

Automating Graphology Using Computer Vision

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ABSTRACT

Graphology is a scientific approach for examining many elements of a person's handwriting in order to identify their personality. The page margins, the slant of the alphabets, the baseline, and other prominent elements of handwriting may reveal a lot about the person. Machines can be introduced to do feature extraction and mapping to various personality attributes. This not only helps the graphologists, but it also speeds up the analysis of handwritten samples. Graphology is the science of analyzing a person's psychological qualities through their handwriting. We have automated the graphology process in this thesis, specifically the pattern analysis of handwriting and inference of personality traits. The system's overall accuracy in personality characteristic prediction was 90% based on our experimental examination of 100 users.

Keywords: Unique Characteristics, Personality Traits, Handwriting Analysis.

INTRODUCTION

Graphology, often known as handwriting analysis, is a contemporary branch of psychology that uses handwriting to identify personality traits and human behavior. Handwriting analyzers can use a person's writing to forecast the writer's personality qualities. The suggested tool will help graphologists work faster and more efficiently during the analysis process. During interviews, automated handwriting analysis may be utilized to correctly analyse personal attributes of candidates. Graphology can be used to forecast a person's personality, decision-making abilities, and analytical skills.

The US government is said to employ graphology in forensic evidence processing, although its most well-known application has to be in psychology. A graphologist's manual handwriting analysis takes around 4-6 minutes on average. With the help of our automation tool it will be done in few seconds. Handwriting analysis, also known as graphology, is a scientific study of handwriting that is used to assess a person's personality. While writing, the strokes, patterns, and pressure used might reflect certain personality traits.

Graphologists, who evaluate handwriting samples for personality identification, are handwriting examiners. Medical graphology is a psychological and scientific method for analyzing handwriting in order to diagnose physical and mental diseases. It's also frequently utilized in forensics.

LITERATURE SURVEY

Handwriting analysis is a centuries-old idea that dates back to the seventeenth century. Camilo Baldi wrote the first book to record these practices about 400 years ago. The use of computer technology in the field of handwriting analysis may be regarded a trustworthy instrument, according to research done by the American Psychological Association. In the subject of handwriting analysis, a paper investigates the use of a machine learning technique. Another research provides a technique for forecasting individual's temperament qualities by assessing the baseline, pen pressure, and the letter "t" in the person's handwriting sample. We investigated the state of the art in handwriting recognition in this study Off-Line Cursive Word Recognition, Proceedings of the IEEE, Vol. 80, pp1150-1161 [J. Simon (1992).] In the topic of image recognition, particularly line image recognition, certain fundamental concepts are addressed. The purpose of this study is to offer an overview of available approaches for analyzing historical texts that have been developed during the previous decade. Fusion-based segmentation is one of the known strategies. In N-gram, training is done on a text corpus, and only characters from that corpus may be identified.

Artificial neural networks and optimization approaches such as genetic algorithms are not used in the recognition of English text. Most businesses now want reduced costs for document storage and transfer, while also grappling with the issue of security. For developing high-recognition-accuracy handwriting recognition systems, having access to vast volumes of data for training and testing is a must. The collection contains 82,227 handwritten word occurrences spread across 9,285 lines of text. There are 10,841 distinct terms in the dictionary. Word and phrase recognizers may be trained and tested using the database. It may also be used to other problems in the unconstrained handwriting recognition area. A explanation of the essential characteristics of the database that is part of the database was provided in a previous version of this page. A considerably more extensive description of image processing techniques is offered in this work. Users can utilize these methods to run recognition tests without having to write their own low-level image processing and segmentation techniques.

The study of handwriting is known as graphology. It is an important approach or strategy for determining a person's personality. The Handwriting Analyzer is a scientific approach for identifying and evaluating writers. In graphology, numerous European countries are well-known, including France, Germany, Switzerland, Belgium, the Netherlands, and the United Kingdom. Different sorts or styles of handwritings are categorized as graphology. Digital sample collection is simple and inexpensive, and it may be utilized as a computer input or through image processing techniques. Features are computed, and a prognosis about the writer's personality is sent on..

Noise Removal

Image noise is an unwelcome by-product of image capture that obscures the information you want to see. Images may be filtered to eliminate noise using a variety of filtration methods. Gaussian, salt and pepper, and gamma noise are some of the most basic forms of noise.

Grayscale and Binarization

Inverted global thres holding is used to transform image instances to grayscale and binarize them. A pixel in a binary picture can be either 0 (black) or 255 (white) (white). All pixels in the picture plane may be categorized into foreground and background pixels using a simple threshold.

Contour and Warp Affine Transformation

After removing the noise and converting the picture to grayscale, the lines of the handwriting are straightened using the Open CV library's dilation, contour, and warp affine transformations. Further processes employing horizontal projection of the picture to extract these handwriting lines will produce a better result.

Horizontal and Vertical Projections

The vertical projection of a picture is the sum of those values for each column, and the horizontal projection is a python list of the total of all the pixel values of each row of the image. Both of these techniques are carried out on grayscale photographs.

The approach is used to locate tiny portions of a picture that match a supplied template image. Individual lines are extracted and characters are recognised from the scanned handwritten sample. Finally, using correlation, the detected characters are compared to all of the template pictures, and a match is obtained. [7]

A flow diagram of the active nodes in a hidden neural network is shown in Figure 2 [8]. Each input is multiplied by its weight (the w_N values) before being added together. This yields a single number, which is then processed through the sigmoid nonlinear function, which is shaped like a "s."

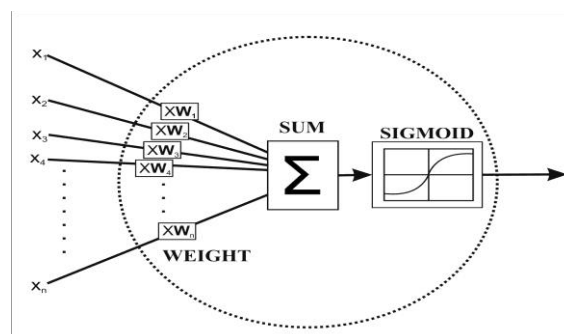


Fig. 1: Artificial Neural Network

PARAMETERS FOR ANALYSING HANDWRITING

The degrees of Letter-slant and Baseline are used. The letter's slant is measured from the letter's baseline to the

letter's baseline. Graphologists are handwriting analyzers that can detect a person's characteristic attributes only by looking at their handwritten samples. The following four parameters will be the focus of this paper:

Baseline, Line Spacing, Word Spacing, Top Margin, Pen Pressure, Letter-slant, Letter Size The width of the margins and the height of the T-bar.

The angle formed by a letter's vertical line and a horizontal line is called letter-slant. The distance between a letter's baseline and the top of the T-bar is called baseline. The width of a letter is the distance between its left and right borders. The space between the baseline and the bottom of a letter is its height.

Baseline

The writer's baseline handwriting reflects how successfully the ego, conscience, and innate urges interact with the writer's personality. The baseline can be represented as a linear graph with the ego and consciousness at the top and somatic tensions at the bottom. The writing is closer to a healthy whole if it is steady yet relaxed, but if it is dragged up and down by ideas and ego worries, or if it is as stiff as a bayonet, the personality is in jeopardy.

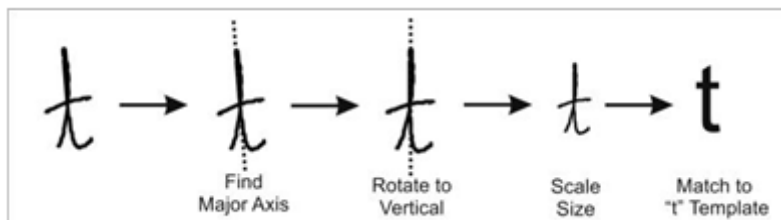


Fig. 2: Template Matching

Artificial Neural Network

Table 1: Baseline Characteristics

Baselines	Corresponding characteristics
Moving upwards	Confident
Moving downwards	Unenthusiastic
In line	Neutral

Letter Size

The middle zone letters are mostly examined while determining the size of a handwriting sample. To fall into the standard, copy-book category, they should be 1/8th of an inch or 3 millimeters high. Small authors frequently have an introverted personality, one who avoids the spotlight and communicates only with intimate friends. Large writers can be brave, enthusiastic, and upbeat, but they can also be cocky, restless, and lack attention and discipline.

Line Spacing

Small writers often have an introspective person, one not apt to seek the limelight and who is not communicative except with close friends. Large writers can act with boldness, enthusiasm, and optimism, but are also capable of boastfulness, restlessness, and lack of concentration and discipline.

Slant of Letters

This type has a head-over-heart emotional approach and is self-interested and self-interested. Although reasoning and judgement reign supreme, there is more sympathy and compassion portrayed here than in the vertical slant. Very inclined: These individuals weep and laugh easily, express their emotions, are future- and goal-oriented, and have an emotional disposition that is impassioned, loving, charming, and sensitive. The reclining writer has a polished public appearance, but his or her inner thoughts are veiled behind a well-constructed façade. The more right-wing the text is, the more severe the social and emotional conduct becomes. These authors are emotionally disconnected from themselves while yet being self-absorbed.

Pen Pressure

Those that exert a lot of pressure on others might motivate them. On the negative side, they might be severe, obstinate, and prone to gloomy thoughts or sadness. Fragility and weak nerves are indicated by light pressure. This

is the middle ground between the extremes, and it indicates healthy vigor and determination.

Word Spacing

The white space between the written words signifies the distance the writer wishes to keep between himself and the rest of society. As with the single letter, the writer is putting each word unit on the paper to represent himself. Between the phrases is the emotional space he requires from others, his territorial limits.

Top Margin

Wide top margin: Respect for the person being written to is demonstrated by modesty and formality.

Top margin: narrow, informality, directness of approach, lack of respect, and disinterest.

PROPOSED APPROACH

This study aims to learn more about people's personal characteristics, particularly those between the ages of 20 to 35 who are frequently subjected to multiple interview questions.

CONCLUSION

We can accurately and efficiently predict personality characteristics from new handwriting picture samples. Except for slant extraction, the system uses a variety of image processing approaches and individually built feature extraction algorithms. For image processing, we utilized the Open CV Library and the Sci-kit Learn Library, and for employing support vector machines with RBF kernel, we used the Sci-kit Learn Library.

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