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STUDY OF PERSONALITY PREDICTION BASED ON HANDWRITING AND SIGNATURE RECOGNITION USING MULTIPLE ARTIFICIAL NEURAL NETWORK AND MULTI-STRUCTURE ALGORITHM

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Abstract: Handwriting Analysis is a scientific method which identify, evaluate and understand an individual's personality. Neurological brain pattern represents the personality trait of a person. Unique neuromuscular movement produced by neurological brain patterns that is the same for every person who has that particular personality trait. Strokes, patterns and pressure applied while writing can reveal specific personality traits. Emotional outlay, fears, honesty and defences are the true personality which are reveled. Handwriting examiners called graphologists analyze handwriting samples for personality detection. There are various techniques to predict the personality. Latest approach uses the graphical approach to predict the personality using Multi- Structure algorithms and Multiple Artificial Neural Networks. This report provides a comparative analysis of various techniques.

Keywords: Graphology, Multi-structure Algorithm, Multilayer perceptron

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INTRODUCTION

Graphology is the study of handwriting,which for hundreds of years has been recognized as being unique to each individual. Through the centuries, starting with Suetonius, the Roman historian, scholars like Shakespeare and Walter Scott believed that personality is reflected in the style of writing. The scientific establishment began to compile evidence and theories proving this as early as the 17th century.

Early work in Italy and France was taken forward in Germany, and the basis of today's methods were set down during the 19th and early 20th centuries. This makes graphology a relatively new science, which perhaps explains why many remain sceptical. The term graphology was first used by the Frenchman Michon in 1875, from the Greek graph o meaning I write, and logos meaning theory. [9]

Graphology is used everywhere from education, recruitment and human resources, to criminal psychology and illness diagnosis. Graphologist most concentrate on handwriting because practically everyone writes but not everyone paints or sculpts or draws. Each individual has unique handwriting. The handwriting is done by your brain. Handwriting is also called as brain writing.

The branches of diverse group of sciences of character reading is the graphology. Graphology is the one method that focuses on interpreting individual's character and personality traits by handwriting analysis. Complete personality and character profile of any person can be determined bi graphology. [10]

Personality prediction can be reflected by patterns of Handwriting and signature are image. Graphology is also known as Handwriting analysis which is pseudoscientific study of handwriting in relation to human mind or called the personality. Graphology is one of methods that analyze the structural graphic element of handwriting. Graphology is used to identify the qualities, traits, attitudes, sentiments or postures that occur in individual's handwriting.

Seven basic elements for handwriting analysis are speed, pressure, shape, dimensions, continuity, direction, and order. Signatures is usually used to identify certain personality as with appearance of dots, streaks, shapes or shell bottom line.[8]

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II. Literature Survey

Methods proposed in literature involve the preliminary process of segmentation from the sample and then application of various algorithms / techniques to determine the characteristic traits.

H. N. Champa, K. R. Ananda Kumar [1]proposes a method to predict the personality of a person from the baseline, the pen pressure and the letter "t" as found in an individual's handwriting. These parameters are the inputs to the Artificial Neural Network which outputs the personality trait of the writer. By examining multiple samples, The performance is measured. Baseline evaluation uses the polygonalization method and the evaluation of the pen pressure utilizes the grey-level threshold value. Template matching is used to calculate the height of the T-bar on the stem of the letter t. The baseline, the pen pressure and the letter `t' in one's handwriting reveal a lot of accurate information about the writer. MATLAB tool is used for the purpose.

S. Prasad, V.K. Singh, A. Sapre[2] proposes a method for personality prediction used the Support vector machin technology for generation of various parameters are then calculated by simple use of Trignometry and Treshold techniques.

Champa H N, K R Ananda Kumar[3] proposes a method to predict personality based on the pen pressure, the letter, the lower loop of letter y and the slant of the writing as found in an individual's handwriting. These parameters are the inputs to a Rule-Base which outputs the personality trait of the writer.

Z. Mohd Zam[4] Uses a back propagation for handwriting analysis in the selection of employees using the size of a letters as parameter.

Sibel Adal, Jennifer Golbeck[5] proposes Some method predict the personality based on social interaction one has with friends along a number of dimensions such as reciprocity and priority. this research features along with a set of features based on the textual analysis of the messages sent by the users.

P. K. Grewal, D Prashar[6] proposes a polygon method for pattern recognition based handwriting baseline, slant letter and pen pressure, and the letters i and f is identified using template matching .the parameters are the input of neural networks.

EC. Djamal[7] proposes a method that is the combination of signature and digit of character of application form using multi-structure algorithms and artificial neural networks (ANN).

III. Comparative Analysis

a. Comparision: This chapter introduces a comparative analysis of various papers with their techniques, results and future analysis as shown below.

H.N Champa, K.R Ananda Kumar[1] proposes a Artificial Neural Network for Human Behavior Prediction through Handwriting Analysis to predict the personality of a person from the features extracted from his handwriting using Artificial Neural Networks. The parameters are used to revealed the personality are baseline, the pen pressure and the letter t as found in an individual's handwriting are explored in this paper. Three parameters, the baseline, the pen pressure and the height of the T-bar on the stem of the letter t are the inputs to the ANN which outputs the personality trait of the writer. The baseline evaluation uses the polygonalization method and the evaluation of the pen pressure utilizes the grey-level threshold value. Template matching is used to calculate the height of the T-bar on the stem of the letter t . The baseline, the pen pressure and the letter t in one's handwriting are the most important parameters that reveal a lot of accurate information about the writer handwriting.

year	Prediction Based on	Method	Result	Future analysis
May 2010	Baseline Pen pressure Letter t	ANN	The performance goal is reached	Size of the letter, margins
Oct 2010	Size of letter Pen pressure Spacing between words and lines	Support Vector Machine	Take less time to test and train the data	Page margin arcade
2010	Pen pressure Letter t Lower loop of letter y	Rule base	Efficiency of automated analysis is better than manual analysis	Size of letter Margins
Dec 2013	Structure of signature letter digit area	Structure algorithm and ANN	Recognition of traning data gave &&% accuracy	More features improves preprocessing

b. Analysis:

S. Prasad, V.K. Singh, A. Sapre[2] proposes a Handwriting Analysis based on Segmentation Method for Prediction of Human Personality using Support Vector Machine to predict the personal behavior of an individual from their handwriting analysis in digital form. The are various features such as slant, size, pressure, upper zone or case(as in I, t, h, S, etc), lower zone (as in g, q, y, z, etc), word spacing, line spacing, page margins, middle zone or case(as in a, o, c, s, e, etc), arcade, garland, angle, thread, ,are used to predict the actual personality of the individual. .But the proposed system used six features among them discussed above. These features are size of the letters, slant of words and letters, baseline, pen pressure, spacing between letters and words because these features are enough to predict the behavior of the person. feature extraction and its classification are the main intension of the paper. All features are extracted automatically from the digital image of handwriting. These samples are then input to the support vector machine for classification. The algorithm proposed is very simple and easy to implement and use.

H.N Champa, K.R AnandaKumar[3] proposes a Automated Human Behavior Prediction through Handwriting Analysis to predict the personality of a person from the baseline, the pen pressure, the letter 't', the lower loop of letter y and the slant of the writing as found in an individual's handwriting. These parameters are the inputs to a Rule-Base which outputs the personality trait of the writer.

EC. Djamal[7] proposes a Recognition of Handwriting Based on Signature and Digit of Character Using Multiple of Artificial Neural Networks in Personality Identification .method uses a combination of graphical approach based on signature and digit of character of application form using multi-structure algorithms and artificial neural networks (ANN). The image is divided into two areas. the signature based on nine features and application form of letters digit area. Each are need to perform preprocessing to improve the recognition accuracy. ANN is used to classify the Signature area which result an accuracy of 56- 78.While four feature of the signature that detection using multi structure algorithm result 87-100.accuracy.

The above comparison have some limitations and some future analysis .so to overcome this problem the new research is done which has some handwriting and signature feature to predict a personality using ANN and Multistructure algorithm that is discussed below.
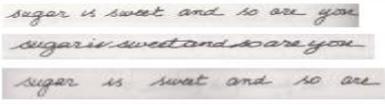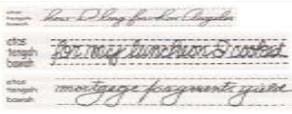
IV.STUDY OF RECENT DEVELOPMENT:

In this system the first ECG steganography is done in the mobile phone of patient, which includes encryption, wavelet decomposition and secret data decomposition. On the other hand the wavelet decomposition, extraction and decryption is done on the authorized receiver's side.

identify various personalities, handwriting recognition performed on handwriting and signature. Image was scanned. Image was converted into bmp or jpg format. Image was divided into two areas i.e. Handwriting and signature. Handwriting area has five features whereas signature area has nine features. Pattern recognition system is divided into two processes namely preprocessing and pattern recognition by feature extraction.

This research predict the personality based on the structure of Handwriting and Signature using ANN and Multi structure algorithm. Recognition of signature area based on appearance of five features (curve start, end streaks shell in the middle, middle streaks, underline) using multiple ANN and using multi structure algorithms based on four features (extreme margin, dot, separate signature, and signature streaks disconnected). While recognition of handwriting area based on four features (margins, spacing between words and lines, and zone domination) using multi structure algorithm and using ANN after hill valley extraction based on baseline feature.[8]

a. Handwriting and Signature feature

In this method handwriting analysis is based on five features i.e. page margin, spacing between words, spacing between lines, Dominance of vertical zone, Baseline and signature analysis is based on the nine features i.e. curved start, end streak, shell, middle streaks, underline, extreme margin, dot structure, separate, and streak disconnected.[8] As shown in figure:4.1 and 4.2.

No	Features/Personality review	Examples of features each class
1	Page margin: Relationship with space and time	
2	Spacing between words: emotional comfort with others	
3	Spacing between lines: clarity of thought and desired number of interactions	
4	Dominance of vertical zones: Personality completely	
5	Baseline: how successful a person overcome the influence of external drives	

No	Feature	Image	Type	Personality	No	Feature	Image	Type	Personality
1	Curved start		Curved backwards	Comfortable going past	6	Extreme margin		Tends to right side	Careless, inattentive
			Curved sharply	To formulate a sharp mind				Tends to left side	Fear of failure, fear of others, lack of confidence, pessimistic
			Curved smoothly	Be careful, friendly, diplomatic				Tends to top side	Respect yourself, reflect personal happy
2	End Streak		Increase	Open, foresight, desires ahead, confident				Tends to bottom side	Depressed, shy, feel foreign
			Down	Lacking spirit, realistic thinking, lack of confidence, easily discouraged.	7	Dot structure		Dot	Establishment of stable, has a suspicion, not always easy to keep believing
3	Shell		Shell	Excessive fear, introvert, do not care are approximately, not sociable and do not like to work together	8	Separate		Separate	Had a less pleasant experience in the past
4	middle streaks		Middle streaks	Possessive	9	Streaks disconnected		Streaks disconnected	Limiting desires, not taking any risks, often discouraged and hesitated to take decisions.
5	Underline		Underline	Have unique ideas and thinking, need support to make decisions, and have reliability in the lead.					

Figure 4.2: Features of signature classified using ANN and Multi–structure Algorithm [8]

b. Handwriting and signature Analysis Process

Image was scanned and converted into bmp or jpg format. It was split into two areas i.e. handwriting area and signature area. Handwriting area was reviewed five features whereas signature area was reviewed nine features. Pattern recognition system is divided into two processes namely

1. Data Acquisition and Image Preprocessing.

2. Pattern recognition by feature extraction

b.1 Data Acquisition and Image Preprocessing:

In this process handwriting and signature images of different individuals are required. These digital images are collected by scanning the handwriting of 25 different writers for training data and 100 different writers for testing data.

Each of the individual was asked to write a text document of simple in running hand and give signature in a box. These samples are written on paper without any lines so that we can predict the baseline and also some features.

In preprocessing stage, Image processing was done with gray scale and threshold so the handwriting image in a bit then divided into two areas i.e Handwriting and Signature area.[8] As shown in figure:4.3.
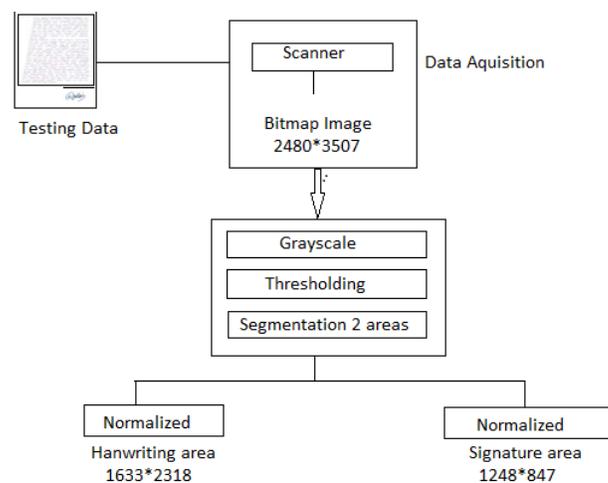
1. Recognition of Handwriting System.

2. Recognition of Signature System.

1.Recognition of Handwriting System:

Handwriting and Signature classified in two ways i.e. using multi-structure algorithm and ANN. Multistructure algorithm is used when features have to be reviewed with simple structure pattern.

When the features have to be reviewed with complex structure pattern then ANN is used with Multilayer perceptron Architecture. As shown in figure 4.4

The Image is divided into two ares i.e. Handwriting and signature areas, each is done preprocessing stage. After that segmented correspond to the features that were

1. Feature Extraction and Segmentation

2. Classification
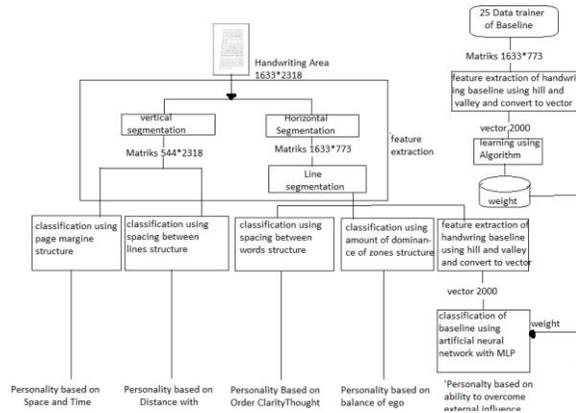
1.Feature Extraction and Segmentation

Feature extraction process is done by saving memory segmentation for classification.Segmentation is of three type i.e Vertical segmentation , Horizontal segmentation and lines segmentation.

1.Vertical Segmentation: It is divided into three sections i.e left, middle and right. Left side and right side of the image are used to analysis the page margin. Spacing between lines analysis using left side.

2.Horizontal Segmentation: It is divided into three sections i.e upper, middle and lower. middle segment are processed into line segment. the process of line segmentation is begins by taking the co-ordinate of x in the upper left corner and y coordinates of the lower left corner. Having found the black pixel value It is used to classify the dominance of vertical zone, baseline and spacing between words. To identify the baseline pattern, result of line process was extracted by Hill Valley features.[8] of x will be stored as cropx1.after that look for the value of cropx2 started last from to right y axis until no black pixels are found .same process is performed to calculate the cropy1 and cropy2.

Classification

1.Page Margin: structure of page margin is identified using the edges of black pixels in the upper left and right corner.

2.Spacing Between Line: This is done by identifying the writing and spaces of color pixels after noise canceling.

3.Spacing between words: Compute average of writing and space.

4.Dominance of vertical zone: This started from the left edge. There will be a row of array, where is searched for the highest series. Highest array will be divided into three based on the number of existing zones, with the goal to find out where the time of writing is at its decline. From this comparisons it will produce the dominant type of zone.

5.Baseline:It is classified using Artificial neural network.[8]

Recognition of Signature System:

Recognition of signature area is based on nine features. first five features i.e. curved start, End streak, shell, middle streak, Underline are classified using ANN and four features i.e. Extreme margin, Dot structure, separate, streak disconnected are classified using structure algorithm.[8] As shown in figure 4.5

1. Classification
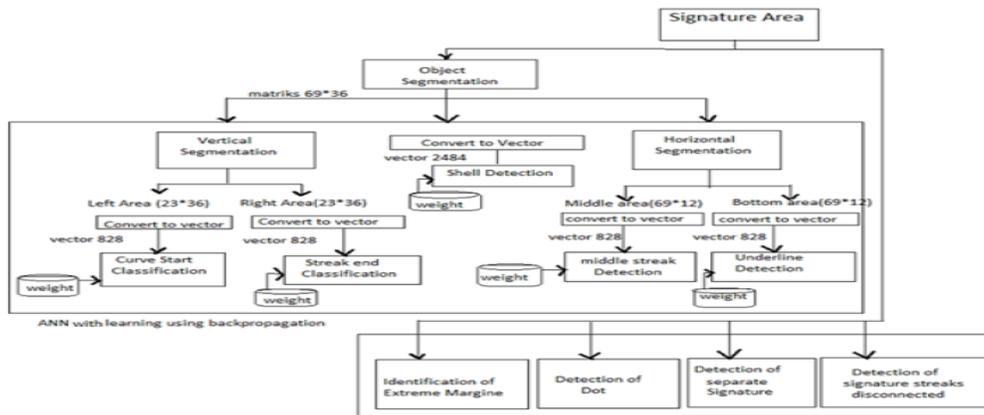
2. Segmentation

3. Identification and Detection System

Figure 4.5: Signature recognition System

1.Classification:

1.1 Extreme Margin: this identification is by comparing the distance between left and right margin., between top and bottom margin. As shown in figure:4.6

1.2 Dot Detection: It is by assuming the dot is a separate structure with the size of 5-17 and 5-15 pixel tall.

1.3 Separate Structure: This is done by ending top to bottom white pixel of more than 15 series.

1.4 Streak Disconnected: this detection was done with the assumption that are on the right, a length of 20 to 38 pixels and width of 5 to 15 pixel.

2.Segmentation:

Vertical segmentation: It is divided into three part i.e. left ,middle and right. left side is used to identify curve start and right side is to identify end streak. As shown in figure 4.6 three parts i.e. upper middle and lower. Middle is used to identify the detection of streaks and bottom is used for the detection of end of underline.
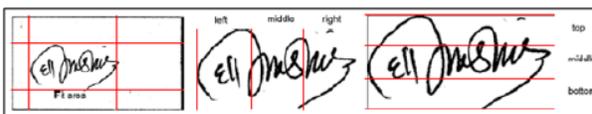

Figure 4.6: segmentation process of signature system

3. Identification and Detection System:

Identification and detection system used Multilayer Perceptron Architecture. It consist of input layer, hidden layer and output layer which are connected via weights. The weights are obtained from the training which is generalization training data using back propagation algorithm. As shown in figure: 4.7
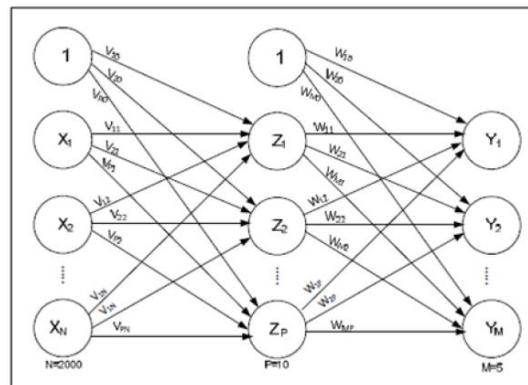

Figure 4.7: Architecture of classification system using MLP

CONCLUSION:

This report compared the various techniques, methods and results. To overcome the limitations of the various technique this handwriting and signature recognition using ANN and multistructure algorithm is used. For future analysis we can add various features to predict the personality.

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