Neural Network to Recognize Handwriting Objects

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Abstract: The Handwriting recognition is the ability of the machine's to receive and translate handwriting input from multiple sources such as text, images and touch screen devices. The adoption of handwritten and machine-made characters is an emerging field of research and finds many programs in banks, offices and industries. The main objective of this project is to design an expert program, "HCR using Neural Network" that can accurately detect a character of a certain type of format using the Artificial Neural Network method. The Neural Computer is a relatively new field, and the construction components are therefore less well defined than other construction. Neural Computers Use Data Matching Neural computers operate in a completely different way from normal computer operations. Neural Computer is trained (not configured) to be given the initial state (data entry); they separate the input data from one of several classes or change the original data in such a way that a particular desirable asset is properly performed.

Keywords: Neural Networks, Handwriting objects, HCR,MNSIT, ANN

1. INTRODUCTION

The Neural Network of Handwriting Digital Handwriting is based on in-depth learning where MNIST Datasets are used to train neural networks. This invention has allowed machines to be identical and beyond human ability to perform certain tasks. Object recognition clause - digital recognition using ANN (Artificial Neural Network) and Electronic Learning with MNIST Datasets. We will take hand-drawn drawings of numbers 0-9 and build and train the neural network with the MNIST Dataset to identify and guess the appropriate digital label shown. Digital images are taken in various scanned documents, in standard and medium size. Handwritten Digital Visibility is one of the most important issues in building an effective visual system. We can use it to read the Address Code, vehicle number and Bank Check functionality, Evidence endorsement etc. Handwritten Digital Recognition is one of the most important issues in building an effective visual system. Quick applications for digital recognition techniques include, reading of address code, plate number plate and processing of bank checks etc.

This app is useful for identifying all characters (English) provided as in the installation image. Once the character input image is provided in the proposed program, then it will see the input character provided in the image. Character recognition and classification are done by Neural Network. The main objective of this project is to successfully identify a specific character of a genre using the Artificial Neural Network method.

1.1 What is Neural Network

In area of computation there is one of the latest tools which deals with brain of human that is neural network can be define as series of algorithms that underlying relationships which is endeavors to recognize in a set of data through a process that mimics the way the human brain operates. The neural network also deals with human brain and neurons in soft computing in which and there are Artificial Neural Network (ANN) is an information-processing paradigm that is inspired by the way biological nervous systems of human being, such as the brain and nervous system, process information. The pattern recognition or data classification is one of the most important applications, through a learning process. The learning process in a Biological system involves adjustments to the synaptic connections that exist between the neurons. The most important element of this scenario is the one of the best structure of the data and information processing system. It is composed with large numbers of highly interconnected processing element that is known as neurons which working in union to solve specific problems. The ANN's like peopling, learning by example and there is ANN configured for a specific applications.

1.2. Implementation of HCR

HCR operates in stages such as preoperative processing, classification, feature extraction and recognition using the neural network. Progress includes a series of tasks that must be performed on a document to make it ready for classification. During partitioning, the document image is separated by a single letter or numerical image and the process of extracting a feature from the character image is applied. Finally, the feature vector is introduced into the selected algorithm for recognition. Here the extracted elements are given to NN to find the character.

2. LITERATURE REVIEW

The various pre-processing techniques involve within the character's recognition with a variety of logical images from simple text based on handwritten form and texts containing a complex and complex background and size. Offline character recognition is suggested by singing the pull feature. supported by ANN model. There are two ways to make a neural network system similar to element 54 and 69 features.[1]

A system of offline handwriting recognition based on Hidden Markov Models (HMM) using discrete and hybrid display techniques. [2]

It has used three trait styles, such as plural elements, temporary elements, and descriptive elements of the Devanagari Numerals classification.Obtained 89.6% accuracy of Devanagari handwritten numbers.[3]

This is using a complex set using the box method and the recognition is 90%. This model works for a variety of sources. In previous research, it is clear that this model is effective with a variety of sources of information, but it lacks a small amount of accuracy in the case of long sentences. Many of the proposed models seem to be less effective in improperly categorizing long text data. Some of the side models include CNN networks and have shown good results due to its ability to handle long text data.[4]

2.1.Offline Handwritten English Numerals Recognition using Correlation Method:

In this paper the author proposes that the system is a better understanding of handwritten digital digits with greater accuracy than previous works. Also, previous handwriting numbers of recognition systems are based

on seeing only one digit and cannot see multiple numbers at once. Therefore, the author focuses on the proper execution of the digit division phase.

2.2.Recognition of Handwritten Hindi Characters using Back propagation Neural Network:

Automatic recognition of handwriting characters is a difficult task because the characters are written in a variety of twisted and combative forms, so they can be of different sizes, shapes, sizes, formats and sizes. The Hindi handwritten offline recognition system that uses the neural network is provided in this paper. Neural networks are good at recognizing handwritten characters as these networks do not care about lost data. This paper proposes a way to accept Hindi characters in four categories: *1) Scanning, 2) Advancing, 3) Feature Extraction 4)* Recognition

Pre-preparation includes noise reduction, contrast performance, familiarity and reduction. Feature output involves extracting some useful information from a diminished image with the characteristic vector status. An element vector contains the pixel values of a standard character image.

3. PROPOSED TECHINIQUES

3.1. Handwritten Text Recognition

The Handwritten Text Recognition (HTR) systems that are consist of handwritten text components in the form of scanned images as shown in figure 3.1 as follow. We are going to build a Neural Network shortly known as (NN) which has trained on word-images from the IAM dataset from database. Since the input layers are often kept small for word-images, NN-training is possible on the CPU. Therefore, the implementation of HTR, the minimum requirement is Text Format.

FIG. 3.1: Image of word taken from IAM Dataset.

3.2. Model Overview

There are uses of a NN for our task process. That is consists of a convolutional neural network (CNN) layers and recurrent neural network (RNN) layers, and a final Connectionist Temporal Classification (CTC) layer. In this process to apply these above layers concept, we have taken five CNN (feature extraction) techniques and a pair of RNN layers and a CTC layer to calculate the loss. First, we have to pre-process the pictures in order that we can reduce the noise.

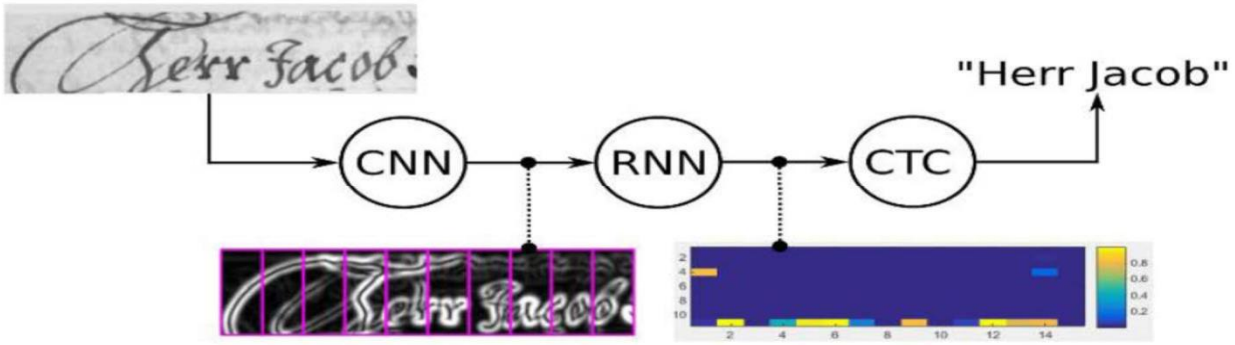

FIG 3.2: Overview of HTR

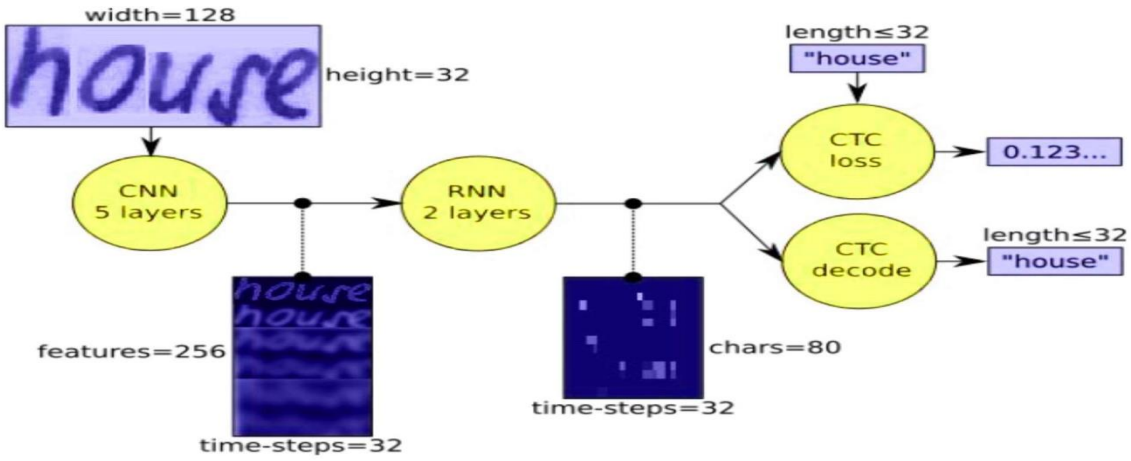

FIG. 3.3: Green indicates the operations of NN and Pink indicate the dataflow through NN

4. METHODS & OPERATIONS

- CNN: The input image is gives to the CNN layers shown in the above figure 3.3. These all the mentioned layers which are trained that to take out relevant features from the main source of the image and extract them with help of features extraction algorithm. Each layer consists of three operations. First, the convolution operation, 5×5 filter is used in the first two layers and 3 × 3 filters used in the last three layers to the input. Then, the non-linear RELU function is applied. In the last phase of operations there is a pooling layer which summarizes image regions and gives outputs and minimized version of the input. While the height of image size is reduced by 2 units in the each layer of the process system, feature channels are added, so that the output feature sequence has a size of 32×256.
- CTC: During training the Neural Network system, the CTC layers is given to the RNN layers as output matrix, and the ground truth text and it computes the loss value. In case of inferring, the CTC is just given the matrix and it decodes it into the ultimate text of result and in both case the bottom truth text and the recognized text are often at the most 32 characters long that measure as pattern.
- RNN: The feature sequence of CNN is consists of 256 features per time-step which as define by algorithm of features extraction, the RNN propagates relevant information through this sequence. The favored Long Short-Term Memory (LSTM) implementation of RNNs is employed because it can propagate information through longer distances and provides more robust training- characteristics than vanilla RNN. The IAM dataset contains at least 79 different set of characters and further one additional character is required for the CTC operation that is CTC blank label, so that there are 80 entries for every of the 32 time-steps of features mapped images. The RNN output sequence is mapped into a matrix of 32×80.

4.1 Introduction to used Algorithms

The Graphical User Interface (GUI) is the Specification for the creation of GUI we have used the java swing toolkit. Tkinter library is an official Python GUI library. The main characteristics of the Tkinter Python library as follow:

1. platform independent
2.customizable 3.extensible
4.configurable 5.lightweight
4.1.1. Important Modules and Algorithm Used

There are descriptions of the various implementation steps of this process in which we are applying in order to achieve the final target our projects.
Module 1: Image Processing

The first step to the Preprocessing includes that are required to shape the input image into a form and suitable for segmentation. Color image is converted into gray scale.The Image transformation into binary image that means in the form of black in white image.

4.1.2. Gray Scale Conversion

A triplet that consist of (R,G,B) of intensities for red, green and blue color that define as each color pixel is described.

We can map that to a single number giving a gray scale value. There are many approaches to that convert color image into gray scale images and an average method is used for color to gray scale conversion of the images.
Algorithm :Gray Scale Conversion

Input :Scanned Handwritten Document Image

Output :Gray Scaled Document Image

Step 1: Start

Step 2: Select Input Document Image.

Step 3: Repeat for x=0 to Width of Image. Step 4:
Repeat for y=0 to Height of Image.
Step 5: Extract RGB value for each of pixel as RGB(i,j) int col =
inPixels[x][y];
int r = col & 0xff;

int g = (col >> 8) & 0xff; int b =
(col >> 16) & 0xff; int gs = (r + g +
b)/3;
Step 6: Set Pixel with computed gray level as :

inPixels[x][y] = (gs | (gs << 8) | (gs << 16)); gimage.setRGB(x, y,
inPixels[x][y]);
Step 7: Display Gray Scale image.

Step 8: Stop

4.1.3. Binarization

Image Binarization converts an image pf upto 256 gray level to a black and white image.

The simplest way to use image binarization is to choose a threshold value and clasify all pixels with values above the threshold as black and all other pixels are white.
Algorithm :Image Binarization(Threshoulding)

Input :Gray Scaled Image Output :Black
and White Image Step 1: Start
Step 2: Select Gray Scaled Document Image.

Step 3: Repeat for x=0 to Width of Image. Step 4:
Repeat for y=0 to Height of Image. Step 5: Set the
Threshold.
Step 6: Extract RGB value for each of pixel as RGB(i,j) int col =
inPixels[x][y];

int r = col & 0xff;

int g = (col >> 8) & 0xff; int b =
(col >> 16) & 0xff; int gs = (r + g +
b) / 3;
Step 7: If pixel(gs) is Above Threshold Then

{

```
r=g=b=0;
}
else
{
r=g=b=255;
}
```

Step 8: Set Pixel with computed Threshold level as : inPixels[x][y] =
(b | (g << 8) | (r << 16));
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```
bimage.setRGB(x, y, inPixels[x][y]);
```

Step 9: Display Binarized Image.

Step 10: Stop

5. RESULT & CONCLUSION

We have successfully completed all the phases of software design but still doing research. About 75% of the software has been developed and its GUI & Documentation are ongoing to complete. We have shown that relatively small amounts of training data are sufficient for state-of-the-art accuracy in handwritten digit recognition, and that the relationship between training set size and accuracy follows a simple asymptotic function.We have also shown that none of the considered learning systems are able to transfer their expertise to other similar handwritten digit recognition datasets. The obtainable error rates are even in the best case far less than what has been reported on single datasets. This indicates that systems learn significant non-task- specific idiosyncrasies of specific datasets or not sufficiently well-documented preprocessing methods and do not yet offer stable dataset-independent performance. Thus, present systems can be considered *brittle* in AI erminology, albeit at higher performance level than previous classical AI systems.

The system will be designed in such a way as to ensure that Offline Awareness of English characters. Our old and heroic HCR books can be digitally returned. Using of Neural Network to be categorized a large number of training data that will improve the efficiency of the proposed method.

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