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RESEARCH ARTICLE

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HUMAN BEHAVIOUR MODELLING & ANALYSIS USING ARTIFICIAL NEURAL NETWORK

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ABSTRACT

In this paper we describe a new behavioural biometric technique based on human computer interaction. Recent advances have allowed computer scientists and psychologists to jointly address automatic analysis of human behavior via computers. Survey is based on skills, style, preference, knowledge or strategy used by people while accomplishing different everyday tasks such as driving an automobile, talking on the phone, handwriting analysis, face analysis, visual action recognition, keystroke dynamics, using a computer. We examine current research in the field and analyze the types of features used to describe different types of behavior by using signature in handwriting analysis .The following feature used in this paper are: orientation, letter spacing, thickness, streaks . Various techniques used for comparing accuracy rates for verification of users using different approaches such as Markov model, Sigma Lognormal model.

KEY WORDS- Artificial Neural Networks, Markov Model, Sigma Lognormal Model, Behavioural Biometrics.

1. INTRODUCTION

Our approach to modeling human behavior is to consider the human as a device with a large number of internal mental states, each with its own particular control behavior and interstate transition probabilities. Domains where human behavior understanding is a crucial need (e.g., human computer interaction, affective computing and social signal processing) rely on advanced pattern recognition techniques to automatically interpret complex behavioral patterns generated when humans interact with machines or with others.

With the establishment of the information society, personal identification systems have gained an increased interest, either for security or personalization purposes. Traditionally, computer systems have based identification procedures on something that one has (keys, magnetic cards or chip cards) or something that one knows (personal identification numbers and passwords). These systems can easily fail to serve their objective in situations of loss or lent of a key or card, or in cases of forgotten passwords or disclosure of codes. Biometric authentication or identification systems use something one is, creating more reliable systems, with higher immunity to authorization theft, loss or lent.

Behavioral biometrics is the field of study related to the measure of uniquely identifying and measurable patterns in human activities. The term contrasts with physical biometrics, which involves innate human characteristics such as fingerprints or iris patterns.

Behavioral biometric verification methods include keystroke dynamics, gait analysis, voice ID, mouse use characteristics, signature analysis and cognitive biometrics. Behavioral biometrics are used for secure authentication in financial institutions, businesses, government facilities and retail point of sale (POS), as well as an increasing number of other

environments.

To increase security and prevent use of biometric credentials for identity theft, biometric data is typically encrypted during gathering and verification. After biometric data is gathered, a software application picks out specific points of data as match points. The match points in the database are processed using an algorithm that translates that information into a numeric value. The database value is compared with the biometric input the end user has entered and authentication is either approved or denied.

Unlike many types of physical biometrics, behavioral biometrics can often be gathered with existing hardware, needing only software for analysis. That capacity makes behavioral biometrics simpler and less costly to implement.

Human behavior is experienced throughout an individual's entire lifetime. It includes the way they act based on different factors such as genetics, social norms, core faith, and attitude. Behavior is impacted by certain traits each individual has.

2 Graphology

It is the study of handwriting and handwriting analysis -is now an accepted and increasingly used technique for assessment of people in organizations. Handwriting analysis can quickly reveal such factors as your character, emotions, intellect, creativity, social adjustment, your desires, fears, weaknesses, strengths and sexual appetite just to mention a few and so is a useful tool for many organizational processes, for example: recruitment, interviewing and selection, team-building, counseling, and career-planning.

Handwriting is as an instantaneous photograph of your mind. Personal identification or identity authentication using biometrics applies pattern recognition techniques to measure physiological or behavioral characteristics.

There are two types of biometric systems that help to understand the link between a person and his/her identity.

- Identity verification (or authentication) occurs when a user claims who he is and the system accepts (or declines) hisclaim.
- Identity identification (sometimes called search) occurs when the system establishes a subject identity (or fails to do it) without any prior claim.

Human personality recognition is becoming more and more important in the modern world. Identifying, evaluating and understanding personality is done by a scientific method known as Handwriting analysis or Graphology, through the strokes and patterns revealed by handwriting. Type of writing in the form of signatures and letters stroked can describe the personality of the author. the use of signatures is usually used to identify certain personality as with appearance of dots, streaks, shapes or shell, and bottom line. Accuracy of handwriting analysis depends on how skilled the analyst is. Human intervention in handwriting analysis although has been effective, it is costly and prone to fatigue. Development in image processing and pattern recognition lead to analyzing of handwriting based on graphology can be done automatically. Handwriting is included in the image, so that recognition can be performed through the stages of conversion of images into numerical vector, image processing for quality improvement, followed by pattern recognition and feature extraction.

Due to the fact that biometrics, as an automatic means of human. Several research handwriting analysis automatically with the aid of a computer without the human intervention to predict personality traits have been conducted.Among all Some of them, using baseline, the pen pressure and the height of the T-bar on the stem of the letter 't' are considered for predicting the personality of the writer.recognition, constitutes a relatively novel field of research , most efforts undertaken by the different parties involved in the development of this technology (industry,researchers, evaluators, etc.) have been mainly (but not exclusively)directed to the improvement of its performance (i.e.finding ways to obtain lower error rates). Different studies have proved that performance of biometric systems is heavily affected by the quality of the input signals, and that even the best systems worldwide struggle

in the presence of noisy samples. the term quality is considered from the *utility* point of view in order to investigate the cause that makes some signatures more suitable for automatic recognition than others.

Especially now, when this science is being recognized by more and more institutions as the accurate counseling and investigative tool it is.

3 PROPOSED WORK

Prediction of human behavior using Artificial Neural network. Prediction is a process of conceiving something as it might happen in future based on knowledge gathered from past experiences and from present scenario.

Objectives

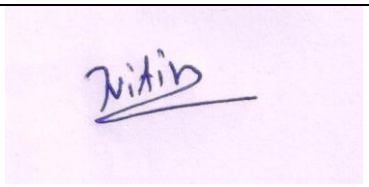
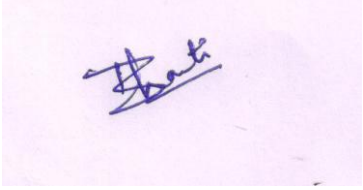
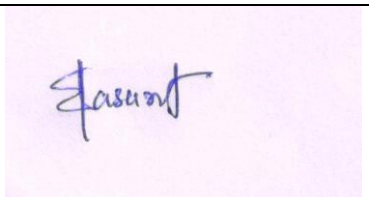
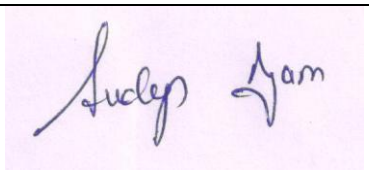
1. Signature analysis to identify the signatures and extract the features from signature.
2. After extracting the features of signature normalize the values.
3. Human behavior prediction using Artificial Neural networks

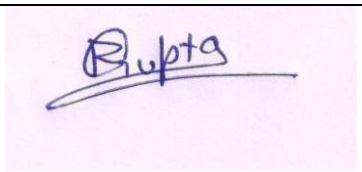
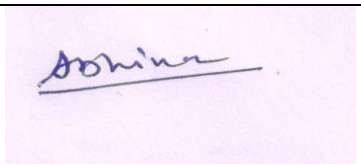
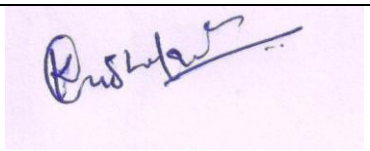
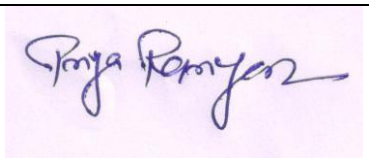
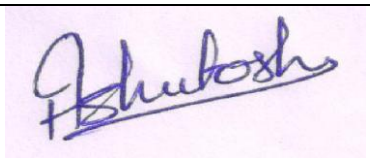
Table Data Set of Signatures

EXTRACTION OF FEATURES

After scanning the signature by computer then, we have to evaluate the feature of in signature. We have taken the four features which are: Streaks, orientation, thickness, letter spacing. We have taken 10 people signature and extracted features are taken out, calculated in table below :

Table1.1 Extracted Features

Sno.	Names	Signature	Streaks	Orientation	Thickness	Letter Spacing
1	Garima		358.8763	-200.4340	65.2239	990.7081
2	Nitin		440.2194	-242.3294	53.8072	806.1978
3	Bharti Sharma		118.6859	121.6705	71.1563	183.3250
4	Basant		317.1587	-185.4470	60.6047	350.4650
5	Sudeep		384.3074	-50.1367	55.4634	362.5680

6	Ruchi		590.6854	-148.6478	56.0048	546.3344
7	Abhinav		264.1503	223.7208	66.8636	346.2716
8	KrishanKant		582.4293	-77.3755	55.4366	445.0734
9	PriyaRanjan		508.9178	-45.7005	53.9864	493.6944
10	Ashutosh		777.9665	54.8690	58.8903	819.1251

In this research, we will use different samples of handwritten signatures. To check the accuracy of algorithm we will use different scanned images of signatures and will apply ANN for training. Find the MSE value for training and testing of samples. From sample data, results which come satisfying the MSE value behavior through signatures can be predicted.

NORMALIZATION OF FEATURES VALUES

As our neural network uses only values between 0 to 1, so we have to normalize the above features values for ease of network and resulted values are in table below:

Table 1.2 Normalized Feature Values

Sno.	Names	Streaks	Orientation	Thickness	Letter Spacing	Target output
1	Garima	0.4	-0.7	0.8	0.7	0.9
2	Nitin	0.5	-0.9	0.6	0.7	0.8
3	Bharti Sharma	0.1	0.4	0.9	0.8	0.85
4	Basant	0.3	-0.6	0.7	0.7	0.95
5	Sudeep	0.4	0.1	0.7	0.2	0.45
6	Ruchi	0.6	-0.5	0.7	0.4	0.75
7	Abhinav	0.3	0.8	0.8	0.7	0.7
8	KrishanKant	0.6	-0.2	0.7	0.6	0.6
9	PriyaRanjan	0.5	-0.1	0.6	0.9	0.65
10	Ashutosh	0.9	0.2	0.7	0.8	0.44

TRAINING OF NETWORK

The algorithm which is used to train the neural network is Back Propagation Network(BPN). It is the Multilayer network which contains three layers input , intermediate hidden, target output layer. In this units are in feed forward fashion where units are fully connected to each other i.e input to hidden and hidden to ouput layer. When learning id done during training phase following general step is done:

1. Each input pattern is applied to input set and then propagated forward.
2. The pattern of activation at the output layer is compared with the correct output pattern to calculate an error signal also known as Mean Square Error.
3. The error signal for each such output pattern is then back propagated from the output to the input in order to appropriately adjust the weight in each layer of the network.

By using BPN (Back Propogation Network) Training we calculated the following results:

1. No. iteration taken to train the network: 25
2. Mean Square Error(MSE) : 0.25
3. Total time taken in seconds: 0.093

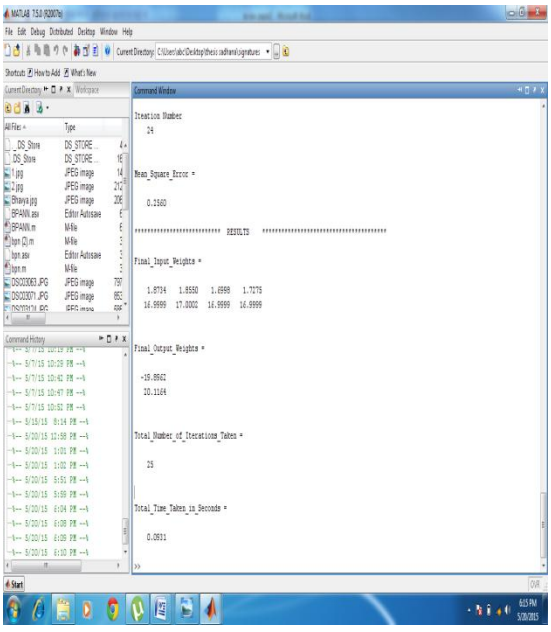


Figure 1

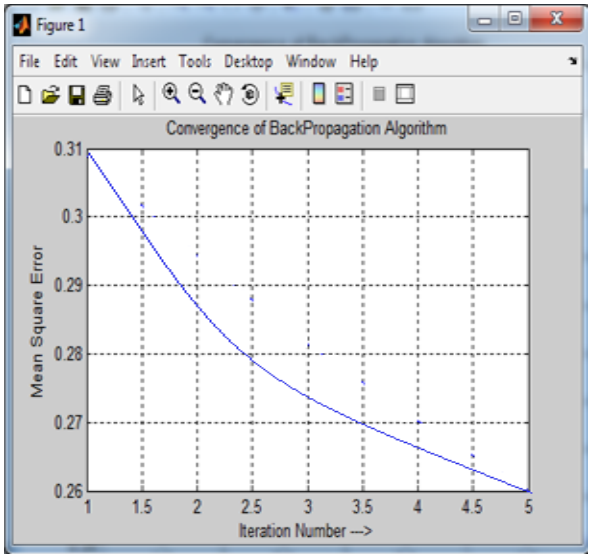


Figure 2 : Mean Square error vs. Iteration Number

Mean Square Error(MSE) is the error value which is generated during training phase. This error is the difference between target output value and actual output. MSE value is set by the user. The iteration is continue until and unless the value of error reaches to its tolerance value or MSE value.

Results

For Training: We uses these five values for training with two features streaks and orientation shows in table below. Table shows the two training input, target output, after training result is given as predicted output, and error value.

Table 1.3

S.no.	Name	Streaks (X1)	Orientation (X2)	Target Output	Behavior
1	Garima	0.4	-0.7	0.9	Polite, Sincere
2	Basant	0.5	-0.9	0.8	Kind, Introvert
3	Bharti Sharma	0.1	0.4	0.85	Hardworking, Sincere
4	Sudeep	0.3	-0.6	0.95	Excitable, Fun loving
5	Ruchi	0.4	0.1	0.45	Charming, Funloving

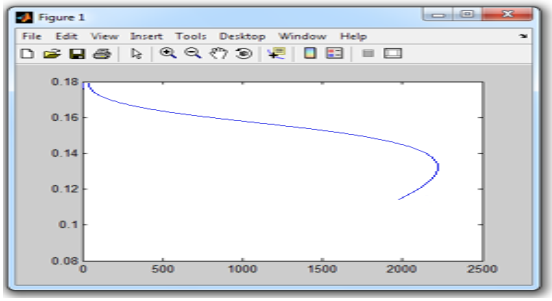


Figure 3

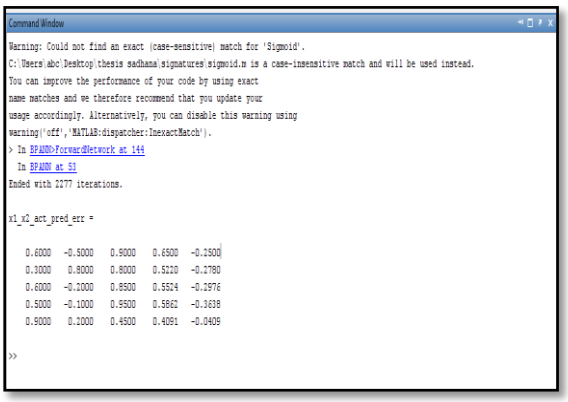


Figure 4: shows predicted output , MSE

The above figure concluded the predicted output and the error value .

TESTING: The table shown below shows the predicted output and error value . So from this table we can conclude that error value which is less than the range set by user of MSE value during training phase. So Target output value of above Table 1.3 is near about the predicted output of Table 1.4. From here it shows behaviorof VishalVerma is same as of Pooja.

Table 1.4

Sno.	Name	Streaks	Orientation	Predicted Output	MSE	Behavior
1	Nitin	0.6	-0.5	0.65	-0.25	Polite, Caring
2	PriyaRanjan	0.3	0.8	0.52	-0.27	FunLoving, Sincere
3	Abhinav	0.6	-0.2	0.52	-0.29	Hardworking,Introvert
4	Ashutosh	0.5	-0.1	0.58	-0.36	Sincere
5	Krishan Kant	0.9	0.2	0.4	-0.04	Fun loving, Loyal

4. Conclusion

Graphology is an emerging field for personality recognition. Identification of personality automatically through signature will prove it to be a helpful and good system for persons behavior identification.

From the research, it was concluded that with the help of ten samples of signature, we predict the behavior of persons whose signature are taken. From the signature, four features are extracted Streaks, Orientation, Thickness, Letter Spacing. With the help of BPN we train the network from which we got the iteration number and MSE values. Then we uses five set of signature for training and remaining five is used for testing the behavior. By calculated the minimum MSE value, we assign its behavior correspond to the above training sample.

From the study it is concluded that number of features, learning rate, training algorithm affects the accuracy of techniques

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