The Evaluation of Handwriting Features in Photocopied Signatures

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Abstract

The photocopies are considered as the best possible evidences in the situations when the original documents are either lost or damaged. A photocopy cannot reproduce all the details of the original document. In the present study, an attempt has been made to study the handwriting features from the non-original documents. The outcomes of this study are very satisfactory and encouraging and could help in the examination of photocopied samples.

INTRODUCTION

The invention of advanced and modern reproduction techniques such as photocopiers or all-in-one machines that can scan, copy and print documents, lead to the acceptance of non-original documents as evidences. The document examiners are very often requested to examine non-original documents especially in cases where it is claimed that the original document has been lost or destroyed or is not available. Sometimes, original documents exist but are not available for use e.g. they may be present in court records at distant jurisdiction. The photocopied documents are often submitted to the forensic document examiners to determine the authorship of writing or signatures. The photocopies are the filtered images of original information; therefore, this photocopied document does not produce handwriting details as in original documents. Some examiners declined to express positive conclusion for the photocopied signature/handwriting due to the fact that the copying process may have concealed or introduce evidence of simulation. At the same time, others furnished a conditional opinion stating that the same was based on the assumption that these non original documents were the true reproduction of the original documents.

Various forensic document examiners have examined handwriting characteristics in the photocopied signatures. They were of the view that though photocopies not always permit exhaustive handwriting examination but some times there will be adequate material in good quality photocopies that help in useful comparison (Hilton 1984a, Ellen 1989). Morton (1989) examined the photocopies of both signatures and extended writing written with different writing instruments and on different type of papers. According to her, most of the copiers reproduced the signatures, genuine and forged; well enough for a fruitful examination. Dawson and Lindblom (1998) investigated the extent to which photocopying process inhibits the ability of experts to assess a variety of line quality features and whether the non original features impacted on the assessment of overall line quality. Grose (1999) presented a survey that addressed authorship, authenticity and effects of potential manipulation on the examination of photocopies and the degree of strength of the conclusion rendered. The results of the survey indicated that 70% of the examiners believe the possibility to conclusively determine the authorship of writing and 79% said that it was not scientifically possible to determine the authenticity of a photocopied document 72% of the document examiners were opined that the issues of authorship and authenticity in a written conclusion should be considered separately. Found et al. (2001) investigated the skill of forensic document examiners in making opinion regarding the process of production and authorship on both original and non-original signatures. According to authors the study had certain limitations as small sample and the group of examiners (who participated in the study) was not true representatives of the document examiners in general. In addition to this, the results could be different for less complex signatures, for extended text or for a more limited writing sample. Moreover, the quality of the photocopy would also affect the results. Found and Rogers (2005) tested the accuracy of 15 examiners opinion regarding whether photocopied questioned signatures were genuine or simulated. The study

provided substantial support that examiners can make accurate observations regarding the authorship of non-original handwriting.

So, an extensive study is proposed to be made on this very important aspect. For this, in the present study genuine, simulated and traced copy of signatures in non original documents (both good and bad quality photocopies) have been compared with there corresponding original signature to determine which handwriting characteristics are detectable and which are not in the photocopies.

MATERIALS AND METHODS

The samples for the determination of the authorship from photocopied signatures were collected in the following manner:

1. Genuine signatures were collected by requesting twenty subjects to append signatures (10 times) on an A4 plain white sheet. After the gap of 7-8 months, these subjects were asked to append their signatures (10 times) again on plain white sheet. 2. Then, two volunteers were requested to copy or imitate the above genuine signatures using their best skills and methods. They copy the genuine signatures through-simulation and tracing. The tracing was done by two methods i.e. the signatures of all the twenty subjects were traced with the help of tracing paper and by transmitted light process. In this way three sets of copied or non-genuine signature were collected.

3. Both genuine and non-genuine signatures were then photocopied. Six photocopiers were selected for the study. Three of them produced good quality of photocopies and three produced bad quality of photocopies.

Analysis of Samples: The originals that include genuine and non-genuine signatures and the photocopies of original signatures were examined under magnification for letter forms, slant, size, t-crossings, I-dots, starting and terminal strokes and Line quality. Line quality includes tremor, pen lifts/pen skipping, pen pause, abrupt change in the direction of strokes and retouching/patching.

RESULTS AND DISCUSSION

Results were obtained after the examination of twenty samples each of original and photocopied samples of genuine, simulated and traced signatures by transmitted light and by tracing paper. The overall handwriting characteristics including line quality were accurately assessed in 18/20 cases in good quality photocopies of simulated signatures, 19/20 cases in traced signatures of both types. Similarities and differences in handwriting features were almost accurately distinguished between good-quality photocopied questioned signatures and the known samples; however, examination was difficult in some of the bad quality photocopies.

Examination of every single handwriting features and the results were shown in tables 1-3. It was clear from the tables that though it was not possible to clearly assess every characteristics form photocopies but this did not lead to inaccuracies in overall assessment except in 2 cases in good quality photocopies and 4 cases in bad quality photocopies. Detailed study of different handwriting features, given in tables 1-3, is discussed below:

TREMORS

Tremors were observed as shaky irregular strokes caused by unnaturally slow pen movements due to conscious attention to letter-forms in deliberate rather than spontaneous writing in simulated and traced copies (Kelly and Lindblom 2006). This feature was observed in 12/20 cases in original, non-genuine (simulated) samples. In case of good-quality photocopies, they were reproduced in 10/20 samples and in case of bad quality photocopies, this feature was reproduced in only 8/20 cases. The most probable reason behind this is because the tremors were less pronounced in original non-genuine signatures. Moreover, the photocopiers were also not able to reproduce it well as there were breaks in the continuity of strokes due to the non deposition of toners.

In the present study, the tracing was done by two methods i.e. the signatures of all the twenty subjects with the help of tracing paper and by transmitted light process. In the original, traced copies of both types (20 samples each), the tremors were present in all the samples while they were less pronounced in 2 and 1 samples of tracing by transmitted light and by tracing paper respectively. Good quality-photocopiers reproduced tremors in all cases. But this feature was not reproduced in all samples photocopied by bad quality photocopiers (Fig1-4).

Figure 1

Fig-1 Showing tremors in Bad-Quality Photocopies

Fig-2 Showing tremors in Good-Quality Photocopies

Fig-3 Showing tremors in Original Non- Genuine(Tracing by Transmitted Light

Fig. 4 Showing Original Genuine Signatures used as model

ABRUPT CHANGE IN THE DIRECTION OF STROKES

Forged signatures often show uncertainty of movement portrayed by abrupt change in the direction of line or stroke (Hilton 1984). This feature was observed in 19/20 original, non-genuine samples (simulated copies) and only in 2/20 samples in tracing by transmitted light. Good quality photocopiers reproduced this feature almost in all cases i.e.18/20 (Table 1). But in cases of bad quality photocopies, this feature was observed in 16/20 cases. This was due to the fact that these changes were less pronounced in original non-genuine signatures as the simulations were more skillful and at the place of direction change, there were no toner deposits (Fig 13-15).

In one case of genuine signatures, the squarish style of the writer was misinterpreted as change in the direction of the stroke in photocopy.

PEN PATCHING

It is defined as the retouching a portion of a written stroke (Hilton 1984a). In case of genuine writing it is bold in nature but in case of forgeries it is of concealed nature. In the present study it was observed in 8/20, 9/20 and 7/20 samples in case of original simulated copies, tracing by transmitted light and tracing by tracing paper respectively. In case of the good quality photocopies it was observed in 8/20, 7/20 and 7/20 samples respectively (Fig 5-6). Bad quality photocopies were not reproduced this feature well (Table-1).

Figure 2

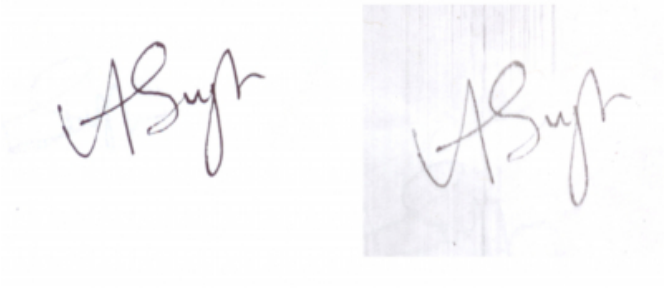

Fig 5 showing Pen Patching in Good Quality Photocopies

Fig 6 showing Pen Patching in Bad Quality Photocopies

PEN SKIPPING/PEN LIFT

An interruption in a stroke caused by removing the writing instrument from the writing surface is known as pen lift. It could be the normal habit of the person. But sometimes the pen was lifted at unnatural place and then the person tried to keep the writing instrument almost at same place and again started the stroke. This concealed pen lift at unnatural place is the feature of forgery (Harrison 1960, Hilton 1984a). In the present study, unnatural pen lifts were present in 7/20 samples of original non-genuine (simulated), in 7/20 samples of original tracings by transmitted light and in 4/20 samples of tracing by tracing paper (Table-2). These pen lifts were characterized by the fact that no un-inked groove was present and the second stroke show a change in direction and its margins were not parallel to and consistent with the margins of the preceding stroke (Singla et al. 2004) (Fig7).

Figure 3

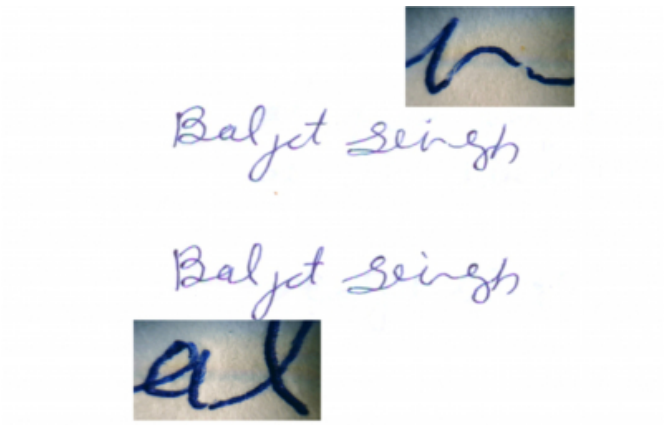

Fig 7 Showing Unnatural Pen lifts in the Original, Non-Genuine signatures.

Pen skipping is observed as break in the inked stroke either due to high speed of writing or because of the fact that ink does not fill in the stroke though groove is very much present. This is a typical nature of ball-point pen strokes (Hung and Leung 1995).

In case of photocopies, un-inked or break in the ink-lines were observed. It was not possible to ascertain that whether these hiatuses were because of unnatural pen lifts, or because of the nature of writing instrument. Light strokes due to high-speed and less pressure used in original signatures also appeared as pen lifts.

In some signatures the concealed pen-lifts were observed like continuous strokes because of the artifacts added due to the process of photocopies (Fig 8).

Figure 4

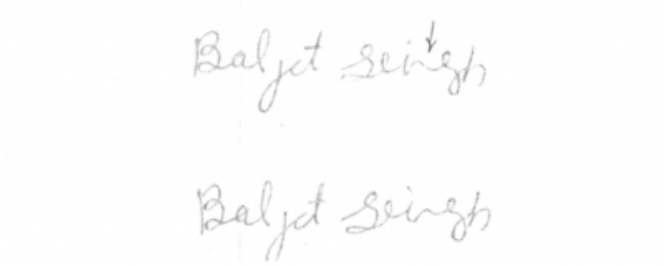

Fig 8 Showing Pen lifts in the Non-Original, Non-Genuine signatures. In the lower Signature continuity of stroke was observed due to added artifacts.

In the study, it was observed that the pen lifts were present in 13/20 and 15/20 cases in case of non-original simulated photocopies by good and bad quality photocopiers respectively. In case of photocopies of traced copies by transmitted light, this feature was observed in 10/20 and 11/20 cases of good and bad photocopies and in samples of tracings by tracing paper they were present in 7/20 and 11/20 cases respectively in good and bad quality photocopies. This is because of the fact that the minute details or the peculiarities, by which these features can be recognized in original writings/signatures, could not be reproduced by photocopying process.

PEN PAUSE/INK GOOPING

Hesitation is defined as a pause or stop in the writing motion in which the writing instrument remains in contact with the writing surface (Hilton 1984b). This is one of the peculiar features of line quality in case of forgery. In the present study pen pause was observed in 12/20, 3/20 and 5/20 cases in original, non genuine signatures i.e. simulated, tracing by transmitted light and tracing by tracing paper respectively. This feature was absent in original genuine signature.

Ink gooping or blobing is the feature that was observed in the form of extra ink deposits along with the main line stroke in case of ball point writings. It can be very well detected in original writings/signatures (Komal 1997; Singla et al. 2004). But in case of photocopies, ink gooping/blobing was also misinterpreted as hesitation or pen pause.

LETTER FORMS

This is one of the important features for the examination of writing/signatures. The forger tries to imitate the design of letters. But a significant difference in the mode of execution of the letters as compared with the standard signature tells its fraudulent character. So, regardless of the care taken in imitating the letter forms, variation in these characteristics are apt to occur (Hilton, 1984a). In the present study, original simulated and traced copies could be successfully detected from the variation in the execution of letter forms as compared with the genuine signature. In case of photocopies, imitated or traced letter forms were reproduced but the variation in the execution of letter form cannot be ascertained (Fig 9-12).

Figure 5

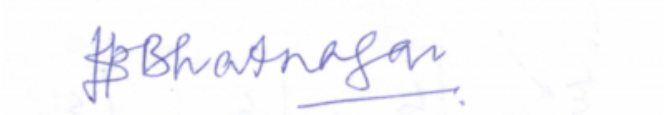

Fig 9 Showing letter Forms in Original Genuine Signatures.

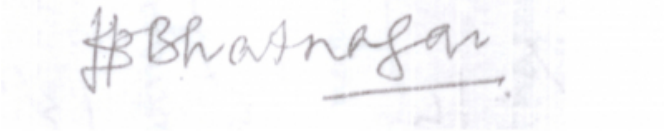

Fig 10 Showing letter Forms in Non-Original Genuine Signatures.

Fig 11 Showing letter Forms in Original, Non-Genuine Signatures. The Formation of Strokes is different form the above Original Genuine signatures.

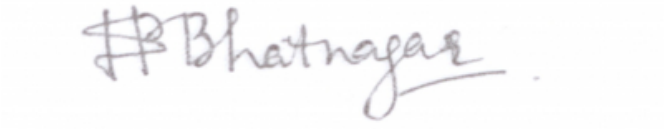

Fig 12 The Formation of Letters cannot be made in Non-Original, Non-Genuine Signatures.

T-CROSSINGS AND I-DOTS

These two features were reproduced in the photocopies. Their shape and place can be ascertained from the good quality photocopies. In case of bad quality photocopies, loss of some details was observed in these features (Fig 13-15).

Figure 6

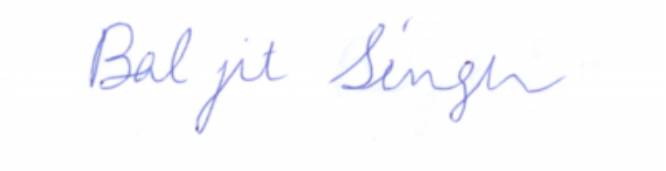

Fig. 13 Original Non-Genuine Signatures showing I-dot, T-crossing and abrupt change in the direction of strokes.

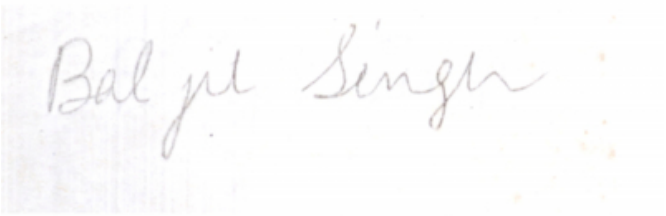

Fig. 14 I-dot and T-crossing in Bad- Quality Photocopy showing that the details of these features were lost. Abript change in the direction of stroke is also not clear.

Fig. 15 Good- Quality Photocopy showing I-dot,T-crossing and abrupt change in the direction of strokes.

TRACING LINES

Tracing lines and guided line are one of the most important features in detecting the traced forgery of tracing paper or carbon paper. This feature was present in all the 20 samples of traced signatures by tracing paper. But this feature was neither reproduced by good quality nor by bad quality photocopier.

From the above observation it has been clear that examination can be done from the photocopies though bad quality photocopies do pose problems in ascertaining some of the important handwriting features. Examination of every single character leads to the conclusion that, these features have not always been interpreted or detected accurately but this does not leads to inaccuracies in the overall examination of photocopies especially good quality photocopies. So, each photocopy must be evaluated on its own merit depending upon the difference in image quality and resolution (Dawson and Lindblom 1998, Grose 1999).The features like pen lifts, pen skipping, pen patching are more commonly misinterpreted. Moreover, most important features like traced or guidelines cannot be reproduced in photocopies. Kelly and Lindblom (2006) also suggested that line quality became harder to interpret as the third dimension of the pen pressure i.e. the depth of the ink line into the paper could not be seen. Moreover, the possibility of a fabrication must always be considered when examining a non-original document as the manipulation became easy to create with modern copiers, scanners and publishing software (Kelly and Lindblom 2006, Dawson and Lindblom 1998, Morton 1989, Found et al.2001).

CONCLUSION

It has been concluded that examination can be done from the photocopies though bad quality photocopies do pose problems in ascertaining some of the important handwriting features. Examination of every single character leads to the conclusion that, these features have not always been interpreted or detected accurately. The features like pen lifts, pen skipping, pen patching is more commonly misinterpreted. The features like traced or guidelines cannot be reproduced in photocopies. So, each photocopy must be evaluated on its own merit depending upon the difference in image quality and resolution. Moreover, the possibility of a fabrication must always be considered when examining a non-original document.

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References

r-0. Dawson G.A. and Lindblom B.S., Science and Justice 1998, 38, 189-194.
r-1. Ellen, D., The Scientific Examination of Documents: Methods and Techniques, 1989, Ellis Harwood Ltd., Chichester: England.
r-2. Found B., Roger, D. and Herkt, A., Journal of Forensic Document Examination, 2001, 14, 1-13.
r-3. Found, B. and Rogers, D.K., The Forensic Science Society, 2005, 29, 1209-1211.
r-4. Grose, W.P., International Journal of Forensic Document Examiners, 1999, 5, 71-75.
r-5. Harrison, W.R., Suspect Documents: their Scientific Examination, 1966, Sweet and Maxwell Ltd. U.K.
r-6. Hilton, O., Scientific Examination of Questioned Documents, Rev. Ed., 1984a, Elsevier Science Publishing Co., New York.
r-7. Hilton, O., Journal of the Forensic Science Society, 1984b, 24, 157-164.
r-8. Hubar, R.A. and Headrick, A.M., Handwriting Identification: Facts and Fundamentals, 1999, CRC press LLC NY.
r-9. Hung, P.S. and Leung, S.C., International Journal of Forensic Document Examiners, 1995,1, 18-31.
r-10. Komal, Ph.D. Thesis (Unpublished), 1997.
r-11. Kelly, J.S. and Lindblom, B.S., Scientific Examination of Questioned Documents, 2nd Edition, 2006, Taylor and Francis Group LLC, NW.
r-12. Morton, S.E., Journal of Forensic Sciences, 1989, 34, 461-467.

r-13. Singla A.K., Saini K., Jasuja O.P. and Singh S., in Hand Book of Forensic Science (ed. Prof. Veeraraghavan, V.), 2004 Selective and Scientific Books: New Delhi.

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