NALAIYA THIRAN

A NOVEL METHOD FOR HANDWRITTEN DIGIT RECOGNITION SYSTEM

Dhanya Prabha S B – 19D018

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PROBLEM STATEMENT:

Handwritten digit recognition is very important as it will be very helpful to reduce human effort. As each individual has different handwritings for representing digits, the system should have a capability to identify every handwriting with maximum accuracy. Such a system will be useful to reduce human interventions in identification, as everything is being digitized. 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. Handwriting recognition has gained a lot of attention in the field of pattern recognition and machine learning due to its application in various fields. Various techniques have been proposed to for digit recognition in handwriting recognition system.

LITERRATURE SURVEY:

i. JOURNALS:

S.NO	PUBLISHED IN	YEAR OF PUBLISHING	TITLE	AUTHORS	ABSTRACT
1.	IEEE	2019	A NOVEL METHOD FOR HAND WRITTEN DIGIT RECOGNITION USING DEEP LEARNING	Rohini.M1,Dr. D.Surendran2 1,Assistant Professor,Sri Krishna College of Engineering and Technology,	Handwritten digit recognition has recently been of very interest among the researchers because of the evolution of various Machine Learning, Deep Learning and Computer Vision algorithms. In this report, the results of some

				2,Professor, Sri Krishna College of Engineering and Technology	of the most widely used Machine Learning Algorithms like CNN-convolution neural networks and Deep Learning algorithm like multilayer CNN using Keras with Theano and Tensorflow are used. MNIST is a dataset which is widely used for handwritten digit recognition. The dataset consist of 60,000 training images and 10,000 test images. The artificial neural neworks can all most mimic the human brain and are a key ingredient in image processing field. For example Convolution Neural networks with back propagation for image processing. The applications where these handwritten digit recognition can be used are Banking sector where it can be used to maintain the security pin numbers, it can be also used for blind peoples by using sound output.
2.	IJCSIT	2011	A novel method for Handwritten Digit Recognition with Neural Networks	MALOTHU NAGU,1, N .VIJAY SHANKAR, 2,K.ANNAPURNA,3 1,Department of ECE, V.K.R &V.N.B.Engg College,Gudivada. Krishna (Dist), A. P, S INDIA. 2,Department of EIE ,S R T I S T, Ramananda Nagar, Nalgonda	It plays an important role in the modern world. It can solve more complex problems and makes humans' job easier. This is a system widely used in the world to recognize zip code or postal code for mail sorting. There are different techniques that can be used to recognize handwritten characters. Two techniques researched in this paper are Pattern Recognition and Artificial Neural Network (ANN). Both techniques are defined and different methods for each technique is also discussed. Bayesian Decision theory, Nearest Neighbor rule, and Linear Classification or Discrimination is

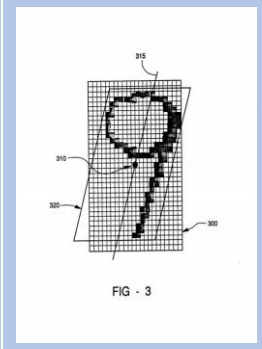
				(Dist).A.P, S.INDIA. 3,School of Electronics, Vignan University, Guntur (Dist).A.P, S.INDIA.	types of methods for Pattern Recognition. Shape recognition, Chinese Character and Handwritten Digit recognition uses Neural Network to recognize them. Neural Network is used to train and identify written digits. After training and testing, the accuracy rate reached 99%.This accuracy rate is very high.

ii. CONFERENCE:

S.NO	TITLE	AUTHORS	ABSTRACT	CONFERENCE
1	Handwritten Digit Recognition Using Machine Learning: A Review	Anchit Shrivastav Isha Jaggi Sheifali Gupta Deepali Gupta Chitkara University Institute of Engineering and Technology, Chitkara University, Punjab,	The task for handwritten digit recognition has been troublesome due to various variations in writing styles. Therefore, the authors have tried to create a base for future researches in the area so that the researchers can overcome the existing problems. The existing methods and techniques for handwritten digit recognition were reviewed and understood to analyze the most suitable and best method for digit recognition. A number of 60,000 images were used as training sets of images with pixel size of 28×28. The images/training sets were matched with original image. It was found out after complete analysis and review that classifier ensemble system has the least error rate of just 0.32%. In this paper, review of different methods handwritten digit recognition were observed and analyzed	2019 2nd International Conference on Power Energy, Environment and Intelligent Control (PEEIC)

2	A Comparative Study on Handwriting Digit Recognition Using Neural Networks	Mahmoud M.Abu Gosh Ashraf Y. Maghari Faculty of Information Technology, Islamic University of Gaza, Palestine	The handwritten digit recognition problem becomes one of the most famous problems in machine learning and computer vision applications. Many machine learning techniques have been employed to solve the handwritten digit recognition problem. This paper focuses on Neural Network (NN) approaches. The most three famous NN approaches are deep neural network (DNN), deep belief network (DBN) and convolutional neural network (CNN). In this paper, the three NN approaches are compared and evaluated in terms of many factors such as accuracy and performance. Recognition accuracy rate and performance, however, is not the only criterion in the evaluation process, but there are interesting criteria such as execution time. Random and standard dataset of handwritten digit have been used for conducting the experiments. The results show that among the three NN approaches, DNN is the most accurate algorithm; it has 98.08% accuracy rate. However, the execution time of DNN is comparable with the other two algorithms. On the other hand, each algorithm has an error rate of 1-2% because of the similarity in digit shapes, specially, with the digits (1,7), (3,5), (3,8), (8,5)	2017 International Conference on Promising Electronic Technologies (ICPET)

iii. PATENTS:

S.NO	PATENT NUMBER/ FILE	INVENTOR	APPLICATIONS	DIAGRAM
1.	US5325447A https://patentimages.storage.googleapis.com/b0/ab/b3/e4f251e6deba81/US5325447.pdf	Robert C. Vogt, III	A handwritten character image normalization technique provides predetermined pixel dimensions and a normalized skew. The skew slope of the input image is calculated. This skew slope is employed to determine the bounds of the smallest parallelogram which completely encloses all of the stroke pixels of the input image. This parallelogram has a first pair of opposed horizontal sides and a second pair of opposed sides having the skew slope. The stroke pixels of this parallelogram are then mapped into the standard size horizontal row and vertical column pixel dimensions using horizontal and vertical scaling factors determined from the parallelogram dimensions and the standard dimensions. This mapping employs a subpixel grid of the normalized pixels. Candidate stroke pixels are identified which correspond to any part of a stroke pixel of the input image. A candidate stroke pixel is set to a stroke pixel if and only if the number of such subpixels mapped into a stroke pixel of the input image exceeds a predetermined number.	 FIG - 3
2.	EP0555227A4 https://patents.google.com/patent/EP0555227A4/en	David L Mccubbrey	There are many instances where it would be useful or desirable to provide a computer readable form of a document not available in a compatible computer readable form. Normally it is the case that the document is not available in machine readable form because the document was handwritten or typewritten and thus no computer readable form exists, or because the computer readable form is not available. In some instances there is a "foreign11 document, i.e. an existing computer readable form but the document was produced on an incompatible computer system. In some instances, such as facsimile transmission, a simple optical scan of the document can produce the required form. In most instances the form most useful for later use and decision making is a separate indication of each	

			character of the document. The field of optical character recognition deals with the problem of separating and indicating printed or written characters. In optical character recognition, the document is scanned in some fashion to produce a electrical image of the marks of the document. This image of the marks is analyzed by computer to produce an indication of each character of the document. It is within the current state of the art to produce relatively error free indication of many typewritten and printed documents. The best systems of the prior art are capable of properly distinguishing a number of differing type fonts.	

EMPATHY MAP: