HANDWRITTEN DIGIT RECOGNITION

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.

INTRODUCTION:

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.

Handwritten digit recognition aims at ensuring effective and reliable approaches for recognition of handwritten digits and make 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.

LITERATURE SURVEY:

[1]In research done on handwritten digits Recognition the model was implemented with an ANN which can identify handwritten digits from 0 to 9. The proposed neural system was trained and tested on a dataset achieved from MNIST. Their proposed method utilized the image pixels for its feature extraction process. ANN carried out the classification, and the overall classification accuracy is 99.60 percentage. The recognition system is broadly divided into 2 parts, first part is feature extraction from handwritten images and the second one is classification of feature vector into digits. We propose descriptors for handwritten digit recognition based on Histogram of Oriented Gradient (HOG) feature .It is one of the widely used feature vector for object detection in computer vision. For classification of features, linear Proximal Support Vector Machine Classifier is proposed. This is a binary class classifier which is further converted to a 10 class classifier by means of One against all algorithm. Due to small training time, PSVM classifier is preferable over standard Support Vector Machine (SVM) Classifier. The handwritten images both for training and testing are taken from MNIST database. The performance of the system is measured in terms of Sensitivity, Accuracy, Positive Predictively and Specificity.

[2] Handwritten digit recognition is a popular issue among researchers. There are many papers and articles published about this topic. These are some researches that are done on handwritten digit recognition using different machine learning algorithms. Convolutional Neural Network (CNN) has high accuracy because of its accuracy it is being used on a large scale in image processing, video analysis. CNN is even being used in natural language processing and sentiment recognition by varying different parameters .The main objective of this research is to design an expert system for Handwritten digit recognition using neural network approach. Other objectives include: To address the issue of accuracy in Handwritten digit recognition systems by developing a system that will use efficient technology for recognizing Handwriting characters and words from image media. To investigate and demonstrate the usefulness of neural network technology in development of efficient Handwriting character recognition systems.

[3] .In research done on handwritten digits Recognition the model was implemented with an ANN which can identify handwritten digits from 0 to 9. The proposed neural system was trained and tested on a dataset achieved from MNIST. Their proposed method utilized the image pixels for its feature extraction process. ANN carried out the classification, and the overall classification accuracy is 99.60 percentage

[4] The handwritten digits recognition model with CNN implemented using different numbers of hidden layers and epochs found that we can reach ideal accuracy with respect to the number of epochs and hidden layers [3]. It is difficult to get a good performance as more parameters are needed for the large-scale neural network. In research, it is discovered that deep nets perform better when they are prepared by basic backpropagation. Their architecture brings about the most minimal error rate on MNIST contrast with NORB and CIFAR10.

[5] Renata F. P. Neves have proposed SVM based offline handwritten digit recognition. Authors claim that SVM outperforms the Multilayer perceptron classifier. Experiment is carried out on NIST SD19 standard dataset. Advantage of MLP is that it is able to segment non-linearly separable classes. However, MLP can easily fall into a region of local minimum, where the training will stop assuming it has achieved an optimal point in the error surface. Another hindrance is defining the best network architecture to solve the problem, considering the number of layers and the number of perceptron in each hidden layer. Because of these disadvantages, a digit recognizer using the MLP structure may not produce the desired low error rate.

CONCLUSION:

In this we recognize handwritten digit. Handwritten digit recognition is the first step to the vast field of Artificial Intelligence and Computer Vision. As seen from the results of the experiment, CNN proves to be far better than other classifiers. The results can be made more accurate with more convolution layers and more number of hidden neurons. It can completely abolish the need for typing. Digit recognition is an excellent prototype problem for learning about neural networks and it gives a great way to develop more advanced techniques of deep learning. In future, we are planning to develop a real-time handwritten digit recognition system.

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