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# Determination of Individuality and Variation from Disguise Handwritten Documents with the Application of Metric System

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**Abstract**

In the era of advancement and technology, the innovation of new techniques has changed the investigation process of questioned documents. A lot of various new computational technology has emerged and provide a dynamic protagonist in the field of handwriting analysis. A signature or handwriting, which is understood as a transcribed graphical representation about the state of human mind and their thought process of any work. Yet some aspects of forgeries of handwriting are unscathed from the reconnaissance which can resolve so many cases, if the felon could be apprehended. In disguise handwriting, it becomes difficult to identify the tangible individual or to ascertain that it is knowingly transcribed or someone else. In this pilot study, we implemented the metric system for the identification of disguised handwriting/ signatures in respect of the known specimen of same individual. As a resultant, it was observed that the class characteristics and individual characteristics vary during assessment. But in the notation, a minute variation was pragmatic of ±3 mm was noticed that ascertain the individual of the crime.

**Keywords:** Handwriting; Identification; Technology; Suspect; Forged; Documents

## Introduction

In forensic arena, the utilization of advancement and development of new techniques towards investigation is in a fast pace. This advancement has changed the process of exploration of our scientific community. The handwriting / signatures which are understood to be individual and specific for identification have questions about their authenticity in the dispute cases. A document that is used for business and legitimate exchanges genuinely keep on playing a critical part in budgetary and secured its confirmation. In some instances, related to money and properties where the exchanges take place and the disputes are also recorded. A signature is transcribed graphical representation which is used to validate singularity. Signature of a man may change as per his state of mind, wellbeing and so forth. In fact, even the honest to goodness endorser may not duplicate his own particular signature as it is, a few changes will be present over there. Subsequently, it is hard to recognize that whether signature unpretentious to the produced one. The author's signature frequently changes relying upon a few components, for example, atmospheric temperature, weariness, time and so forth. Awesome irregularity can even be seen in signatures as indicated by their propensities, mental or mental state, physical and down to earth conditions. Signature can be dealt with as a picture in light of the fact that a man may utilize any image, line, Curve and letter or gathering of letters as a signature. Henceforth it is a flawless possibility for picture handling and example acknowledgment [1]. In any procedure, where signatures are required in those cases a signature is a prime contender for signature distinguishing proof. Now a day, People are more averse about the authenticity of their signature being affirmed as contrasted with other conceivable verification frameworks [2]. The inescapable reaction of signature is that they can be misused with the end goal of faking an archive's legitimacy. Subsequently the requirement for examination in effective mechanized answers for signature acknowledgment and confirmation has expanded in late years to abstain from being helpless against extortion [3]. In this era of advancement, the biometrics system and software has changed the empowers to distinguishing proof or genuine confirmation of a person from its physical or behavioral attributes relying upon their inclination. Biometrics is mechanized techniques for perceiving a man taking into account a physiological or behavioral trademark. The past of biometrics incorporates the distinguishing proof of individuals by unmistakable body components, scars

or a gathering of other physiological criteria, such like tallness, eye shading and composition. This strategy is presently turning into the establishment of a wide cluster of profoundly secure distinguishing proof and individual confirmation. As the level of security rupture and exchange trick expands, the requirement for well secure distinguishing proof and individual confirmation advancements is getting to be evident [4]. Metric system is another aspect of identification of genuine author's signature / handwriting. By meaning of this system, the measurements of all aspects of both original and the disputed signatures and compare the length, breadth and angle from the straight line. So that we can prove the difference on the basis of matrix system between original and the disputed one. In this present study, we utilized the metric system for the identification of disguised handwriting and authentication of the genuine author. Since we are aware that a human is not a machine who can work similar, so some variation is observed up-to a limit. By using this system, the authentication of original author or the forger can be done successfully. The utilization of metric system can put the document examination on the par of all other evidences and to nab the culprit in court of law.

## Methodology for The Study

### Material

For this pilot study, all the samples were collected from the students at amity institute of forensic science, Amity University between the age group 16-20 years. All the samples were selected randomly, and the consent were taken prior to the sampling. All the samples were collected on a plain A4 size white sheet and with a blue ball point pen. During the sampling, it was kept in mind to provide them same surface for support. For the analysis of samples, a ruler, protector, scale, and pencil were used. All the samples were photographed with the help of a Samsung galaxy S-5 phone, so the clarity of pictures can vary [5-7].

### Method

All the subjects were asked to write a name (demo sampling) in their original handwriting and in normal writing speed. Again, all the subjects were asked to disguise the same sample in their own handwriting. All the collected samples, normal handwriting as well as disguised were analyzed by using the metric system for conclusive identification of original author. This study was also concluded to find out any correlation between the writing and state of mind.

## Result and Discussion

As it is well known and very common use of the disguise handwriting / signature of an individual by himself for any unjudicial propose or for any specific indication. This indication may be a symbol of any specific threat or the subject is being pressurized to write something by other person who can harm to him or his personal. In common practice, it is very often that disguise handwritings/ signature being used for unjudicial purposes and it becomes a challenge to identify the author. Even on the basis of the individual and class characteristics, author can be identified and often concluded. During this study, we used the metric system to identify the disguise writings and the original author of it. Even we try to identify that if the same individual disguise writing, what factors can individualize the author and provide us important information in form of individual characteristics. In the below given figures, two sample have been shown which consists the authentic signature of the subject while the second one is having the disguise signature of same subject. Shown in (Figure 1,2). Now by use of the metric system, the measurement of the signatures has taken from the parameters that were fixed for the measurement. These parameters were fixed from the line of the writing and consist length of the original writing as well as disguise, breadth of the original signature as well as the disguise, the angle of the signature from the line of writing that starts from the below side of first letter as well as in disguise writing. The measurements are given below in the Table 1. Now to get the conclusive identification of the author/ individual, all the letters were examined minutely which as writing/ signature consists. During this observation, the special features/ parameters of circular formation such as vertical measurement of original signature as well as in disguise, horizontal signature and disguise too were observed. The formation of middle letters were also measured and noticed. The measurements are given below in the Table 2. After taking all the measurements, the statistical analysis of the both of writings/ signatures were calculated. For statistical analysis, SPSS software was used. By the statistical analysis, it was observed in table 3 that the length of the original signature ($\mu$=4.15) in comparison of disguise writing ($\mu$=4.56) doesn't have a significant difference. The breadth of the original signature ($\mu$= 2.33) in comparison of the disguise signature ($\mu$=2.33) also doesn't differentiate them. A difference was noticed between the angle of the original signature and the disguise signatures from the starting point of line of writing as ($\theta$ =15.41 & 22). The statistical calculation is given below in (Table 3,4) During the specific measurements of the letters included in a writing, firstly, it was taken for the circular formation of the letters of a specific writing / signature. When the vertical measurement of the letters was taken, it was observed that it consists a minutiae difference which may be a result of the natural variation or due to surface. This one was also having same occurrence in the horizontal measurements too. In final stage, when we see the formation of middle order letters that also does not have a significant difference which can conclude it significantly. The observation of the study can easily be differentiated in the graphical representation which was taken on the basis of the mean values between the length, breadth and angle from the line of writing of both original signature as well as in disguise signatures. It has been shown in the Graph 1 that the angle from the line of writing between the original and disguise signatures have significant difference and represent the natural tendency of the writer and his own individual style. Shown in Graph 1. While in Graph 2 same observations were noticed


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for identification. From this graphical representation, it was concluded that except the vertical length of the middle order letter included in signature show a minutiae difference while the other measurement such as horizontal and formation of letters have similarity. A little difference was noticed that is not significant and may be a cause of speed, natural circumstances, person health and surface too. It has been successfully observed by the above conducted study that if a person tries to disguise his own writing, it will not be easy for them. Being habitual, if care will be taken unknowingly some individual characteristics will be reflected in form of their identity. These characteristics can be found in various form such as individual or class characteristics, but no body care about the size of the letters in the writing specifically the letters which would have been inserted in the words. These middle order letter provide the key to identity about the suspected person. The careful measurements and study of parameters or features, metric system will be great helpful in forensic field. During the study a natural variation was also observed up to a limit of ± 2cm.

**Table 1:** The metric values of genuine and disguised handwriting.

| Sample No | Length of Original, $L_O$ (cm) | Length of Disguised, $L_D$ (cm) | Breadth of Original, $B_O$ (cm) | Breadth of Disguised $B_D$ (cm), | Angle from Straight Line of Original, $A_O$ (Degree) | Angle from Straight Line of Disguised, $A_D$ (Degree) |
|---|---|---|---|---|---|---|
| 1 | 5.1 | 6.2 | 2.4 | 2.8 | 15 | 25 |
| 2 | 3.9 | 3.9 | 2 | 2.7 | 15 | 14 |
| 3 | 4.2 | 4.5 | 2.2 | 1.9 | 15 | 24 |
| 4 | 4.1 | 4.7 | 2.2 | 2 | 13 | 20 |
| 5 | 4.8 | 4.3 | 2 | 2 | 14 | 10 |
| 6 | 3.7 | 4.9 | 2.6 | 2.1 | 16 | 35 |
| 7 | 4 | 4.8 | 2.4 | 2.8 | 19 | 28 |
| 8 | 3.7 | 3.9 | 1.8 | 2.8 | 15 | 28 |
| 9 | 3.9 | 5.4 | 2 | 2.2 | 15 | 17 |
| 10 | 4.3 | 3.4 | 1.8 | 1.8 | 15 | 22 |
| 11 | 4.4 | 4.8 | 2.1 | 2.2 | 15 | 20 |
| 12 | 3.8 | 4 | 2.3 | 2.7 | 18 | 21 |

**Table 2:** Showing the matric values of specific letters used in the words.

| Sample No | Circular Formations | | | | Formation of Middle Letters | |
|---|---|---|---|---|---|---|
| | Vertical Measurement of Original, $V_O$ (cm) | Vertical Measurement of Disguised, $V_D$ (cm) | Horizontal Measurement of Original, $H_O$ (cm) | Horizontal Measurement of Disguised, $H_D$ (cm) | Original (cm) | Disguised (cm) |
| 1 | 2.2 | 2.7 | 1.1 | 1.1 | 1.1 | 1.4 |
| 2 | 1.9 | 2.4 | 1.2 | 1.4 | 0.9 | 1.1 |
| 3 | 2.2 | 1.6 | 0.8 | 0.9 | 1.3 | 1.6 |
| 4 | 2.2 | 2 | 1 | 1.2 | 1.1 | 1.2 |
| 5 | 2.2 | 2.1 | 1.2 | 1.1 | 1.3 | 1.2 |
| 6 | 2.5 | 1.6 | 0.9 | 1 | 1 | 1.3 |
| 7 | 2.4 | 2.1 | 0.9 | 1.8 | 1.2 | 1.5 |
| 8 | 1.8 | 1.9 | 0.9 | 1.8 | 1.3 | 1.4 |
| 9 | 2 | 2.2 | 0.9 | 1.2 | 1.2 | 1.8 |
| 10 | 1.7 | 1.6 | 0.9 | 0.8 | 1.1 | 0.8 |
| 11 | 2 | 1.9 | 0.9 | 1.4 | 1.4 | 1.2 |
| 12 | 2.1 | 1.8 | 1.1 | 1.3 | 1.2 | 1.4 |


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**Table 3:** Representing the analysis in accordance with table no. 1.

| Variables | Length of Original Sig | Disguise Sig Length | Breadth of Original Sig | Disguise Sig Breadth | Angle from line of Original Sig | Angle of Disguise Sig |
|---|---|---|---|---|---|---|
| Stand. Dev. | 0.4358 | 0.7535 | 0.2467 | 0.3938 | 1.6213 | 6.714 |
| Mean | 4.15 | 4.56 | 2.33 | 2.33 | 15.41 | 22 |
| Stand. Err. | 0.4012 | 0.2273 | 0.074 | 0.1187 | 0.4888 | 2.024 |
| Variance | 0.189 | 0.227 | 0.0609 | 0.1551 | 2.628 | 45 |

**Table 4:** Representing the analysis in accordance with table no.2.

| Variables | Circular Formations | | | | Formation of Middle Letters | |
|---|---|---|---|---|---|---|
| | Vertical Measurement of Original, $V_O$ (cm) | Vertical Measurement of Disguised, $V_D$ (cm) | Horizontal Measurement of Original, $H_o$ (cm) | Horizontal Measurement of Disguised, $H_D$ (cm) | Original (cm) | Disguised (cm) |
| Stand Err | 0.0704 | 0.1016 | 0.0403 | 0.949 | 0.075 | 0.0722 |
| Stand Dev | 0.2335 | 0.3369 | 0.1337 | 0.3147 | 0.0187 | 0.2562 |
| Mean | 2.1 | 1.99 | 1 | 1.25 | 1.3 | 1.32 |
| Variance | 0.0545 | 0.1135 | 0.017 | 0.099 | 0.0594 | 0.0656 |

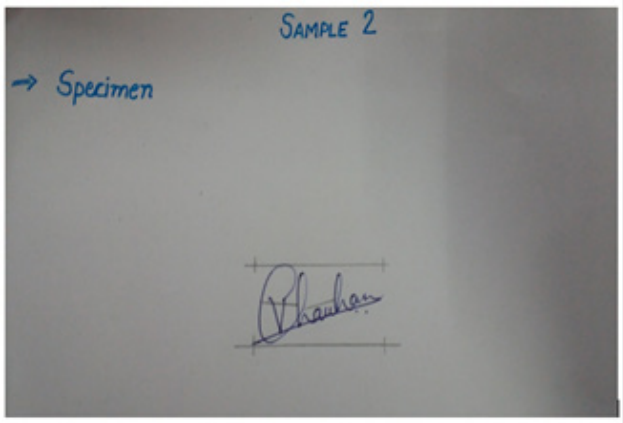


**Figure 1:** Showing the specimen used for the disguise handwriting.

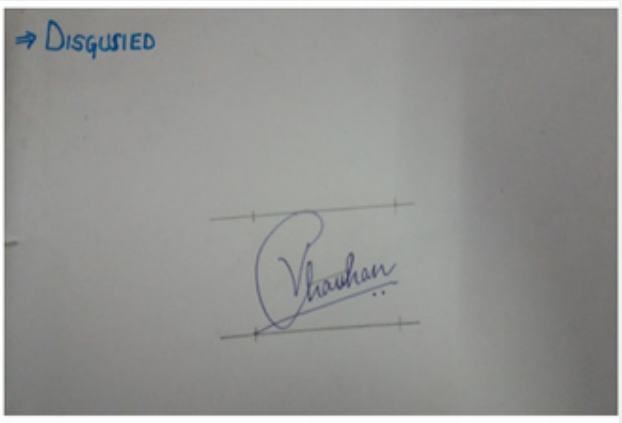


**Figure 2:** Showing the disguised signatures sample for authenticity.


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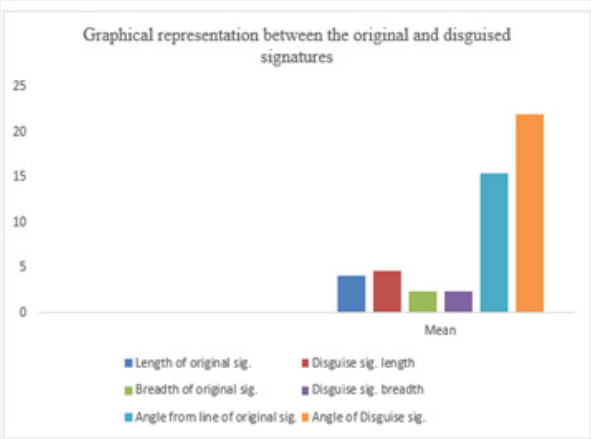
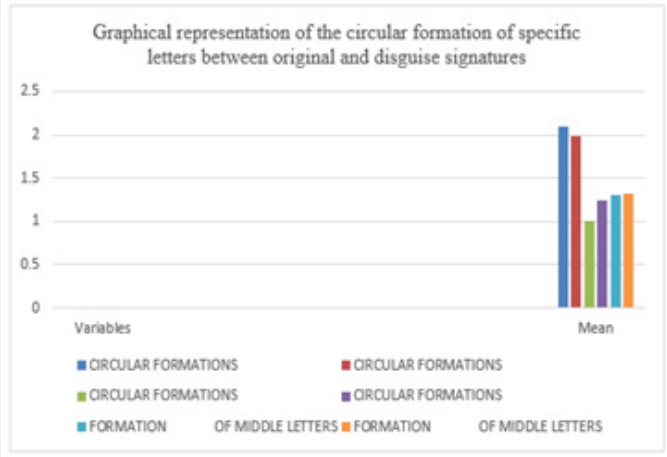



**Graph 1:** Graphical representation between the original and disguised signatures.




**Graph 2:** Graphical representation of the circular formation of specific letters present in both the original as well as in disguise signature.

## Conclusion

It is common in practice to find the similarities between the writing of an individual for identity based on the individual characteristics. But in this study, we used the metric system to prove that two signatures belong to same person. The natural variation occurs up to a limit in the writing because human is not a machine who can work similar and this natural variation is the identical characteristics of writing not the copied writing. The other factors such as the health of the person, circumstances, the environment and temperature can affect the writing of an individual but in these conditions the habit of their style and owned features will not change. The size can vary but the line quality and the formation of letters can be changed slightly not completely. These individual characteristics will provide the information about suspected person or it is done by the individual himself to take an unjudicial benefit or to harm someone his personal. The use of metric system can provide the important information in form of his identity and can be presented anywhere in front of the court of law. This technique has significant potential of identification of the culprit. If it will be followed by the individual characteristics or the class characteristics, then it can be put on the par above of all the evidences. Now a day, the new techniques are innovated which are expensive and is not easy to carry at scene of occurrence every time. But this can be done at any place and at any time. Being convenient and inexpensive this system will prove it significance in the investigation and nabbing the suspect person.

## References

1. Bhavana Desai, JL Kalyan (2013) Signature Scrutiny System in Banking Application. International Journal of Science and Research (IJSR) 2(2): 114-117.

2. Yogesh VG, Abhijit Patil (2014) Offline and Online Signature Verification Systems: A Survey. International Journal of Research in Engineering and Technology 3(3): 328-332.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3. Ali Karounia, Bassam Dayab, Samia Bahlakb (2011) Offline signature recognition using neural networks approach, World Conference on Information Technology. Procedia Computer Science 3: 155-161.

4. Surabhi Garhawal, Neeraj Shukla (2013) A Study on Handwritten Signature Verification Approaches. International Journal of Advanced Research in Computer Engineering & Technology (IJARCET) 2(8): 2497-2503.

5. Renu Bhatia (2013) Biometrics and Face Recognition Techniques. International Journal of Advanced Research in Computer Science and Software Engineering 3(5): 93-99.

6. Rajpal Kaur, Pooja Choudhary (2015) Handwritten Signature Verification Based on Surf Features Using Hmm, International Journal of Computer Science Trends and Technology (IJCST) (1): 187-195.

7. Sameera Khan, Avinash Dhole (2014) A Review on Offline Signature Recognition and Verification Techniques. International Journal of Advanced Research in Computer and Communication Engineering 3(6): 6879-6882.


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