HCTL Open Int. J. of Technology Innovations and Research
HCTL Open IJTIR, Volume 9, May 2014
e-ISSN: 2321-1814
ISBN (Print): 978-1-62951-521-2

Automated Human Behaviour Prediction System for Detecting the Career of a Person through Handwriting Analysis/Graphology

***Piyush Bagla**[*] **and Shuchi Bhadula**[†]*
piyushbagla13@gmail.com

Abstract

Handwriting Analysis or Graphology can be used as scientific means of identifying, evaluating and understanding someone's personality depending on handwriting. Handwriting is normally called mind writing or brain writing. In this paper, an automated human behaviour data system is presented, which classifies the writers scripts and will predict the personality together with career of individual automatically with the aid of a computer system,

[*]M.Tech, Department of Computer Science and Engineering, Graphic Era University, Dehradun, India.
[†]Asst. Professor, Department of Computer Science and Engineering, Graphic Era University, Dehradun, India. Email: bhadula.shuchi@gmail.com

HCTL Open Int. J. of Technology Innovations and Research
HCTL Open IJTIR, Volume 9, May 2014
e-ISSN: 2321-1814
ISBN (Print): 978-1-62951-521-2

without worrying about human intervention when using the science of Graphology (Art of Handwriting Analysis) through which we consider various handwriting parameters including size, slant, word spacing, pen pressure, line spacing, upper zone loops, lower zone loops, page margins etc. within the sets of characters to identify the nature associated with a person, which assists in deciding the career of their individual.

Keywords

Handwriting Analysis, Human Behaviour Prediction, Automated System, Graphology.

Introduction

Handwriting Analysis or Graphology is a scientific method of identifying, evaluating and understanding personality through the strokes and patterns revealed by handwriting.Handwriting Analysis is not document examination, which involves the examination of a sample of handwriting to determine the author [1]. Handwriting reveals the true personality including emotional outlay, fears, honesty, and defences and over many other individual personality traits. Handwriting is often referred to as brain-writing [5]. Each personality trait is represented by a neurological brain pattern. Each neurological brain-pattern produces a unique neuromuscular movement that is the same for your business who may have that particular personality trait. When writing, these tiny movements occur unconsciously. Each written movement or stroke reveals a specific personality trait. Graphology is the science of identifying these strokes as they appear in handwriting and describe the corresponding personality trait [1]. According to Gore [2], graphology is the science of the understanding human mind through person's handwriting. The experts in graphology which called graphologists analyse most of handwriting analysis. They perform the analysis according to their knowledge and experiences. Therefore, the outcome might vary among graphologists. If a tool is available for the analysis, the non-experts may use it for the same purpose. Handwriting analysis is an effective and reliable indicator of personality and behaviour. Handwriting represents the mental status of a person and handwriting analysis is s projection technique as being the gestures that profiles a person's behaviour in elements of social skills, achievements, thinking styles, or work habits. Handwriting also depicts the possible options for somebody's transactions with stress. Handwriting analysis is usually a study of frozen graphic structures that happen to be being generated in the author's

e-ISSN: 2321-1814
ISBN (Print): 978-1-62951-521-2

brain and so are designed into the paper in the cursive or printed handwriting style that is different from other authors comparing the personalities and their likelihood of problem solving.

Related Work

Handwriting Analysis or Graphology is really a scientific approach to identifying, evaluating and understanding personality over the strokes and patterns revealed by handwriting. Bar stools on sale elements of handwriting that could serve as scheme to calculate character traits are baseline, sized letters, writing pressure, connecting strokes, spacing between letters, words and lines, starting strokes, end-strokes, word-slant, speed of handwriting, width of margins, while others [5]-[7]. Writer individuality rests for the hypothesis that each individual has consistent handwriting, that's distinct on the handwriting of one other individual. However, this hypothesis is not exposed to rigorous scrutiny using the accompanying experimentation, testing, and peer review [8]-[13].

Proposed Methodology

Professional handwriting examiners called graphologists often predict the personality of any person through a sheet of paper. However the accuracy in the results count on the skill sets from the analyst. This manual strategy of handwriting analysis is very costly and time intensive. Hence the proposed methodology concentrates on creating a tool for behaviour analysis which often can predict the personality automatically by making use of some type of computer [1]. The many features in handwriting whereby behaviour can be predicted are pen pressure, baseline, slant, width of margins, spacing between letters, spacing between words, height and width of writing, height of bar on letter `t`, letter `y`, etc. A method may be proposed to predict the personality of the person in the features extracted from his handwriting using Artificial Neural Networks. Most of researches were done to recognize the characters of handwriting and commonly used Artificial Neural Network (ANN) for the recognition [3]. It is easier to apply neural network for that purpose because ANN is known as a good method for pattern recognition. Anyhow the training process for ANN requires a lot of time and data. So this study is proposing to apply fuzzy technique in detecting the features in handwriting and later to identify the personality.

HCTL Open Int. J. of Technology Innovations and Research
HCTL Open IJTIR, Volume 9, May 2014
e-ISSN: 2321-1814
ISBN (Print): 978-1-62951-521-2

System's Overview

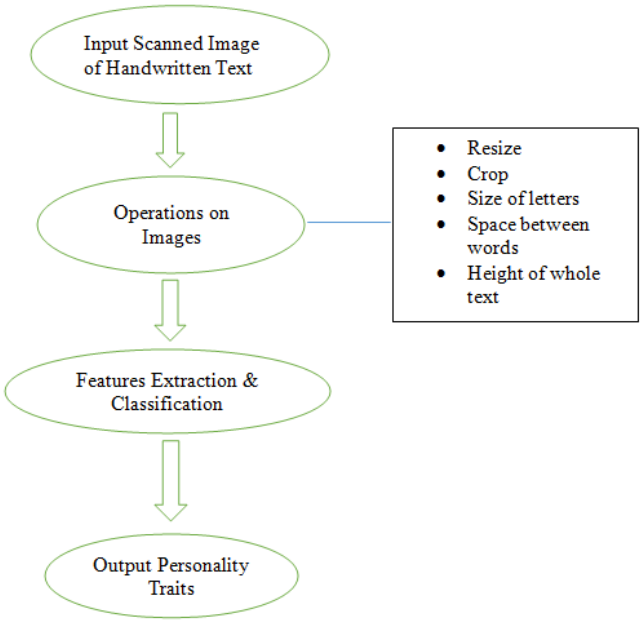

Figure 1: *Image Acquisition & Processing [4]*

HCTL Open Int. J. of Technology Innovations and Research
HCTL Open IJTIR, Volume 9, May 2014
e-ISSN: 2321-1814
ISBN (Print): 978-1-62951-521-2

Algorithm Implemented for Single Character

Conventions used	
I:	image name
P:	source data
T:	target data
Steps	
Step1.	While images in file
Step2.	I <- Read image files
Step3.	D <- rgb2gray I
Step4.	I <- resize
Step5.	Detect endpoints using Harris
Step6.	End while
Step7.	Save files
Step8.	Load saved file
Step9.	P <- create source
Step10.	Find end points of target image
Step11.	S <- create target data
Step12.	net <- newrbe(p,t) // create exact radial basis network
Step13.	o <- sim(net,P) // simulate network
Step14.	If o matches input image
	Show image
	Display properties associated with text
Step15.	Else check other images
Step16.	If not found display error message
Step17.	End if

HCTL Open Int. J. of Technology Innovations and Research
HCTL Open IJTIR, Volume 9, May 2014
e-ISSN: 2321-1814
ISBN (Print): 978-1-62951-521-2

Career by Number - Categories

1. Right Slant
2. Vertical (or slightly to Right) Slant
3. Small Size
4. Large Size
5. Slow Writing
6. Fast Writing
7. Spacing Between Words and Lines Same Width as Middle Zone Letters
8. Lines Separated and Evenly Spaced
9. Very Narrow Spacing between Letter and Words
10. Very Wide Spacing between Letter and Words
11. Tall Upper Zone
12. Compressed Upper Zone
13. Light Pressure
14. Medium to Heavy Pressure
15. Angular writing
16. Graceful and Rounded Writing
17. Large Capitals
18. Large Capital `I`
19. a and o (and top portions of p, g, and q) Slightly Open at Top
20. a and o (and top portions of p, g, and q) Tightly Closed
21. Some Letters Look like Numbers (eg., g looks like 8 or 9, o's are perfect circles)
22. Strong and Long T Bars Centered Above Half-Way on Stem
23. Wide and Long Lower Loops
24. Narrow and Long Lower Loops
25. No Loops in Lower Extensions
26. Wide Left Margin and Narrow Right Margin
27. Narrow Left Margin and Wide Right Margin

Analysis of Jobs and Professions by Categories

Accountant	2,3,8,21
Actor	1,4,8,14,16,17,18,19
Advertising	1,4,11,14,17,18,19
Agriculture Work	7,26
Artist (Simple, Rhythmic, Script)	8,11,14,16

e-ISSN: 2321-1814
ISBN (Print): 978-1-62951-521-2

Assembly-Line Work	12,27
Attorney	1,4,6,8,15,17,20,25
Author (non-fiction)	1,6,11,14,17,18
Author (Fiction)	3,6,14,15,17,18,21
Bank Teller	2,6,9,21
Bartender	1,4,7,12,16,19,24,26
Book keeper	2,3,9,20,21
Budget Director	2,3,9,20,21
Cashier	2,3,20,21
Caterer	1,6,8,17,19,23
Checker (Supermarket)	2,3,20,21
Clergy	1,4,6,7,8,11,16,17,18,19
Clerical Work	3,8,21
Computer programmer	2,3,14,17,20,21,27
Construction work	4,12,23,27
Contractor	3,6,7,8,14,17,18,22
Conservation work	4,7,8,17,18,19,26
Cook	5,23
Court reporter	2,3,6,7,8,16,20,27
Craftsman	4,7,8,17,18,19,26
Dentist	2,3,6,11,14,15,17,18,20,22,25
Designer	3,8,17,18,20
Desk Clerk	1,4,7,8,16,19,25
Detective	4,6,7,8,11,14,17,18,20,22
Diplomat	1,4,6,8,14,16,17,18,20,26
Doctor	2,3,6,11,14,15,17,18,20,22,25
Dramatics (Writing has simple open appearance)	1,4,11,17,18,19,26
Editor	2,3,6,7,9,14,15,22
Engineer	2,3,6,9,14,17,20,21
Entertainer	1,4,6,7,14,16,17,20,26
Executive	2,3,6,8,11,14,17,18,20,21,22,25,26
Food critic	1,8,11,14,15,17,18,19,22,23
Forest ranger	1,4,14,16,26
Heavy equipment operator	2,12,24,27
Hermit	2,10,12,13,20,27
Historian	2,3,6,12,14,20,27
Housewife	1,4,7,13,16,19,23

e-ISSN: 2321-1814
ISBN (Print): 978-1-62951-521-2

Interior Decorator	1,2,8,11,17,18,26
Inventor	2,3,7,9,11,14,15,20,22,26
Journalist	1,6,8,,14,17,18,26
Librarian	2,3,7,9,13,15,20,27
Loan Officer	2,6,9,15,20,21,26
Lumberjack	12,24,27
Manager	2,3,6,14,15,17,18,20
Manual Labor	5,12,27
Marathon Runner	12,17,22,24
Mathematician	2,3,6,9,14,17,20,21
Mechanic	2,12,20,24
Musician	8,11,14,16
Nurse	1,7,8,14,16,19
Philosopher	1,4,7,11,13,16,17
Pilot	2,3,6,10,14,17,27
Poet	1,4,7,8,11,14,17,27
Policemen	1,2,4,6,14,15,17,19
Politician	1,4,6,14,15,16,17,18,20,26
Professor	3,6,7,11,14,15
Psychologist	6,7,8,11,14,17,18
Public Servant	1,4,7,8,13
Public Relations	1,4,6,7,8,11,14,17,18,26
Physicist	2,3,6,9,14,17,20,21
Researcher	2,3,6,7,8,11,14,15,20
Real Estate Agent	1,4,7,8,14,1617,19,26
Receptionist	1,4,7,8,13,16,191,26
Sales	1,4,6,10,14,16,17,181,19,26
Sales Engineer	(combination of sales & engineer)
Scientist	(see Researcher)
Secretary	1,2,3,6,7,8,13,16
Sexual Surrogates	12,16,17,18,19,22,24
Sports Player	12,17,22,24
Statistician	2,3,6,9,14,15,17,18,21,22
Student	2,5,8,12,27
Supervisor	(see Manager)
Teacher	1,3,6,7,15,17
Technician	(see Engineer)
Tool Maker	2,3,5,12,20,21,27

e-ISSN: 2321-1814
ISBN (Print): 978-1-62951-521-2

Travel Agent	1,2,7,8,16,19,22
Treasurer	2,3,6,9,14,1,7,28,20
Waiter	1,4,7,12,16,19,24,26
Warehouse Worker	2,5,14,21,24,27

Results

Sample (Connected)	Length of whole text	Height of whole text	Word Gap	No. of Objects	Actual Objects	Efficiency (in %age)
1	1009	155	4	5	4	80.00
2	2177	195	5	8	5	62.50
3	1337	213	3	4	3	75.00
4	1167	217	4	4	3	75.00
5	1321	157	4	5	5	99.99
6	1989	195	5	7	5	71.42
7	1827	209	4	6	5	83.00
8	1239	247	3	6	3	50.00
9	1477	187	6	9	7	77.77
10	1625	203	6	7	5	71.42

Table 1: *Results of Connected Samples*

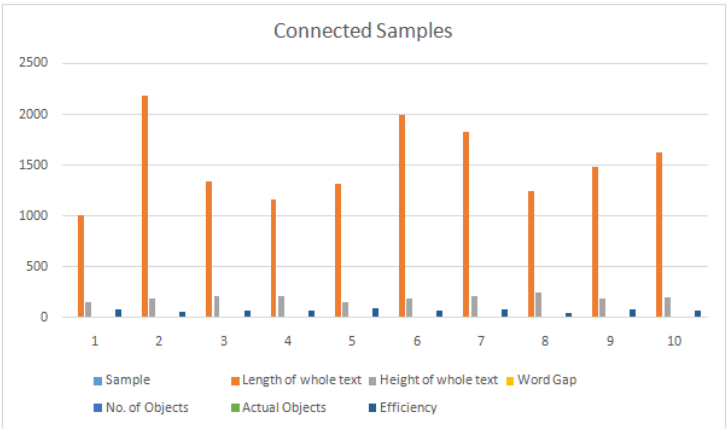

Figure 2: *Results of Connected Samples*

e-ISSN: 2321-1814
ISBN (Print): 978-1-62951-521-2

Sample (Un-connected)	Length of whole text	Height of whole text	Word Gap	No. of Objects	Actual Objects	Efficiency (in %age)
1	2213	167	16	12	18	66.66
2	2347	197	13	16	23	69.56
3	2031	173	12	17	21	80.95
4	1793	249	13	11	19	57.89
5	1743	127	15	13	21	61.90
6	2209	179	18	17	23	73.91
7	2295	183	21	18	29	62.06
8	1501	183	13	12	20	60.00
9	1501	183	13	13	25	52.00
10	2079	197	11	11	21	52.38

Table 2: *Results of Unconnected Samples*

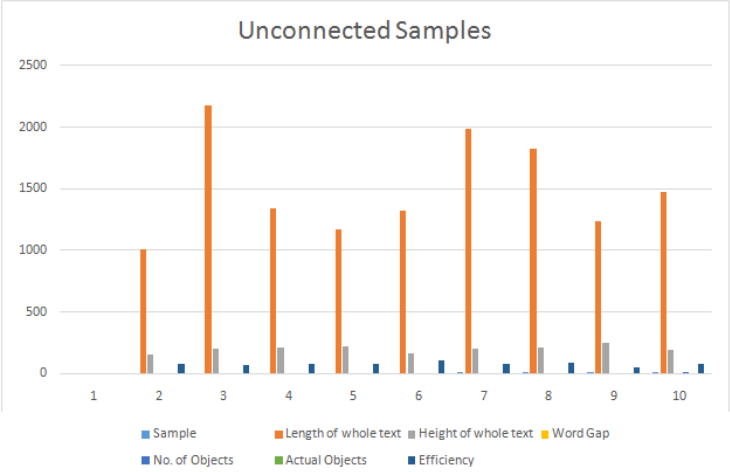

Figure 3: *Results of Unconnected Samples*

e-ISSN: 2321-1814
ISBN (Print): 978-1-62951-521-2

Conclusion

By inputting text as an image from the user which has both connected and unconnected words, then by calculating various features from it like length of the whole text, height of the whole text, word gap, number of objects and actual objects in the text and then we have to extract each character from that text image by performing segmentation for the extraction of character. Then we have to train that segmented character so that we can compare the matching point of the segmented character and the database.The input in our system are both the connect words and unconnected words in the text then by indexing each character, and if the match occur then that index number get initialize. We have make a table of detecting behaviour when a proper index set matched with the corresponding row from which we can detect career of an individual later.Someone can also apply our algorithm for check individual career by inputting single character only. But our main focus is on text and not on single character. The good the scan text, the better the results. The efficiency of the system is not on the very high side as it depends on the scanned image because it is very difficult to segment highly connected words.

References

[1] Champa H. N. and K. R. Ananda Kumar. 2010. Automated Human Behaviour Prediction through Handwriting Analysis. First International Conference on Integrated Intelligent Computing.

[2] N. Gore, (2006), Graphology - Unleash Inner Personality & Talent of Child Retrieved March 09, 2006.

[3] Y. L. Cun, B. Boser, J. S. Denker, D. Henderson, R. E. Howard, W. Hubbard, and L. D. Jackel. (1999). Handwritten digit recognition with a back propagation network.

[4] Abdul Rahiman MDirector, Diana Varghese and Manoj Kumar G., HABIT: Handwritten Analysis Based Individualistic Traits Prediction.

[5] Champa H N, K R AnandaKumar, A Scientific Approach to Behaviour Analysis through Handwriting Analysis, National Conference on Research Trends in Information Technology, S R K R Engineering College,Bhimavaram, Andhra Pradesh, 2008.

e-ISSN: 2321-1814
ISBN (Print): 978-1-62951-521-2

[6] N Mogharreban, S Rahimi, M Sabharwal, A Combined Crisp and Fuzzy Approach for Handwriting Analysis, IEEE Annual Meeting of the Fuzzy Information,2004, vol1, pp 351-356.

[7] Sung-Hyuk and Charles C Tappert , Automatic Detection of Handwriting Forgery, Proceedings of the Eighth International Workshop on Frontiers in Handwriting Recognition, 2002, vol1, pp.351-356.

[8] K Toraichi, T Horiuchi, R Haruki, Observation Method for Mathematical Graphology, Proceedings of the Third International Conference on Document Analysis and Recognition, 1995, volume 2, pp. 656-659.

[9] Sung-Hyuk Cha, Sargur N Srihari, Apriori Algorithm for Sub-category Classification Analysis of handwriting, Proceedings of the Sixth International Conference on Document Analysis and Recognition, 2001, pp. 1022-1025.

[10] H. E. S. Said, T. N. Tan and K. D. Baker, Writer Identification Based on Handwriting, IEEE Third European workshop on Handwriting Analysis and Recognition, volume 33, no.1, 2000, pp 133-148.

[11] Philip Jonathan Sutanto, Graham Leedham and Vladimir Pervouchine, Study of the Consistency of some Discriminatory Features used by Document Examiners in the Analysis of Handwritten letter "a", Proceedings of the seventh International Conference on Document Analysis and Recognition, 2003.

[12] Saragur N Srihari and Zhixin Shi, Forensic Handwritten Document Retrieval System, Proceedings of the First International Workshop on Document Image Analysis for Libraries (DIAL'04), 2004.

[13] Ameur Bensefia, Ali Nosary, Thierry Paquet, Laurent Heutte, Writer Identification by Writer's Invariants, Proceedings of the Eighth International Workshop on Frontiers in Handwriting Recognition, (2002), pp 274-279.

[14] Parmeet Kaur Grewal, Deepak Prashar, Behaviour Prediction Through Handwriting Analysis, International Journal of Computer Science and Technology, Volume 3, Issue 2, April-June 2012. Available at: http://www.ijcst.com/vol32/3/parmeet.pdf

[15] Champa H. N., Dr. K. R. Ananda Kumar, Artificial Neural Network for Human Behaviour Prediction through Handwriting Analysis, International Journal of Computer Applications, Volume 2 - No.2, May 2010. Available at: http://www.ijcaonline.org/volume2/number2/pxc387878.pdf

HCTL Open Int. J. of Technology Innovations and Research
HCTL Open IJTIR, Volume 9, May 2014
e-ISSN: 2321-1814
ISBN (Print): 978-1-62951-521-2 *References*