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Predicting Human Behaviour from Handwriting

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ABSTRACT

Graphology is a field of study which is used to predict the behavior of human being through their handwriting. There are nearly around 5000 traits which can be predicted from the person's handwriting. Predicting the person's personality from their handwriting is one of the scientific methods. There are observable and recognizable traits found while the person is writing. As writing gets affected subconsciously by the person's thinking, character and personality. The motive of this method is to predict the behavior of person by their handwriting. Someone can try to write in other person's handwriting style, but this can be done only till few or less sentences. The particular person's handwritten text tells about the personality of a person, as writing is related with signals of neurons and brain, hence it subconsciously leaves a path regarding the traits like optimistic, pessimistic or balanced. The terms which are taken into consideration when analyzing person's handwriting are zones, slant, connection, spacing between the alphabets and spacing between the words, letter size, clarity, pressure, speed, margin, a large middle zone, small middle zone, upper zone. The system's whole operation which is to be perform is divided into six steps. The first step is to take the input of digital image from the user of the system. After which second step is carried out. In the second step, the image is converted into grey scale image using python. In third step, image preprocessing is carried out for the noise removal and sharpening of image. In next step segmentation is carried out to separate the word into characters. Then image is handed to CNN (Convolutional Neural Network) which analyses the input image with the CNN model which is developed by performing CNN on training dataset and the input image is labelled accordingly. In last step, the behavior predicted is displayed as output to user.

Keywords: Behavior prediction, Image Processing, feature extraction, CNN.

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I. INTRODUCTION

Humans have ability to write differently. And one person's handwriting can be differentiable from another person. Handwriting is useful in getting to know the behavior of person. As handwriting in humans is not develop overnight and it is continuous process, thus it is useful in finding the traits in human. Graphology is termed as determining the physical characteristics and patterns of handwriting for knowing the personality characteristics of person.

Writing can indicate personality features like feeling, fear, honesty etc. Identifying the personality of human being by his handwriting is an old technique. Handwriting analysis done by experts on the person's handwritten text samples for determining the traits of person.

The experts can do the analysis if the samples are in sufficient amount, if the samples are more, it becomes tedious for experts. Hence, the analysis system can help the graphology experts for predicting the behavior faster and efficient manner.

II. LITERATURE REVIEW

1. Nikita Lemos et al analyzed the personality based on the slope of the baseline in handwritten text. CNN model was used on the image and then it compared input with the older one.

2. Anamika Sen and Harsh Shah analyzed the flow of handwriting shortness etc. It was created in MATLAB.

Some of the features of input image were compared with the older images.

3. Anupam Varshney and Shalini Puri discussed about the various terms associated with handwriting. They also did survey on the basis of handwriting using ANN. They also showed various fields where this technique can be useful.

4. Behnam Fallah et al used MMPI technique, hidden markov model and neural network to perform analysis. They proposed system which would identify the characteristics which were related and not related to writer. The preprocessing was also performed.

III. PROBLEM STATEMENT

Design an efficient system to identify human personality parameters based on handwriting.

IV. PROPOSED METHODOLOGY

The features which are associated with handwriting are as follows: -Slant, Letter size, Margin, Pressure, Zones, Connections, Clarity, Spacing, Baseline

1. Slant: - The slant has three types, a. Handwriting tilted towards left or left slant. b. Handwriting is not tilted or straight. c. Handwriting tilted towards right or right slant.

2. Letter size: - The alphabet letter written can be divided into three zones, they are upper zone, lower zone and middle zone. As some of the alphabet letters are in middle and lower zone. The size of middle zone has vital role in handwriting analysis.

3. Margin: - The location of alphabets on page within a particular frame is known as margin. This feature is used to test the person's potential.

4. Pressure: - The pressure can tell how much the writer has the emotional intensity. The low pen pressure indicates light thinking and high pen pressure indicates strong thinking.

5. Zones: - The letter written can be divided into three zones, they are upper zone, lower zone and middle zone. The upper zone indicates the person's 'state of mind', the middle zone indicates the person's 'emotions' and the lower zone indicates about 'impact of physical elements in their environment'.

6. Connections: - There are four types of connections which can be seen in handwriting, they are garlands, arcades, angles and thread.

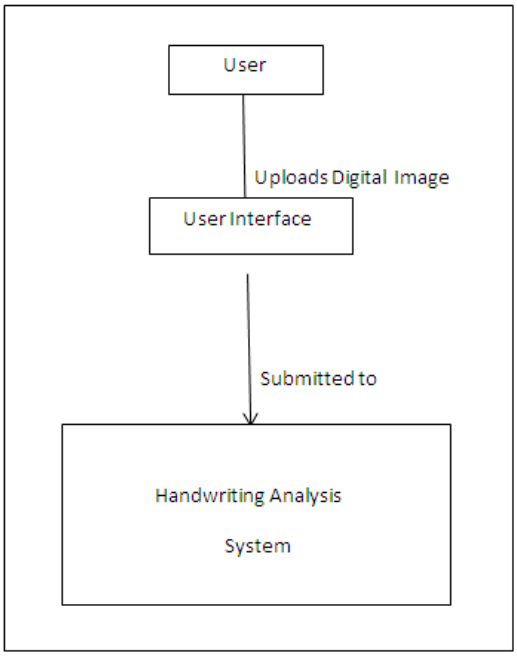
7. Clarity: - Clarity in handwriting indicates the positive emotions. The clarity of overall text is considered. A better spacing between words means the person shows interest in social contacts. There are other factors also which are also considered along with clarity.

8. Spacing: - Spacing is considered within words and overall with the margin also. A 'rule-of-thumb' technique is used in spacing. If the whole text in handwriting sample is towards left, then the person is having fear about his/her future. If the whole text is towards right side, then person is motivated and enthusiastic.

9. Baseline: - The three common baselines found in any handwriting are ascending, descending and level.
The proposed system task is divided into six steps:

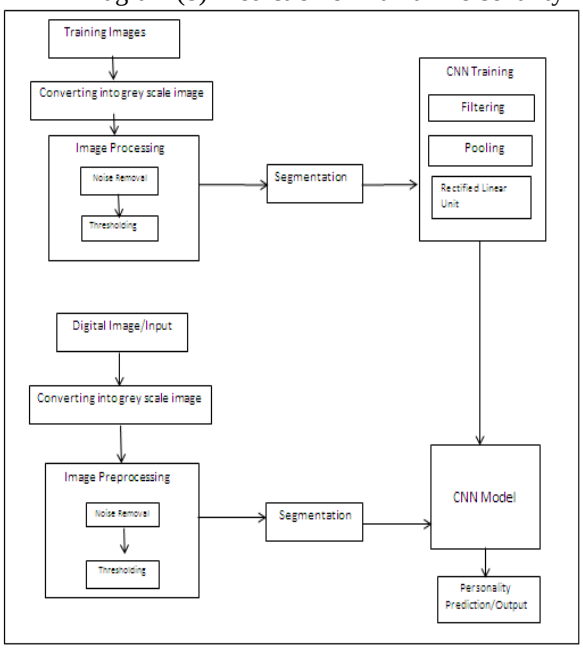
1. In first step the digital image of handwriting is taken from the user through user interface. The user submits the digital image and it is then passed to the system as shown in diagram(a).

Diagram (a) Overview / Input of digital image



In second step, the digital image is converted into the grey scale image in python.
After that, the threshold value of pixel which is higher than the value which is selected is set to '1' in binary image. The threshold value of pixel which is less than the selected value is set to '0' in binary image. Hence, by this task, the digital image is converted into binary image which is useful for neural network to work.
In third step, image preprocessing is carried out for the noise removal and sharpening of image. Preprocessing is basically done for byground clearance and locating the exact handwriting to be processed without any noise.
In fourth step, the segmentation of words into alphabet letters is done using drop fall algorithm. The flowchart of drop fall algorithm is as shown below. This algorithm divides the words into alphabet letters and is standard segmentation technique for finding traits from the input.
In fifth step, the dataset is created through the collected data and it is given as a training data to model. Even if the amount of data is not more, Convolutional Neural Network can work well and can perform smoothly on less dataset. If further the amount of data is added to dataset, the CNN can still work without necessary to make any change in model. CNN gives better accuracy and noise resistance is high in CNN and more features can also be added to it.
In sixth step, after the main processing on the input image is complete, the test sample is passed to CNN model. Feature extraction is done and the output label is obtained.

Diagram (b) Prediction of Human Personality



V. CONCLUSION

A simpler method has been proposed to predict the personality of a person by exploring his handwriting. The system extracts feature from breaks, size, space between words, baseline, loop of 'e' and few other features like pressure, margin, slant and dot distance in 'i'. The proposed system can be used as a twin tool by graphologist to improve the accuracy and anticipate the behavior s of a person faster. In the proposed methodology the system compares the input image with the CNN model which is created after applying the convolutional network on training dataset. The key feature of this proposed system is extracting all the possible traits of human behavior using CNN from handwriting.

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