Dynamic Signature Verification System Based on One Real Signature

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Abstract: ***This paper is based on dynamic signature used for image processing and biometric traits. Signature verification is essential in preventing duplication of documents in numerous financial, legal and other commercial fields. The project presents several unique and complicated difficulties: high/low intra-class variability (an individual's signature may vary from day-to-day), large temporal variation (signature may vary completely over time), and high/low inter-class similarity (original signature should be different from one another). To build a signature, we need a signature verification system using a Neural Network (NN). Our paper focuses on building systems trained on data with varying degrees of information, as well as experimenting with different objective functions to obtain optimal error rates.***

Indexed Terms: Signature verification, biometric trait, Neural network (NN)

I. INTRODUCTION

The identification of objects of an image would probably start with an image processing technique such as noise and source removal, followed by feature extraction to locate lines, regions, plots and possibly areas with certain textures and design. The main plot is to interpret collections of these images as single objects, e.g. cars on a road, boxes on a conveyor belt or cancerous cells on a microscope slide and more on.

There is a reason that an AI problem of an object can vary differently when viewed from different angles or under different lighting. Another problem is deciding what features belong to which object and which background or shadows etc is been applied. The human visual system performs the tasks mostly unconsciously, but a computer requires skillful programming and lots of processing power to approach human performance and its expectation.

Manipulating data in the form of an image through several possible techniques and using different systems. An image is usually interpreted as a two-dimensional array with brightness values, and is represented by such patterns for a photographic print, television screen, or movie screen. An image can be processed optically or digitally with a computer system.

To process an image, it is necessary to minimize the image to a series of numbers that can be manipulated by the computer dynamically. Each number representing the brightness value of an image at a particular place is called a picture element or pixel. A digitized image may have 512 × 512 or roughly 250,000 pixels or bits, although much larger images are becoming common and similar. Once the image has been digitized, there are three basic operations that can be performed in the computer for the better recognition.

For a point operation, a pixel value in the output image depends on a pixel value in the input image of the particular object. For local operations, several neighboring pixels in the given input image determines the value of that output image pixel. In a global operation, all of the given input image pixels contribute to an output image pixel value for further use. These operations are taken singly or in combination and are thus the means by which the image is enhanced, restored, or compressed for the use. An image is enhanced and modified so that the information it contains is more clearly evident and simple, but enhancement can also make the image more visually appealing.

II. EXISTING SYSTEM

1) Temporal shift estimated by the phase of gabor filter: It is a band pass filter usually used in the segmentation of fingerprints and palm prints.
2) Adaptive neuro-fuzzy inference system: Based on offline signature process.

3) HMM and graph metric features: A hidden Markov model (HMM) is a statistical Markov model in which the system being modeled is assumed to be a Markov process with unobserved states. An HMM can be presented as the simplest dynamic Bayesian network and is bulkier and more complicated than other algori thms.

Disadvantages:

1) It doesn't detect the forged signatures
2) Requires a highly representative dataset
3) Large computational efforts
4) More complex and slower than feature based approach
5) Less performance accuracy

III. PROPOSED SYSTEM

In our proposed work signature verification system using a Convolutional Neural Network (CNN) is implemented. Our method focuses on building systems trained on data with varying degrees of information, as well as experimenting with different objective functions to obtain optimal error rates.

Advantages:
1) Has very low FAR and FRR results
2) Can easily detect the forged signatures
3) Performance rate is high

IV. USE OF NEURAL NETWORK

Neural networks are predictive and adaptive model loosely based upon the action of biological neurons. Neural network is the best tool for recognizing and discriminating between different sets of signals and plots. In order to get the result by using the neural network, it is necessary to choose a suitable architecture and algorithm. The best way to do is to choose what is suitable according to our previous experience and then to expand or shrink the neural network size until a reasonable and confirmed output is obtained.

In this project, we tried different sizes of image for the neural network using MATLAB tool.

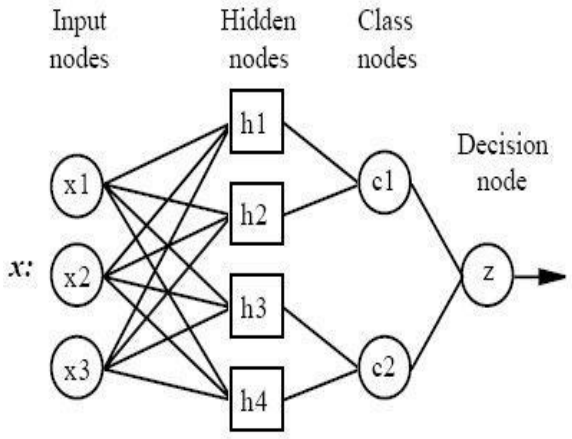

Fig. 1 Architecture of a Neural Network

It has an input layer with 2000 inputs, first hidden layer with 11 nodes, and TANSIG transfer function, second hidden layer with 7 nodes, and TANSIG transfer function, and output layer with PURELIN transfer function and 2 outputs. One of the two outputs is used for the detection and analyzing of tumor, and the other for the localization. TANSIG transfer function is selected to limit the signal between -1 and1. For the output layer, PURELIN transfer function is chosen to give all the possible cases for the location of tumor.

The proposed neural network has been used to detect, analyses and locate the tumor in two cases. The first case was to detect and locate a tumor in a two-dimensional sector of the cervical model. The location of tumor was considered randomly at the center and in any of the four quadrature. The second case was to detect, analyses and locate tumor anywhere in the three-dimensional model of an object.

The neural network has been trained and tested using 100 sets of inputs using the training and testing function (TRAINSCG). Additional 40 Sets of inputs were used to test, analyses and locate the performance of each neural network.

V. SYSTEM ARCHITECTURE

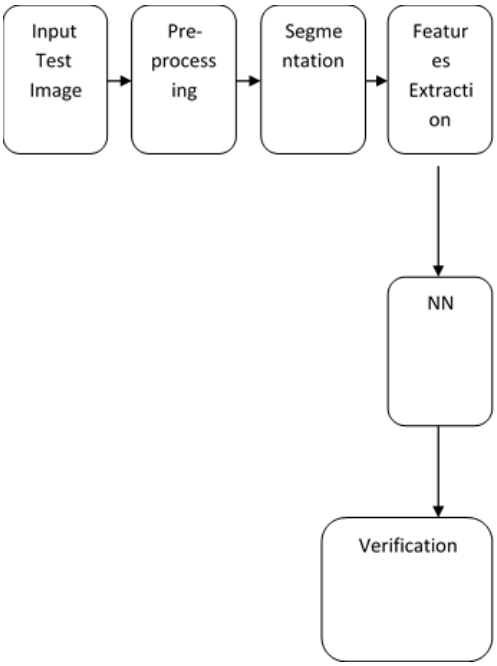

Fig. 2 System Architecture

The project is based on two parts: Trained and Tested. The image(signature) is taken into an account and is first converted into grey-scaled. Here, the image is been analyzed minutely and is moved into the further steps. In the segmentation part, the whole image(signature) is been analyzed and taken into an account for recognition and is been tested.

In the segmentation process, the image is been recognized as an original image or a duplicate image. After the image is been recognized then the algorithm (Neural Network) is used to check whether the image is already been stored or not in the database and whether the image is real or not. Hence, the image is verified and can be used for further process.

VI. MODULES

There are four modules:

1. Pre-processing
2. Segmentation
3. Neural Network (NN)
4. Verification

1) Pre-processing:

- It is an improvement of the image data that suppresses unwanted distortions or enhances some image features important for further processing.
- Image is been grey-scaled before adding it to the database.
- Image is been trained before testing.
- Pre-processing is the lowest form of abstraction.

2) Segmentation:

- Image segmentation is the process of partitioning the digital images into multiple segments (sets of pixels or a set of bits, also known as super-pixels).
- The goal of segmentation is to simplify/modify or change the representation of an image into something that is more meaningful and easier to test,analyze and detect.
- Here, each and every pixel of an image is been analysed and detected(tested) for approving whether the image is an original image or a duplicate image.

3) Neural Network (NN):

- Instead of feeding the entire image as an array of numbers, the image is broken up into a number of tiles/bits, the machine then tries to predict what each tile/bit is.
- Finally, the computer tries to predict what's in the picture based on the prediction of all the tiles/bits.
- This allows the computer to parallelize the operations/ performance and detect the object of an image regardless of where it is located in the image.

4) Verification:

- After training and testing, the image is been stored in the database and is verified.
- After verifying the image, the image can be used as a biometric trait in the required field.
- It is the last process in the whole mechanism.

VII. CONCLUSION AND FUTURE WORK

We can conclude that the proposed method enhances the security of the system to a great extent thereby improving the system and also increasing the accuracy of the system.

The future work can be dealt in the area to further improve the accuracy so as to further decrease the cases of false acceptance.

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