A comparative study of peculiarities of asynchronous handwriting with time gap

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Abstract
It is necessary for every document expert to discriminate between authentic and forged handwritings. Although at times, when contemporary writing is not available, it is relatively difficult to ascertain the fine demarcations and bring out the peculiarities from handwriting. The range of variations in writing from different span of life, documents and instruments called as asynchronous writing, vary more than the synchronous writing. In present research, 85 samples were collected, 5 samples from each individual out of which three samples are collected from their Past writing (1-32 years) and two in their Present writing. For the present samples individuals were asked to write printed model text. The results were based on the handwriting characteristics which were more prone to variations (Slant, Initial and Terminal Stroke, Spacing and Connectivity between the letters) as well as those which remain unaffected by showing consistency (Skill, Rhythm) in due course.

Keywords: Handwriting, Time, Rhythm, line quality, skill.

1. Introduction
Forensic document examination involves the examination and comparison of handwriting and/or signatures. In questioned document cases there are many instances when it is not possible for the expert to take specimen handwriting and/or signature. There may also be a significant time gap between the admitted handwriting and/or signature and the questioned handwriting and/or signature. Handwriting is a complex perceptual motor task which is an acquired skill. Handwriting identification depends upon the various extrinsic and intrinsic factors. Extrinsic factors include environmental conditions, position and style of holding pen and paper, etc. Intrinsic factors include health, mental stability, etc. [1] Handwriting identification also is a discriminatory process that is derived from the comparison of writing habits, and an evaluation of the significance of their similarities or differences. [1]
T.S Kapoor *et al.* "The structure and degree of characteristic variety in authentic composition with age" (2008) contemplated the level of variety in full grown journalists and its impact on penmanship following a time of 10 years. In his examination of 50 persons matured 30 to 55 years, he reasoned that the scope of common variety, as opposed to the attributes themselves, will change bit by bit with time. This change advocates the need for contemporary compositions in correlation of penmanship, despite the fact that penmanship attributes stay pretty much perpetual [13].
S. N Srihari, Sung –Hyuk Cha Arora ans H Sangnik *et al.* "Individuality of hand writing" (2001). Penmanship tests from 1500 people, from the US populace as for sex, age, ethnic gatherings, and so on were acquired. Examination of penmanship was carried out by PC calculations for separating gimmicks from checked pictures of penmanship. Traits normal for the penmanship were acquired, e.g., line partition, inclination, character shapes, and so on. These characteristics, which are a subset of traits utilized by master archive inspectors, were utilized to quantitatively secure singularity by utilizing machine learning methodologies. Utilizing worldwide properties of penmanship and not very many characters in the written work, the capacity to focus the author with a high level of certainty was made. This work is giving logical backing to conceding penmanship prove in court. The scientific methodology and the subsequent programming additionally guarantee the supporting to the record analyst [14].
Shruti Gupta *et al.* on the theme "Appraisal of scope of common variety under control composition qualities from Asynchronous hand composing" (2012). For this, an aggregate number of 540 examples have been gathered from 9 diverse age gatherings running from 20 years - 60 over, each with five years of interim (60 specimens from every age bunch 30 examples each from guys & females). Altogether 3 penmanship tests from every person on A-4 sheet, two penmanship tests with the substance; same as the past composed script is additionally taken as a specimen for near study. With due impact of the discoveries assembled from the present examination, the cases without the contemporary penmanship styles can be attempted effortlessly by considering the penmanship qualities which are inclined to varieties (integration between letters, arrangement and separating) alongside those which stay unaffected and in place by indicating consistency (Skill and Speed) at the appropriate time course or age and time [7].
In this study, samples from past writing are compared with the present writing samples to check if they show similarities or dissimilarities in their writing habits. To check the rate of variation and to check which characteristics are the most and least prone to variation, in the class characteristics? This study will be helpful in the cases where it is not possible for the expert to take specimen hand writing and/or signature of the person and admitted hand writing and/or signature have significant time gap. Characteristics which are taken into consideration in this study are Speed, Skill, Initial and terminal stroke, Tremors, Rhythm, Spacing between words, Slant, Connection and stroke between letters.

2. Material and Method

A total no 85 samples (5 samples from each individual – 3 samples are from their old handwriting and 2 samples in their present hand writing) had been collected.

The samples were collected from the individuals on A-4 sized plain paper sheet, two handwriting sample in present handwriting with a content (The London letter) in English and 3 old or past samples collected from each individual (gap ranged from 2 – 15 years). The samples were collected with 045 Reynolds fine carbure ball point pen only. All samples were collected along with their personal details and signatures indicating their consent for hand writing sample. Three samples are collected from their Past writing (Time interval for sample Past (a) is 1-5 years; for time interval for sample Past (b) is 1-10 years; and for time interval for sample Past (c) is more than 10 years) and two samples in their Present writing (P and P-1 with gap of 10- 15 minutes). All the samples were collected from the individuals who have minimum graduation qualification.

The collected samples were analysed by magnifying glass for following class characteristics:-

Line quality (Speed, Skill, Initial and terminal stroke, Tremors), Rhythm, Spacing between words, Slant, Connection and stroke between letters

Instrument used

1. Hand lens
2. Nikon cool pix L810 / HTC desire 816 mobile cameras has been used for photography of handwriting samples in present study.

The observations were made for each handwriting characteristic by analysing each individual's past (a, b, c) and Present (P and P-1) hand writing.

The skill of writing, is estimated as Superior, Medium or Inferior on the basis of the smoothness of strokes and line quality and the overall impact of the writing. Speed has been analysed based on the rapid distribution of ink, consisting of thickening and thinning of inks in production of strokes. If distribution of ink is even as well as consists of thickening and thinning of ink is observed as moderate speed. Low distribution of ink is observed in slow. Initial strokes were observed as flying, blunt or gooping. Blunt, tapering or pointed terminal strokes were observed as well. In tremors its presence and absence has been examined. For Spacing between the words it has been observed as even if between 0.5 -0.1 cm, wider if gap is more than 1 cm and narrow if less than 0.5 cm, and inconsistent if it's a combination of any two of them. Rhythm has been observed as smooth & consistent, moderately smooth & consistent or less smooth & consistent. Connectivity between letters has been studied as more connected if letters are more like cursive in any of five samples or less connected if letters are more like a text format in any of five samples.

The samples were compared with each other i.e. firstly both present samples were compared with each other if they are showing similarities or variation, then each past sample was compared with present sample to find out which characteristic remains unchanged with time and age.

3. Result and Discussion

During examination, similarities as well as variation in the present and old handwriting of individuals were observed and analyzed. Natural variation was taken under consideration and class characteristics of handwriting were compared. I observed that with time some characteristics in the writing showed variation and few remained similar throughout. Skill and Rhythm of writing was found to be slowly changing with time. In the samples from group of 0-9 years skill and Rhythm was found to be similar, after that variation was observed. Characteristics such as Slant, Initial Stroke, Terminal Stroke, and Connectivity showed more variation than Skill, and Rhythm of the writing.

Table 1: Result of Samples of Individual

S. No	Handwriting Characteristics	Past a	Past b	Past c	Present (P)	Present (P-1)
1.	Skill	Medium	Medium	Medium	Medium	Medium
2.	Speed	Rapid	Rapid	Rapid	Rapid	Rapid
3.	Initial stroke	Gooping	Gooping	Gooping	Gooping	Gooping
4.	Terminal stroke	Tapering	Tapering	Tapering	Tapering	Tapering
5.	Rhythm	Smooth and consistent	Smooth and consistent	Smooth and consistent	Smooth and consistent	Smooth and consistent
6.	Spacing between words	Even	Even	Even	Even	Even
7.	Slant	Vertical in nature	Forward in nature	Forward in nature	Forward in nature	Forward in nature
8.	Connecting stroke	More	More	More	More	More
9.	Tremor	Absent	Absent	Absent	Absent	Absent

Table 2: Distribution of handwriting characteristics on the basis of variation and similarity

S. No.	Sample No's	Line quality					Rhythm	Connectivity	Slant	Spacing
		Skill	Speed	Initial stroke	Terminal stroke	Tremors				
1.	P &P(1)	S	S	V	V	S	S	S	S	S
	P(a) & P	S	S	V	V	S	S	S	S	S
	P(b)&P	S	S	V	V	S	S	S	S	S
	P(c) & P	S	S	V	V	S	S	S	S	S
6,	P & P(1)	S	S	S	S	S	S	S	S	S
	P(a) &P	V	S	S	S	S	S	S	S	V
	P(b)&P	V	S	V	V	S	S	S	S	V
	P(c) &P	V	S	S	S	S	S	S	S	V
P – Present 1, P(1) – Present -2 ; P(a)Past 1, P(b)- Past 2, Past (c)- Past 3, S – SIMILARITIES, V- VARIATATIONS										

Table 3: Variations in Handwriting Characteristics with Time Gap

S.No	Time gap	No. of samples	Variation in Handwriting characteristic in Descending Order
1.	0-3 Years	6	Slant ≤ Connectivity ≤ Spacing < Rhythm ≤ Speed ≤ Initial stroke ≤ Terminal stroke < Skill < Tremor
2.	3- 6 Years	13	Spacing < Initial strokes < Rhythm < Speed < Connecting stroke < Terminal stroke < Skill < Tremor
3.	6- 9 Years	11	Speed ≤ Rhythm ≤ Skill ≤ Initial stroke ≤ Terminal stroke < connectivity ≤ Slant ≤ Spacing < Tremors
4	9- 12 Years	8	Speed ≤ Rhythm < Spacing ≤ Skill ≤ initial stroke < Connectivity ≤ Slant < Terminal stroke < Tremors
5.	12-21 years	7	Skill ≤ Speed <Terminal stroke ≤ Spacing < Rhythm< Connectivity < Slant ≤ Initial stroke < Tremor
6.	21- 32Years	6	Spacing < Speed ≤ Rhythm ≤ Skill < Initial stroke ≤ Terminal stroke < connectivity ≤ Slant< Tremors

4. Conclusion

It can be concluded from the present study that time gap and age play significant role in study of natural variation in handwriting characteristics. The class characteristics like slant, initial Stroke, terminal Stroke, and connecting strokes play eloquent role in inducing natural variations. While skill, speed and rhythm in one's writing remains less affected giving rise to more consistency in handwriting than natural variations.

5. Acknowledgments

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