Handwritten Digit Recognition for Banking System

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Abstract - The aim of a handwriting digit recognition system is to convert handwritten digits into machine readable formats. The main objective of this work is to ensure effective and reliable approaches for recognition of handwritten digits and make banking operations easier and error free. Handwritten digit recognition system (HDR) is meant for receiving and interpreting handwritten input in the form of pictures or paper documents. Traditional systems of handwriting recognition have relied on handcrafted features and a large amount of prior knowledge. Training an Optical character recognition (OCR) system based on these prerequisites is a challenging task. Convolutional neural networks (CNNs) are very effective in perceiving the structure of handwritten characters/words in ways that help in automatic extraction of distinct features and make CNN the most suitable approach for solving handwriting recognition problems. Our aim in the proposed work is to recognizing written character on cash deposit/ withdrawal/ and other transaction, we are proposing to develop an automatic banking deposit number recognition system which is able to recognize the handwritten account number and amount number on the cash deposit slip and thus automate the cash deposit process at bank counter.

I. INTRODUCTION

Handwritten digit recognition for banking system aims at ensuring effective and reliable approaches for recognition of handwritten digits and make banking operations easier and error free**.** In the current age of digitization, handwriting recognition plays an important role in information processing. A lot of information is available on paper, and processing of digital files is cheaper than processing traditional paper files. The aim of a handwriting recognition system is to convert handwritten characters into machine readable formats. Handwritten digit recognition has not only professional and commercial applications, but also has practical application in our daily life and can be of great help to the visually impaired. It also helps us to solve complex problems easily thus making our lives easier. Handwritten digit recognition has gained so much popularity from the aspiring beginner of machine learning and deep learning to an expert who has been practicing for years. Developing such a system includes a machine to understand and classify the

images of handwritten digits as 10 digits (0–9). Handwritten digits from the MNIST database are already famous among the community for many recent decades now, as decreasing the error rate with different classifiers and parameters. Digit recognition system is the working of a machine to train itself or recognizing the digits from different sources like emails, bank cheque, papers, images, etc. and in different real-world scenarios for online handwriting recognition on computer tablets or system, recognize number plates of vehicles, processing bank cheque amounts, numeric entries in forms filled up by hand (say — tax forms) and so on. 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, so the general problem would be while classifying the digits due to the similarity between digits such as 1 and 7, 5 and 6, 3 and 8, 2 and 5, 2 and 7, etc. This problem is faced more when many people write a single digit with a variety of different handwritings. Lastly, the uniqueness and variety in the handwriting of different individuals also influence the formation and appearance of the digits.

II. RELATED WORKS

Handwritten digit recognition (HDR) is considered one of trivial and critical machine learning problems. It has been used widely by researchers as experiments for theories of machine learning algorithms for many years. In recent years, neural networks and conventional neural network currently provide the best solutions to many problems in handwritten digit recognition. A novel hybrid CNN–SVM model for handwritten digit recognition. This hybrid model automatically extracts features from the raw images and generates the predictions. For this work, the author used non-saturating neurons and a very efficient GPU implementation of the convolution operation to reduce overfitting in the fully-connected layers. The author introduces a novel visualization technique that gives insight into the function of feature layers and the procedure of the classifier have observed convolutional net architecture that can be used even when the amount of learning data is limited. It has used new network structure, called Spatial

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Pyramid Pooling SPP-net, can generate a fixed-length representation regardless of image. Multi-column DNN (MCDNN) used MNIST digits. The result has a very low 0.23% error rate. Hayder M. Albeahdili et al. have performed a new CNN architecture which achieves state-of-the-art classification results on the different challenge benchmarks. The error rate for this approach is 0.39 % for MNIST dataset.

III. ARCHITECTURE DIAGRAM
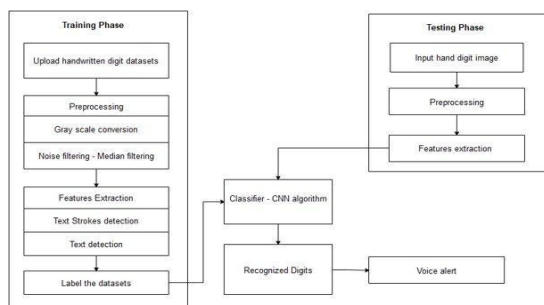
METHODOLOGY

Nowadays the whole world is a shift in the digital world. They want everything in digital form, they not ready for manual work or any manual handwritten transaction. Also, they want to avoid the handwritten data. Depositing cash requires the physical presence of the depositor at the bank, and cashier needs to enroll the transaction into the system, which slows down the rate of money deposit and teller's activity. To overcome such issue, we are proposing to develop this system.

Image processing:
Optical Character Recognition is easy for the naked eye to recognize a character when spotted in any document; however, computers cannot identify the characters from an image or scanned document. In order to make this possible, a lot of research has been done, which resulted in the development of several algorithms that made this possible. One of the fields that specialize in character recognition under the light of Image Processing is Optical Character Recognition (OCR).In Optical Character Recognition, a scanned document or an image is read and segmented in order to be able to decipher the characters it contains. The images are taken and are preprocessed so as to get rid of the noise and have unified colors and shades, then the characters are segmented and recognized one by one, to finally end up with a file containing encoded text containing these characters, which can be easily read by computers.
Handwritten digit recognition: It extracts the written character on the slip. After that, the extracted characters were passed to the recognition phase, where Neural Network will identify the input character patterns.
User Interface:
In this user interface, digit recognition recognizes the input character and automatically put the input character into particular user interface.

System Administrator:
The System Administrator automate the cash deposit process at bank counter.

IV. CONCLUSION

Handwriting recognition is undoubtedly one of the most challenging areas of the pattern recognition. The goal of the project is to classify numeric samples which are mostly saved as digital images. Several pattern recognitions approaches have been applied to both online and off line handwriting recognition on the basis of unique patterns. The process of recognition consists of several steps such features extraction and recognition with voice alert. Python has a special toolbox, called neural network toolbox which makes the implementation less difficult but the knowledge of theory is needed. We can train these networks with preferred parameters. Artificial Neural Network approach for character recognition is now gaining importance because of CNN's high fault tolerance and parallel architecture.

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