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REVELING TRANSPLANTED SIGNATURES WITH THE HELP OF PHOTOGRAPHIC IMAGE PROCESSING SOFTWARE: A CASE STUDY

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ABSTRACT

In this digital era, paper documents still have their own values. The digital revolution however has minimized the paper works but failed to eliminate them completely from the office tables or record rooms. Many important correspondences in offices of India are still in form of paper works. The forgers have always been using easiest and safest methods to falsify a document with intent to obtain undue benefits from them. Inventions of document copying machines have made transplantation of signature an easiest method for forgeries. Scanners, photocopiers, computers & printers are the machines which make forgers task easier. Selection of machine depends upon its accessibility and skill of the forger as well as risk factor involved in whole operation.

This case study involves spotting of transplanted signatures of first signatory authority amongst genuine signatures of the other authorities with the help of image recording by DSLR with specific setting and processing of captured images over image processing software (Photoshop 6).

Keywords: Document, Signature, Forgery, DSLR, Image Processing Software.

I. INTRODUCTION

Digital revolution has saved lots of space on office tables and in almirah by preserving information in paperless form. But it doesn't mean that digitization of information has totally eliminated the paper work in offices. In India, irrespective of digitization of information, important information or decisions are still made on paper. The forgers have always been using easiest and safest methods to falsify a document with intent to obtain undue benefits from them. Inventions of document copying machines have made transplantation of signature an easiest method for forgeries. A transplanted signature refers to such signature which is transferred from some genuine source to a fraudulent document either by scanning, photocopying or by mechanical cut paste methods. The sole purpose is to deceive fraudulent document as genuine one. Scanners, photocopiers, computers & printers are the machines which make such type of forgery tasks easier. Therefore cases of transplanted forgeries have dramatically been increased in recent years. The perfection in forgery depends on both skills of the forger as well as quality of machine used. Selection of machine depends upon its accessibility by the forger as well as risk factor involved in the whole operation.

To prove that a signature is forged using transplantation method either or all of the following methods can be utilized-

1. If source document is available; by proving that the transplanted signature actually belongs to the source document. It can be done by superimposition and establishing mathematical correlation between transplanted signature portions of forged document and source document.
2. If source document is not available and there are two or more transplanted questioned signatures from same source available for examination; by proving that all transplanted signatures are replica of one another. It can be done by superimposition and establishing mathematical correlation among transplanted signature portions of all forged documents.
3. If source document is not available and there are two or more transplanted questioned signatures from different sources available for examination, and the transplantation is done by cut- paste and scanning or photocopying method; by revealing toner lines generated by cut piece contours and ink lines of the transplanted signatures.

This paper discusses a case of transplanted forgery made by cut- paste and photocopying method with aim to draw an attention on applicability of Digital SLR camera and image processing software in revealing transplanted forgeries.

II. CASE HISTORY

In a district office of U.P. State Government, eight persons were fraudulently recruited for the post of ‘Seenchpal’ by using eight deceiving letters (Karyalay Gyap). The matter was exposed when all the candidates came to the office for their joining. FIR lodged in this matter and departmental enquiry was set. The Executive Engineer denied to have signed any such document (Image-1). All eight ‘Karyalay Gyap’ then sent to me for Expert Opinion on the point that whether the subject in question actually signed all eight questioned signatures or they were created fraudulently.

III. MATERIAL AND METHODS

All eight original copies of deceiving ‘Karyalay Gyap’ containing questioned signatures were received and marked respectively as **Q1, Q2, Q3, Q4, Q5, Q6, Q7 & Q8**. Examination was done using measuring scale, Nikon D3000 DSLR camera with 18- 55 VR lens, camera stand, Light source, computer with photoshop-6 software.

Set camera with F-Stop- 5.6, Exposure- 1/30, ISO speed- 100, Focal length- 55mm, Aperture- 5, focus area- 3D and White balance- auto to maintain chroma of the questioned signatures with maximum details. All the questioned signatures were kept flat on photographic table one by one and the photographs were taken in raw format. For precaution two images of each questioned were clicked. The images were then transferred to computer for further analysis. All the images were opened in Photoshop software and curve, level, brightness, contrast were set in such a way that images may reveal maximum details with maximum clarity. All the images were also converted in inverted form to visualize evidential characteristics.

IV. RESULT AND DISCUSSION

When a forger mechanically transplant a genuine signature on a forged document, he takes out the desired signature portion from source document first by cutting with blade or paper cutter, then fix the cut piece at desired place on the forged document, then he finally takes Xerox of it. In this process of transplantation and Xeroxing the resultant forged document generates a number of revealing characteristics. The first revealing characteristic seen is the presence of toner particles instead of pen inks in signature lines (The comparative difference between black pen ink line in original copy and toner lines in Xeroxed copy of a signature is exhibited in image-2). The second revealing characteristic is scattering of extra toner particles around the transplanted signature, sometimes in whole page. Third revealing characteristic is generation of toner lines by the gaps between signature cut piece and underneath page. In this case the toner lines form the same pattern of lines as contours of the original piece of signature form. Fourth revealing characteristic is presence of toner particles as uneven black patches throughout whole signature line. Sometimes the cut piece of the genuine signature may contain writing remains of the source document or may partially hide writing portions of the deceiving document which may also be an additional characteristic. All the revealing characteristics discussed above may be sufficient proof for an expert to declare a signature as transplanted signature.

During examination of questioned signatures **Q1, Q2, Q3, Q4, Q5, Q6, Q7** and **Q8** revealed that-

1. The questioned signatures do not contain handwriting pen ink; instead they contain toner particles in the lines (Image-3).
2. The paper containing questioned signatures show scattering of carbon particles around the signature portion which is resulted normally in case of copying (Image-4).
3. The papers containing questioned signatures also show toner line representing contours of cut piece of questioned signatures (Image-5).
4. The questioned signature also shows writing remains of source document (Image-6) and partial masking of typed portion of deceived document (Image-7).

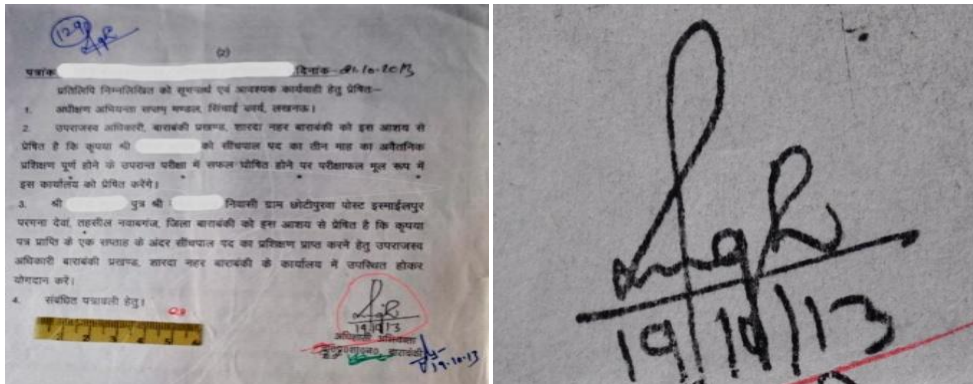
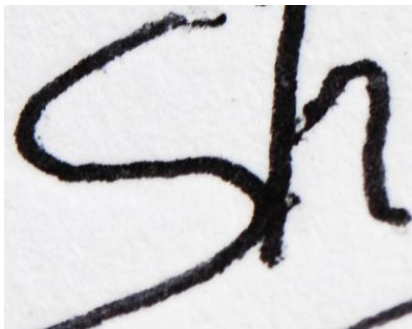


Image-1



Ball point pen ink line in original



Toner line in Xerox

Image-2

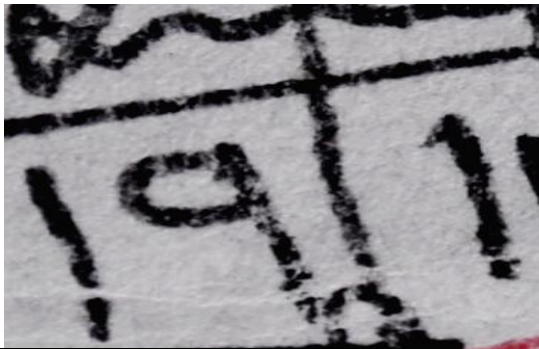


Image-3

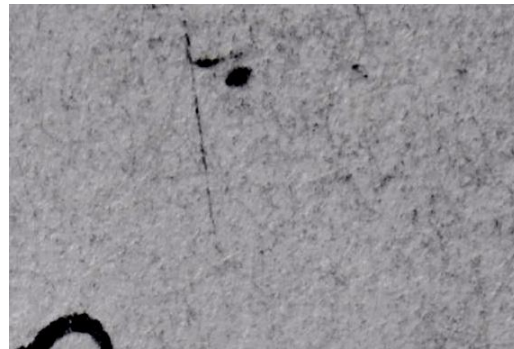


Image-4

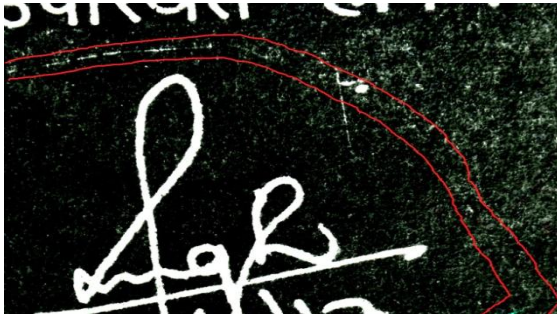


Image-5



Image-6



Image-7

V. CONCLUSION

If a genuine signature is cut and pasted on a wrongfully prepared paper and is Xeroxed to finally get it in desired form for the purpose of deceiving, the resultant deceived document may show deceptive look of genuineness through naked eye. Such kind of document when examined thoroughly with help of proper tools and techniques may dramatically unfold the story of forgery. In this case it is evident that the perpetrator performed his task in systematic manner and very cleverly. To accomplish this task he might have prepared eight 'Karyalay Gyaps' for eight intended persons first. After that he might have collected some documents from the office bearing genuine signatures of the 'Executive Engineer' and the signatures would have been cut away from the documents with help of blade or paper cutter and pasted over the desired place of the prepared 'Karyalay Gyap'. All 'Karyalay Gyaps' then would have been photocopied in such a way that the resultant Xerox of 'Karyalay Gyap' might look as genuinely signed by black pen. The resultant deceived letters obtained after Xeroxing would then have been managed to be signed by subsequent officers of that department deceiving them to be genuine.

The present case study is an attempt to fetch an attention on extraordinary use of DSLR and Photographic image processing software in revealing transplanted signatures made by mechanical cut-paste methods. It can be easy and simple method for an Expert to establish whether a particular document is authentic or not.

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