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Multilingual Text & Handwritten Digit Recognition and Conversion of Regional languages into Universal Language Using Neural Networks

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***Abstract*—The Character recognition techniques equate an illustrative identity with the image of character. Handwritten human character recognition is a machine's ability to obtain and recognize handwritten information from various sources such as papers, photos, tactile touch devices etc. Recognition of handwriting and computer characters is an evolving field of study and has broad uses in banks, offices and industries. The key objective of this research work is to develop a knowledgeable framework for "Handwritten Character Recognition (HCR) victimization Neural Network" which might effectively acknowledge selected type-format character victimization as the substitute Neural Network approach. Neural method is the best method for controlling images, thus style parts square measure less all around plot as compared to various designs. Neural computers do parallel results. Neural computers square measure run during a manner that's utterly different from traditional operation. Neural computers square measure conditioned (not programmed) in such a way, that how it's given in an explicit beginning state (data input); they either assign the information (input file or computer file) into one amongst the quantity of categories or permit the initial data to evolve to maximize an explicit fascinating property. In this research work, a purely handwritten digit recognition using machine learning model as well as character recognition matlab model is used. A translator using MATLAB to beat the barrier of various languages is designed. The projected style is also used for English, Marathi and Guajarati text to speech conversion into English language. Input is taken in English, Marathi and Gujrati text manually to the interface or image of written text or handwritten text and output can be translated in English Language by facilitating use of Optical Character Recognition (OCR) technique. The projected methodology is also used to produce help to folks that lack the ability of speech or non-native speakers. On the other hand, purely handwritten digit recognition using machine learning algorithms is used to interpret the human handwriting to the second person easily and effectively.**

Keywords—: Off-line Handwritten Recognition, Handwritten Character, Pattern Recognition, Feature Extraction, Neural Network.

I. INTRODUCTION

Handwriting recognition has acquired a special place in the field of pattern recognition and machine learning due to its enormous applications. This technique is the solution to the problem when it is difficult for the viewer to understand someone else's handwriting. For this we are using a certain type of deep neural network which is Convolutional Neural Networks. A GUI is build in which we can draw the digit and recognize it straight away. This Python project requires you to have basic knowledge of Python programming, deep learning with a library for building GUI.

For character recognition and translation, we will use a matlab code. Optical character recognition (OCR) is actually a computer code established to translate pictures that are captured employing a scanner and regenerate into machine editable text, or to remodel pictures of characters or symbols into standard ASCII or Unicode formats. [1] In this particular project, a character recognition framework by employing JAVA is build. There is a great need of recognition program of this type these days. In today's world, where our main focus or concentration is on using efficient and cost-effective processes, many people are now using technology to perform activities that used to be both laborious and time-consuming.

The nature of our modern gadgets is their productivity and their role in reducing the strength of labor. Computers are now being used as a more well-ordered and well-regulated substitute for taking and handling notes and for eradicating potential issues around handwriting consistency or paper sheets being lost. Additional advantages of choosing technology include the ease of later rendering such notes easier, as well as reducing the waste of physical space.

Those electronic documents would be placed on drives as such. Another example of the advantages of the current technology is the use of tablets for both professionals and students, eliminating the need for multiple books and various important documents, once again avoiding the loss of additional physical space and enabling all the necessary data to be stored in a small piece of equipment. Data management has achieved considerable popularity in executions in

engineering. Since the industry sector has been steadily increasing over the past several decades, a significantly higher market can be met for automated machinery. This automatic machinery is highly dependent on data management in the form of utility character identification. A simple example for this can be the analogy of data management in a particular distribution complex close to mail organization, where all data is processed by OCR platforms. Then decisions are made by means of automated machine arms to route the correct mail to the right lane so that all mails are routed according to the places they need to be sent.

II. LITERATURE SURVEY

ManikVarma, "Character Recognition In Natural Images" they implement the matter of realizing characters in pictures of natural scenes. Specially, they concentrate on recognizing characters in things that might historically not be handled well by OCR techniques. They gave associate degree anno-tated data of images carrying South and English Dravidian characters.[2] The data contains images of street scenes taken in city, Asian natiSon using a standard device. The matter addressed in the associate object categorization framework supported a counts-of-words illustration. They evaluate the performance of assorted choices supported nearest neighbor and SVM classification. It's incontestable that the performance of the projected methodology, victimization as few as fifteen coaching pictures, may be way superior to it of economic OCR systems. what is more, the strategy will take pleasure in synthetically generated coaching information, preventing the requirement for dearly-won information assortment and annotation.

In more recent add a similar space; Lopresti and Zhou dynasty calculated the performance of the many classical and magnified IR models exploitation simulated OCR information. to strengthen ancient IR models to agitate the flawed information, they used estimated string matching and symbolic logic. At large, they were able to reveal that the new ways that area unit extra robust to strident information than the initial ways that, suggesting that simple enhancements is used to improve performance [3].

Ohta et al, delineate a system for word (content) search throughout that they augment three possibilities any retrieval ways in which with info regarding awaited OCR errors.The approach used uncertainty data for certain characters, in conjunction along with bi-gram potentialities of character existence to make numerous possible search terms for each primary search term when activity the search with each latest term, the rationality of came documents depends on the hesitancy and bi-gram prevalence probabilities.. [4]The results claim will increase from 2-3 percent in recall with decreases or 4-5 percent in exactitude. Fujisawa Associate in NursingdMarukawa used constant approach throughout that they use confusion statistics to urge Associate in nursing enhanced finite state machine for question terms in Japanese text.

A different approach to making an attempt to alter the question to influence low quality is to alter the parallel (matching) rule, as depicted by Takasu. To urge rate, the process uses a 2 stage rule where the first stage uses a fast string matching rule to urge match aspirant, and conjointly the 2nd stage uses loads of acceptable close distance live, just like the Levenshtein distance. Like this process shows little enhancements in recall, with small decreases in preciseness.

III. INDIAN CHARACTER RECOGNITION

Not many makes it, a several trials are done on the word recognition of Indian character sets. Even so, some vital works square measure according on Nagari script. A few makes an attempt on Tamil, Gujarathi, Malayalam, Marathi and Bengali. Word recognition and written communication is of nice importance for electronic conversion of historical knowledge alongside letters and varied documents. The matter is hard as a result of human handwriting unevenness, variable skew and direction still as noise and deformation like fleck, smears, light-weight print, and so on.

Recognition of written Indian manuscripts considerably of gujrati, still as English, Marathi etc. Majority of the Indian scripts have five hundred or heaps of characters, words or symbols utilized in flowing text, by way of quantity of basic consonants and vowels isn't quite fifty. The quantity is inflated by 3 forms of vowel modifiers that is in a position to be appendant below the consonants, thus generating threefold consonant-vowel mixtures. A great deal of increase in vary is feasible wherever consonant creates a rhetorical writing kind discovered as compound characters. For a couple of manuscripts like Malayalam, kannada and syllabary languages compromise monumental vary of compound letters. These compound letters may take vowel transformers to come back up with threefold tons of shapes. Hence, writing symbols may run of the structure of a thousand.

Purpose of study

Recently, it tends to be within the condition that people forever carry giant resolution digital devices. For this rationale, image recovery with queries captured by a digital device is paid further attention. Throughout this a tendency to particularly concentrate on document image recovery, that would be the duty to search out a document image from an information comparable to a question achieved by clicking a document. This method will give people with the knowledge that is related to the recovered document within the information. In alternative words, along the assistance of document image recovery, paper documents will be observed as media for accessing varied information; pictures, texts and additional. In addition to that it focuses on text recognition of traditional languages such as gujrati and Marathi. The projected methodology is also use to produce help to folks that lack the ability of speech or non-native speakers.

IV. OBJECTIVE

1. Using Neuronal signals in the realm of literature.

2. Man-power reduced for manually converting old literature into digitized form.

3. The suggested program acted as a reference and functioned in identification fields of character.

4. Making the digitized language library rich.

V. SYSTEM ARCHITECTURE

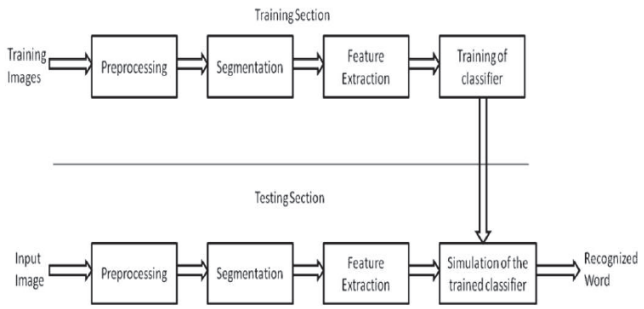

Fig. 1. System Architecture

VI. TECHNICAL DETAILS

A. For character recognition and translation

1. Input an Image
2. Image Preprocessing
3. Selection (Segmentation)
4. Extracting features (Feature Extraction)
5. Categorization (Classification)[6]

1) Input an image

Input image is also any written scanned image that contains Bangla numeric digits. The image could contain single or connected digit(s) and size of letter could dissent from one another.

2) Image Preprocessing

The image is preprocessed victimisation varied algorithms for image process, like Inverting image, grey Scale Conversion, and image cutting.

3) Segmentation

After preprocessing of the image selection is finished. This can be through along with the assistance of following steps:

1 .Take out the borderlines.

2. Split the text (Characters) into series,

3. Split the rows (horizontal lines) into text.

4 .Bisect the word (text) into characters

4) Feature Extraction

Once the word (letter) is divided binary glyphs is produced and find the summation as options of every row including column values.

5) Classification

In this part, focus is on area unit aiming to instruct and check the Neural Network.

B. For Handwritten digit recognition

1. Import the libraries and load the dataset.
2. Preprocess the data
3. Create the model
4. Train the model
5. Evaluate the model
6. Create GUI to predict digits

1) Import the libraries and load the dataset

Firstly, import all the modules that will need to training our model. The Keras library already contains some datasets and MNIST is one of them. So it can easily import the dataset and start working with it. The mnist.load_data() method returns us the training data, its labels and also the testing data and its labels. Files of handwritten images is made and converts it into .csv file and make it read.

2) Preprocess the data

The image data cannot be fed directly into the model so we need to perform some operations and process the data to make it ready for our neural network. The dimension of the training data is (60000,28,28). The CNN model will require one more dimension so we reshape the matrix to shape (60000,28,28,1).

3) Create the model

Now, create our CNN model in Python data science project. A CNN model generally consists of convolutional and pooling layers. It works better for data that are represented as grid structures, and so CNN works well for image classification problems. The dropout layer is used to deactivate some of the neurons and while training, it reduces over fitting of the model.

4) Train the model

The model.fit() function of Keras will start the training of the model. It takes the training data, validation data, epochs, and batch size. It takes some time to train the model. After training, we save the weights and model definition in a certain file.

5) Evaluate the model

We have 10,000 images in our dataset which will be used to evaluate how good our model works. The testing data was not involved in the training of the data therefore, it is new data for our model. The MNIST dataset is well balanced so we can get around 99% accuracy.

6) Create GUI to predict digits

For GUI, we need to create a new file in which we build an interactive window to draw digits on canvas and with a button, we can recognize the digit. The Tkinter library comes in the Python standard library. For that create a function that takes the image as input and then uses the trained model to predict the digit. We create a canvas where we can draw by capturing the mouse event and with a button, we trigger the function and display the results.

VII. ALGORITHM

- To make this model, first study and search for the handwritten digits and the actual computerized digits.
- We need to look for the dataset available already or if we want, we can create our own dataset which can be in the ".csv" file format.
- MNIST dataset can be accessed through OpenML library, while ".csv" dataset can be made to read through panda's library.
- Next we need to check for the dimensions of the images in the dataset, for this model we are using (28*28) dimension that is 28 rows and 28 columns.
- Then work on the python code and import necessary modules, libraries and create functions for the same. We can check for the desired digit then and it will

show us accuracy of the digit it has been matched maximum with.

VIII. EXPERIMENTAL RESULTS

We have used MATLAB and ANACONDA software system for our implementation on character recognition and translation & handwritten digit recognition respectively. The experiments were performed on several datasets, take a look at pictures having differing types of numerals in Gujrathi, Hindi and English literature. First we tend to browse the scanned input image then eliminate the noise from the scanned image. The preprocessed input image is divided line by line by scanning and indicating the left-top edge and right-bottom fringe of the road from the input image. The segmentation is extracting a line of numerals. All sides of those lines of numerals can specifically bit the road boundary of the bounding box. Then we segment on individual Characters from each segmented line. The scanned image is resized to 32x32 pixels and convert them into English We collect hand written numeral for input from set of different people and a selected dataset.

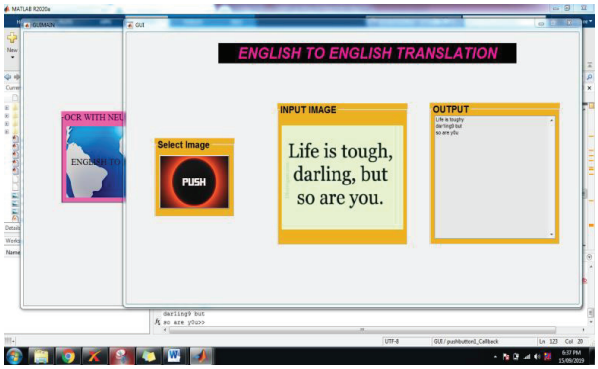

Fig. 2. Text Recognition of English Language

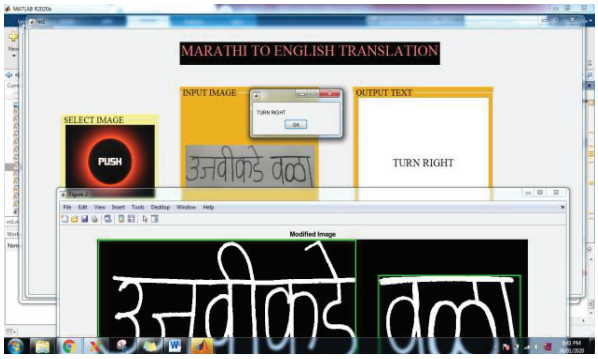

Fig. 3. Text Recognition and Conversion of Marathi to English

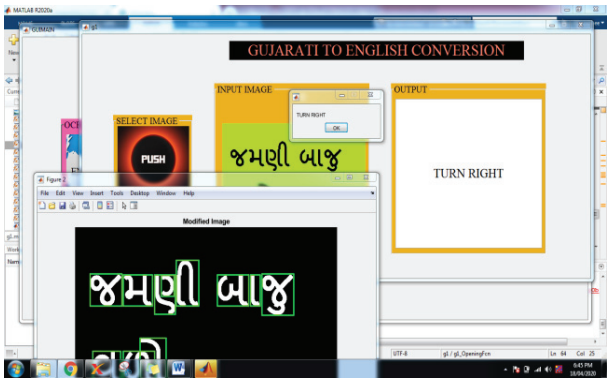

Fig. 4. Text Recognition and Conversion of Gujrathi to English

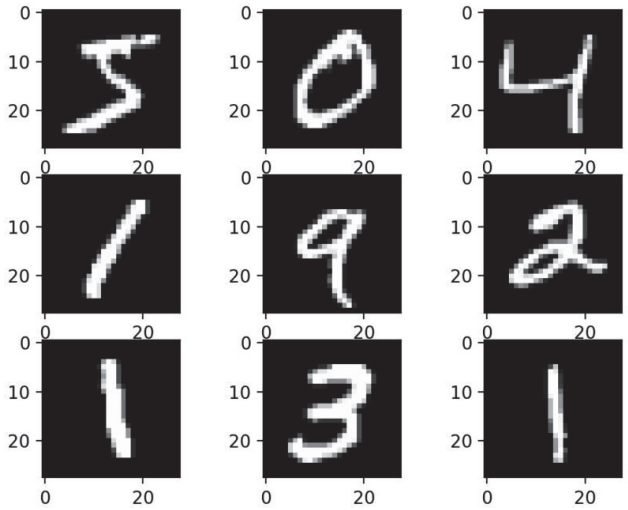

Fig. 5. Human handwriting dataset

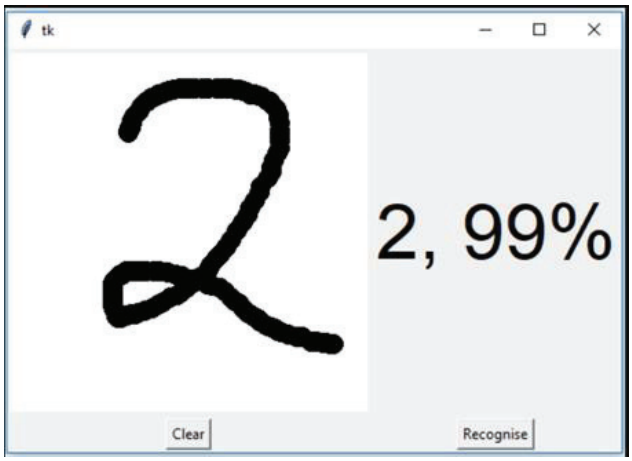

Fig. 6. Recognized Digit Testing

IX. CONCLUSION

Regional languages throughout the globe have completely distinct sorts of writing that may be recognized. The correct algorithms and methods with HCR systems are implemented. To acknowledge characters is learnt. It's been found that written character recognition becomes troublesome for multiple characters because of the presence of weird characters or similarity in shapes. To induce a clean image, the scanned image is pre-processed, and also the characters area unit outlying into independent characters.

Pretreated work is applied within standardization; purification is applied, exploitation pro-cessation measures that deliver hushed and unstained performance. Managing our assessment formula along with correct coaching, evaluating alternative step-wise method with higher potency can lead to a triple-crown output of system. Exploitation some applied mathematics options and geometric options through neural network can offer higher character recognition result. This analysis ought to be of profit to the researchers in their analysis on another story.

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