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Handwritten Text Recognition System using Convolutional Neural Network

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Abstract- Character recognition is one in all the emerging fields within the computer vision. The most abilities of humans are they will recognize any object or thing. The hand transcription can easily identify by humans. Different languages have different patterns to spot. Humans can identify the text accurately. The hand transcription cannot be identified by the machine. It's difficult to spot the text by the system. During this text recognition, we process the input image, extraction of features, and classification schema takes place, training of system to acknowledge the text. During this approach, the system is trained to seek out the similarities, and also the differences among various handwritten samples. This application takes the image of a hand transcription and converts it into a digital text.

I. INTRODUCTION

It's difficult for a machine to recognize the handwritten characters of human beings. For recognition, we've to coach the system to acknowledge the text. Handwritten Text Recognition (HTR) systems consist of handwritten text in the form of scanned images

we are going to build a Neural Network (NN) which is trained on word-images from the IAM dataset. because the input layer (and therefore also all the opposite layers) are often kept small for word-images, NN-training is possible on the CPU (of course, a GPU would be better).

For the implementation of HTR, the minimum requirement is TF. For recognition, we've to coach the system to acknowledge the text. The character recognition involves several steps like acquisition, feature extraction, classification, and recognition. Handwriting recognition is the ability of a machine to receive and interpret the handwritten input from an external source like image. the most aim of this project is to style a system that may efficiently recognize the actual character of format employing a neural network.

II. PROPOSED SYSTEM

Handwritten Text Recognition (HTR) systems converts handwritten text which are in the form of scanned images to editable text.

A Neural Network (NN) is trained on word-images from the IAM dataset which is used for conversion.

Recognition accuracy is improved by using Data Augmentation.

The working model of the handwritten text recognition System involves steps beginning from the data pre-processing to the resulting interface that allows users to upload the image and finally obtain the digital text.

III. SYSTEM REQUIREMENTS

1. Hardware Requirements

The minimum hardware requirements toexecute the system are as follows:

- Processor - Intel I7
- RAM - 8GB
- Storage - 2GB

2. Software Requirements

- Operating System – Windows 10

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- Backend – Python
- Frontend – Python

3. Functional Requirements

- Data Collection
- Data Preprocessing
- Training and Testing
- Modeling
- Predicting

4. Non-Functional Requirements

- Performance
- Reliability
- Availability
- Maintainability
- Portability

IV. METHODOLOGY

We use a NN for our task. It consists of a convolutional neural network (CNN) layers, recurrent neural network (RNN) layers, and a final Connectionist Temporal Classification (CTC) layer. In this project, we've taken 5 CNN (feature extraction) and a pair of RNN layers and a CTC layer (calculate the loss). first, we've to preprocess the pictures in order that we are able to reduce the noise.

3 LAYERS OF HTR :

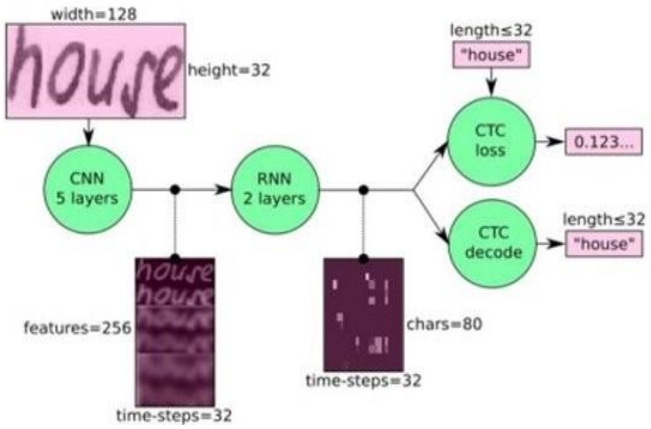

Fig 1: 3 layers of HTR

CNN layer:

The input image is given to the CNN layers. These layers are trained to take out relevant features from the image. Each layer consists of three operations. First, the convolution operation, 5×5 filter is used in the first two layers and 3×3 filter used in the last three layers to the input. Then, the non-linear RELU function is applied. At last, a pooling layer summarizes image regions and outputs a downsized(smaller) version of the input. While the height of image size is reduced by 2 in each layer, feature channels are added, so that the output feature sequence has a size of 32×256.

RNN layer :

The feature sequence consists of 256 features per time-step, the RNN propagates relevant information through this

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sequence. The favoured Long Short-Term Memory (LSTM) implementation of RNNs is employed because it is in a position to propagate information through longer distances and provides more robust training-characteristics than vanilla RNN. The RNN output sequence is mapped to a matrix of 32×80.

CTC layer:

While training the NN, the CTC is given the RNN output matrix and also the ground truth text and it computes the loss value. While inferring, the CTC is just given the matrix and it decodes it into the ultimate text. Both the bottom truth text and also the recognized text are often at the most 32 characters long.

V.IMPLEMENTATION

The method of implementation isexplained by the below steps:
Step-1 Path of the image is entered in the HTR interface.
Step-2 The model is trained using NN and IAM dataset.
Step-3 The handwritten text in the image is converted to digital text and displayed on the interface.

RESULTS

Fig 2: Input image

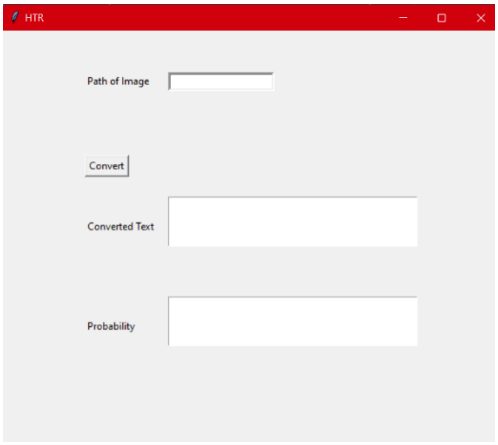

Fig 3: GUI of HTR

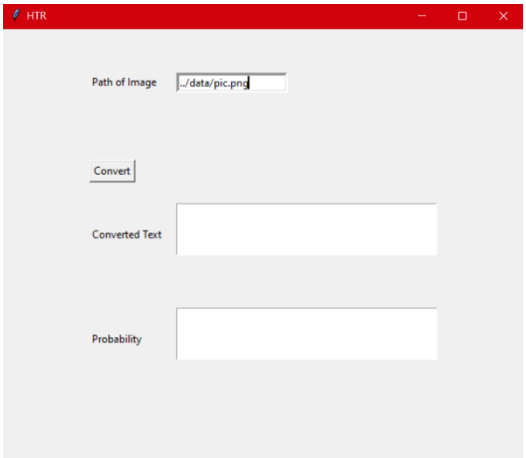

Fig 4: Entering the path of the image

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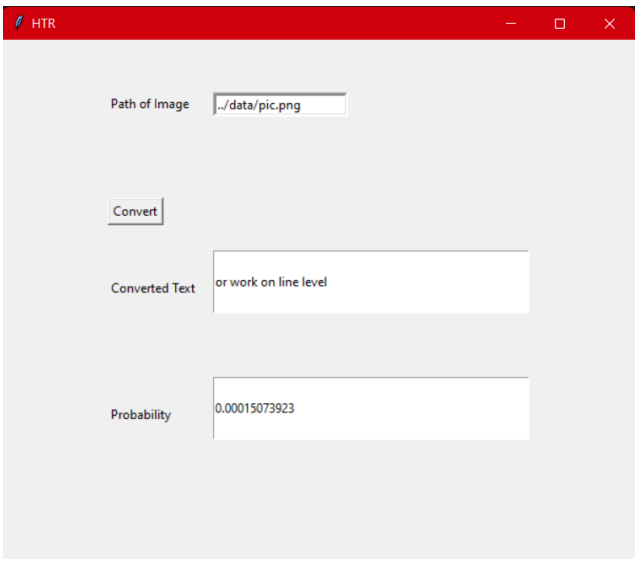

Fig 5: Output Screen

CONCLUSION

In this project classification of characters takes place. It is achieved through the conventional neural network. The accuracy we obtained in previously is 90.3%. But currently the accuracy is 95.03%. This algorithm will provide both the efficiency and effective result for the recognition.

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