Major Project Synopsis

On

Handwritten Digit Recognition

For the partial fullfillment for the award of the degree of

Bachelor of Technology
In
Computer Science and Engineering

Submitted By

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1. Introduction

The handwritten digit recognition is the ability of computers to recognize human handwritten digits. It is a hard task for the machine because handwritten digits are not perfect and can be made with many different flavors. The handwritten digit recognition is the solution to this problem which uses the image of a digit and recognizes the digit present in the image.

2. Objective

Handwritten character recognition is one of the practically important issues in pattern recognition applications. The applications of digit recognition includes in postal mail sorting, bank check processing, form data entry, etc. The heart of the problem lies within the ability to develop an efficient algorithm that can recognize hand written digits and which is submitted by users by the way of a scanner, tablet, and other digital devices. This paper presents an approach to off-line handwritten digit recognition based on different machine learning technique. The main objective of this paper is to ensure effective and reliable approaches for recognition of handwritten digits.

3. Existing System

Handwritten digit recognition finds its application in various fields such as post mail sorting system where scanned images of mail envelopes are made into queue and extract the section describing postcode to be delivered. With the help of digit recognizer, sorting of mails can be done based on these postcodes according to their region. Another application that utilizes this technique is form processing, digits are extracted from certain columns of a form and users put certain filters to get the desired results they want.

Related work:-

1. Recognition of Handwritten text using Proximal Support Vector Machine by Swapna Prava

   Ekka (2014)
2. Learning algorithm for Classification: A comparison on hand written digits and character recognition by Yann Lecun
3. Representation and Recognition of Handwritten Digits and Character Using Deformable Templates (1997)Anil K. Jain, Fellow, IEEE, and Douglas Zongker.

4. Using generative models for hand written digit recognitation Michael Revow, Christopher K.I. Williams and Geoffray E.Hinton (1996).
5. Handwritten Digits Recognition by Gaurav Jain, Jason Ko (2008)
6. Recognizing Handwritten Digits and Characters by Vishnu Sundaresan Jasper Lin (2015).
7. HANDWRITTEN DIGIT CLASSIFICATION by Andrea Giuliodori, Rosa Lillo.

4. Motivation

The task of handwritten digit recognition using a classifier has great importance and use such as online handwriting recognition on computer tablets, recognize zip codes on mail for postal mail sorting, processing bank check amounts, numeric entries in forms filled up by hand and so on. There are different challenges faced while attempting to solve this problem. The handwritten digits are not always of the same size, thickness or orientation and position relative to the margins. Our goal is to implement a pattern classification method to recognize the handwritten digits provided by the user.

Problem Statement:-

Following are the constraints faced when computers approach to recognize handwritten digits:

1. The Handwritten digits are not always of the same size, width, orientation and justified to margins as they differ from writing of person to person.
2. The similarity between digits such as 1 and 7, 5 and 6, 3 and 8, 2 and 7 etc. So, classifying between these numbers is also a major problem for computers.
3. The uniqueness and variety in the handwriting of different individuals also influence the formation and appearance of the digits.

5. Methodology

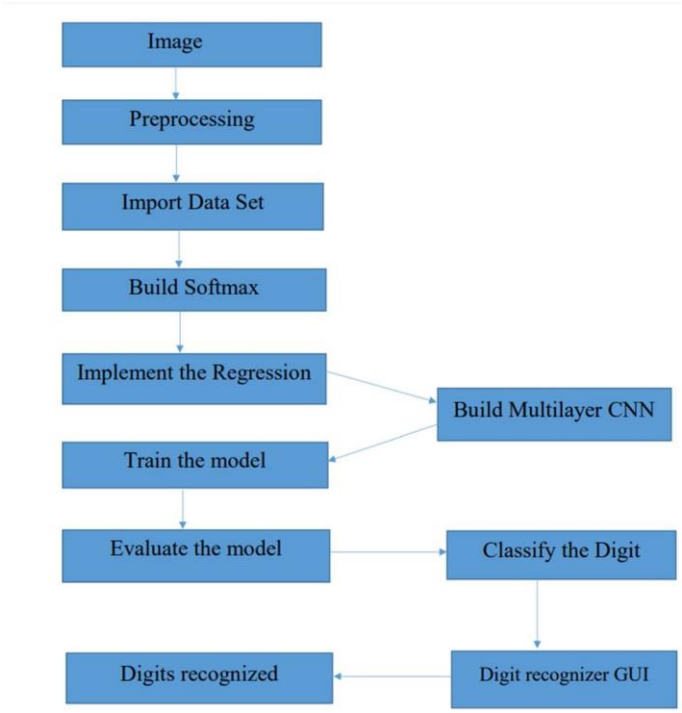
Deep Learning has emerged as a central tool for self-perception problems like understanding images, voice from humans, robots exploring the world. The project aims to implement the concept of Convolutional Network which is one of the important architecture of deep learning. Understanding CNN and applying it to the handwritten recognition system, is the major target of the proposed system.

This project is divided into 3 sections:

1. Image Feature Extraction
2. Image Classification
3. GUI development for digits prediction

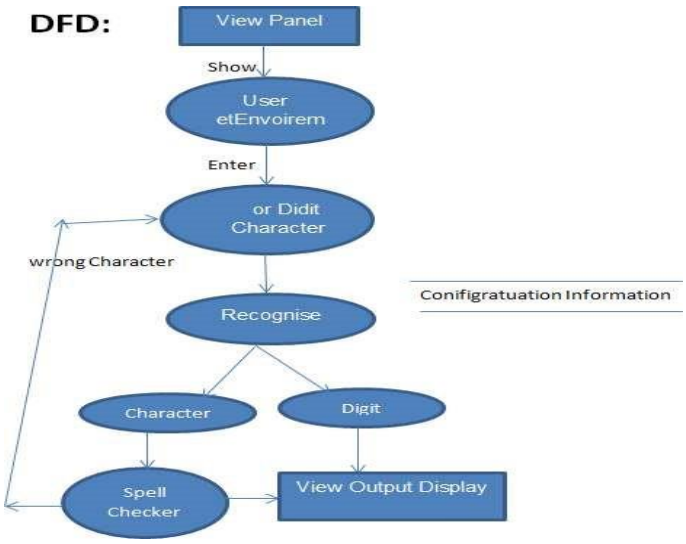
6. Plan Of Work

The following figure (Figure 1) provides a high level design of the system and the association between various modules used.

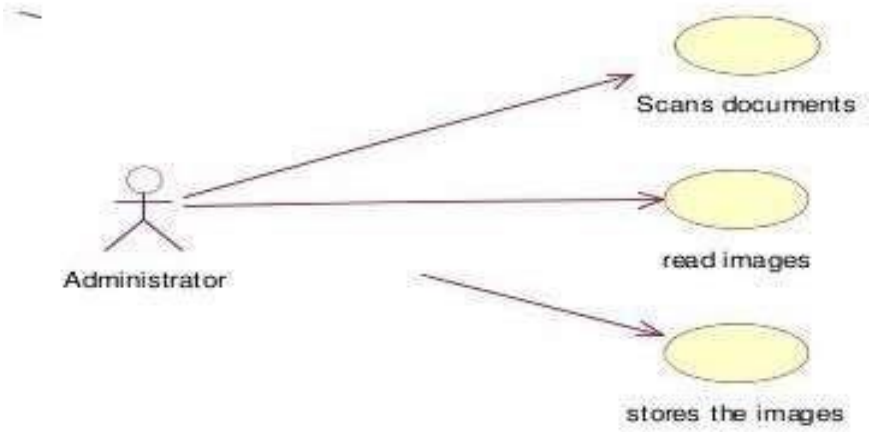


Data flow diagram:-

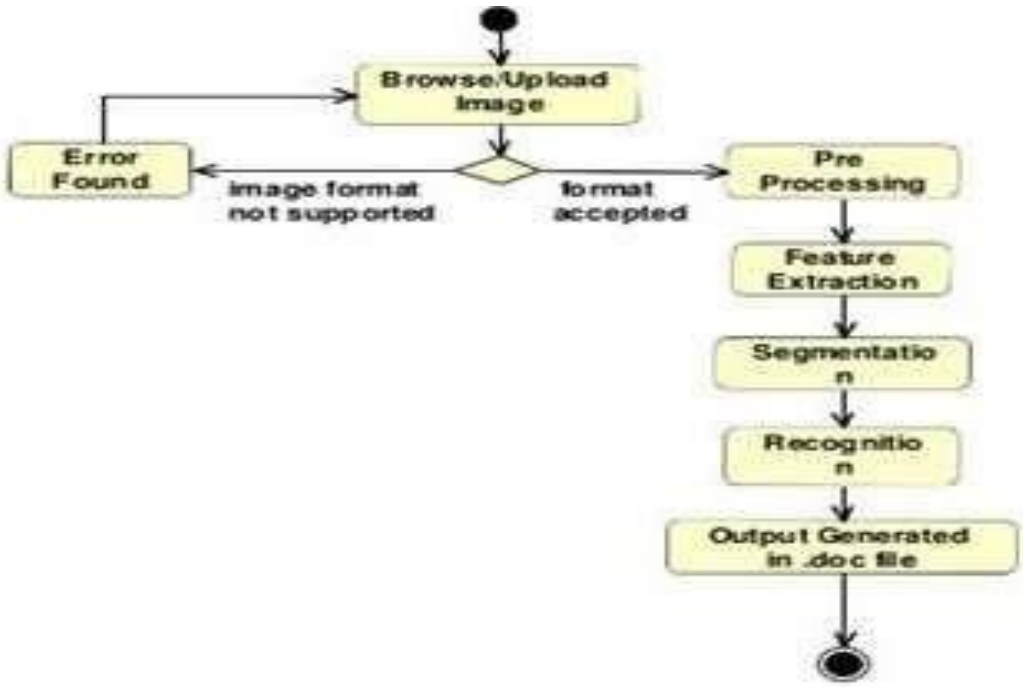
The DFD's have been show below:



State Diagram



Activity Diagram



7. Tools and Technology used/Hardware/Software Requirements

Tools:- 1. Keras
2. Tkinter
3. TensorFlow

Technology:- 1. Python
2. Deep Learning
3. MNIST Dataset

8. References

[1] In J.A. Storer and editors. M. Cohn, editors, Proc. 2000 IEEE Data Compression Conference, Los Alamitos, California, 2000. IEEE Computer Society Press.

[2] Calgary corpus. 2000. ftp://ftp.cpsc.ucalgary.ca/pub/projects/text.compression.corpus.

[3] http://www.cs.wisc.edu/niagara/data/

[4] N. Abramson. Information Theory and Coding. McGraw-Hill, 1963.