a field of research in pattern recognition, artificial intelligence and machine vision. Though academic research in the field continues, the focus on character recognition has shifted to implementation of proven techniques. Optical character recognition is a scheme which enables a computer to learn, understand, improvise and interpret the written or printed character in their own language, but present correspondingly as specified by the user. Optical Character Recognition uses the image processing technique to identify any character computer/typewriter printed or hand written. A lot of work has been done in this field. But a continuous improvisation of OCR techniques is being done based on the fact that algorithm must have higher accuracy of recognition, higher persistency in number of times of correct prediction and increased execution time. The idea is to device efficient algorithms which get input in digital image format. After that it processes the image for better comparison. Then after the processed image is compared with already available set of font images. The last step gives a prediction of the character in percentage accuracy.

1.2 Objective of the Project

The objective of this project is to identify handwritten characters with the use of neural networks. We have to construct suitable neural network and train it properly. The program should be able to extract the characters one by one and map the target output for training purpose. After automatic processing of the image, the training dataset has to be used to train "classification engine" for

recognition purpose.

CHAPTER - 2

Literature Survey

2.1 Literature Survey

Research in the region of word recognition, being done from Grimsdale in the year 1959 is soonest endeavor to perceive the handwritten character. This mid-sixty research exhibited the utilization of examination by combination strategy being proposed by the eden in 1968. He demonstrated that every single handwritten character is limited to number of schematic highlights. This hypothesis was later utilized as a part of almost all strategies for auxiliary methodologies in the region of character recognition. K. Gaurav and Bhatia P. K [2], proposed different prehandling systems being associated with the recognition of the characters. The procedure took a shot at the various types of pictures from a basic picture-based report to a hue and changed forces including foundation. Different systems of pre-handling and standardization like skew remedy, differentiate evacuation, commotion expulsion and numerous other upgrade procedures were recommended. They reached the decision that a solitary procedure can't be connected for preprocessing the picture. Yet additionally there were a few disparities that utilizing every one of these systems likewise can't give the best exactness comes about. Salvador España-Boquera [3], The analysts proposed the utilization of hybrid or half plus half concealed markov show (HMM) to perceive the handwritten content in disconnected mode. The optical model's basic part was prepared with markov chain procedure and a multilayer perceptron was likewise used to gauge the probabilities.

In [4], to perceive the disconnected handwritten numerals of six prominent Indian language, a changed quadratic classifier is utilized. A similar paper likewise manages perceiving the English letters in order. For both of these, a multilayer perceptron was utilized and Boundary following and Fourier descriptors were utilized for the component extraction. By examining the shape and looking at their highlights,

the characters were identified. Also, to decide the quantity of concealed layers, back spread system was utilized. With this very calculation, a recognition rate of 94% have been accounted for with less preparing time. R. Bajaj, S. Chaudhari, L. Dey, et al [5], for grouping the Devanagari numerals, distinctive highlights like clear part, thickness and minute highlights were utilized. Additionally, to increase the recognition capacity, the paper proposes multi classifier unwavering quality for handwritten Devanagari numerals. Sandhya Arora in [6], In this paper specifically four highlights like shadow, histogram of chain code crossing point and horizontal line fitting highlights being portrayed. Among these highlights the shadow was registered all around for picture character, the rest three were processed by partitioning the character picture into the distinctive sections. In the one useful execution utilizing the dataset of 4900 examples demonstrated the exactness rate of 90.8 % for Devanagari handwritten characters. Nafiz Arica at al. [7] This paper gave the technique because of which it was less demanding to maintain a strategic distance from the preprocessing stage along these lines lessening the loss of imperative data. The best one proposed was calculation of capable division. What's more, the different strategies supporting this calculation were utilizing neighborhood maxima and minima, additionally other, for example, stroke tallness which turned out to be ideal and furthermore character limit. What's more, these were altogether connected on a grayscale picture. Utilizing this approach, superfluous division was decreased bit by bit. Alongside that, the paper additionally proposed another model called shrouded markov demonstrate (HMM) preparing for estimation of worldwide and highlight space parameters alongside estimation of model parameters. Additionally, to rank the individual characters and furthermore to get the shape data, this preparation show was utilized. Additionally, by utilizing the one-dimensional portrayal of a 2-D character picture tremendously builds the energy of HMM for shape perceiving. In [8], a technique was proposed to perceive the individually Tamil written character by utilizing the grouping in the strokes. Principally a strokes' format or shape-based portrayal is utilized spoken to as a string of shape highlights. Utilizing this strategy, the unrecognized stroke was perceived by contrasting it and a dataset of strokes by the string coordinating method in an adaptable mode. Utilizing this, an individual character was perceived

by distinguishing every one of the strokes and its segments.

CHAPTER 3

METHODOLOGY

3.1 Artificial Neural Network

An early phase of Neural Network was developed by Warren McCulloch and Walter Pitts in 1943 which was a computational model based on Mathematics and algorithm. This model paved the way for research which was focused on the application of Neural Networks in Artificial Intelligence. Artificial neural network is basically a mesh of large number of interconnected cells. The arrangement of cells are such that each cell receives an input and drives an output for subsequent cells. The diagram below is a block diagram that depicts the structure and work flow of a created Artificial Neural Network. The neurons are interconnected with each other in a serial manner. The network consist of a number of hidden layers depending upon the resolution of comparison of inputs with the dataset.

3.1.1 Creating and training of network

In case of character recognition we have to create a 2D vector of character images which can be fed to the network as ideal set of input variables. In our case there is a total of 26 capital English letters which we are to recognize. Below is a set of characters written in binary form of 7x5 sized matrix of 26 capital English letters:

3.1.2 The architecture of an artificial neural network:

To understand the concept of the architecture of an artificial neural network, we have to understand what a neural network consists of. In order to define a neural network that consists of a large number of artificial neurons, which are termed units arranged in a sequence of layers. Let us look at various types of layers available in an artificial neural network.

Artificial Neural Network primarily consists of three layers:

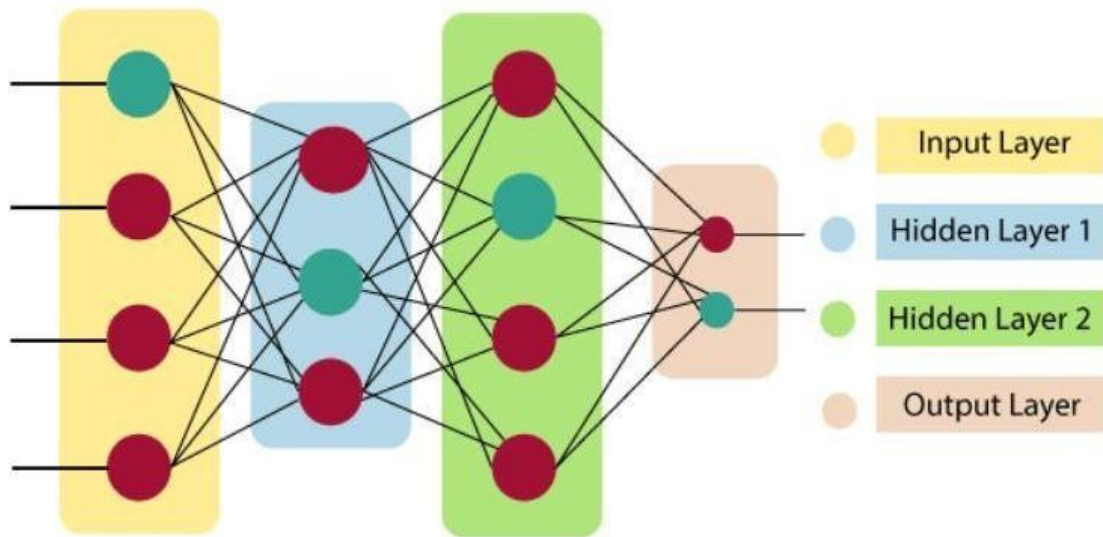


Fig.3.1 Architecture of an artificial neural network

Input Layer:

As the name suggests, it accepts inputs in several different formats provided by the programmer.

Hidden Layer:

The hidden layer presents in-between input and output layers. It performs all the calculations to find hidden features and patterns.

Output Layer:

The input goes through a series of transformations using the hidden layer, which finally results in output that is conveyed using this layer.

The artificial neural network takes input and computes the weighted sum of the inputs and includes a bias. This computation is represented in the form of a transfer function.

$$\sum_{i=1}^n W_i * X_i + b$$