

Computer Imaging for Questioned Document Examiners II: The Potential for Abuse

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ABSTRACT: Just as today's digital imaging products can be a great deal of help to Forensic Document Examiners, they also provide an opportunity for the creation of fraudulent documents. Part 2 of this paper will discuss two ways in which the use of Adobe Photoshop 3.0 might cause some real headaches in Questioned Document examinations.

KEYWORDS: forensic science, questioned documents, computer imaging, document examiners

In Part I the use of Adobe Photoshop 3.0 to address some examination problems for Forensic Document Examiners was explored. This computer software, and other similar programs such as Aldus Photostyler and Micrografx Picture Publisher, provides a number of procedures which can help make the examiner's job easier. Unfortunately, a loud word of caution must be raised. This software also presents the unscrupulous user with an opportunity to perpetuate fraud.

With the many capabilities of this type of software, the potential for its fraudulent use is fairly obvious. Two areas that will be addressed here are the alteration of signatures and the displacement of typewriting.

Alteration of Signatures

All Forensic Document Examiners are familiar with the "cut-and-paste" method of placing a genuine signature onto a fraudulent document. When a photocopy of this amalgamation is made, there is usually no visible evidence of the "cut-and-paste" and the signature appears genuine, which it is. One of the risks with this practice is that the original signature may be found by investigators and matched to that on the fraudulent photocopy. Also, if an image of the same signature is placed on several different fraudulent documents, the fact that all of the signatures are identical will be obvious if all of the documents are seen together. With Photoshop, it is possible to conduct an electronic "cut-and-paste." In addition, subtle alterations can be made to the signature so that it is no longer an exact duplicate of the original, but is still within the writer's range of natural variation. There are a number of alterations which can be carried out on a signature and these can be as subtle

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or as gross as the operator wishes. The image in Fig. 1 is the author's natural signature. This signature was scanned in grayscale. If it had intersected any other writing or typewriting, the Paint Brush and Paint Bucket Tools could have been used to remove the unwanted images. A series of manipulations will be conducted on various parts of this signature.

It should be noted that each of the changes illustrated below was carried out independently on the original signature from Fig. 1. Thus, the illustrated effects are not cumulative, although that certainly could have been done, also.

Changing Perspective

Step 1—Assign a background color by clicking the Eyedropper Tool. Place the cursor over a clear area of the document, hold down the **Alt** key and click the left mouse button.

Step 2—Click on the Rectangular Selection Tool. Use the cursor to draw a box around the area to be changed (in this example, the name "Hicks" was used). The box, called a selection, will look like a moving dotted line.

Step 3—Go to **IMAGE, EFFECTS, PERSPECTIVE**. Small squares, called handles, will appear in each corner of the box. The Perspective command allows the creation of a three-dimensional effect by moving two of these handles in opposite directions at the same time.

Step 4—Place the cursor over one of the handles and hold the mouse button down while dragging the handle. The change in the shape of the box will be immediately apparent. The change to the image will take place when the mouse button is released. The area of the original selection which has been vacated by the newly shaped selection is replaced by the chosen background color. If the change in perspective is not acceptable, place the cursor outside the selection and click. The process can now be restarted. If the change is acceptable, place the cursor (which will change to the

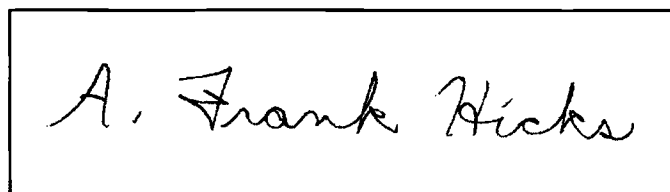


FIG. 1—Unretouched signature.

shape of a gavel) inside the selection and click the left mouse button. The selection box will be removed. In Fig. 2, the Perspective of the last name has been changed by drawing the top corners of the box around the name in toward each other and down slightly. This has the effect of squeezing the tops of the letters in toward the center of the name.

Skewing and Distorting

The Skew and Distort commands are accessed under IMAGE, EFFECTS, just like the Perspective command. Skewing slants a selection vertically or horizontally along the edge of the selection. Distorting allows any of the four handles around the selection to be moved independently.

In Fig. 3, the baseline of the name "Frank" has been skewed up on the right. In Fig. 4, the "A" has been distorted by pulling the box around the letter down on the lower right corner and to the left on the upper left corner.

Erasing

Very basic changes in the appearance of a signature can be made by simply erasing some of the line endings. To do this, click on the Eraser Tool. Now hold the mouse button down while dragging the cursor over the area to be erased. The image will be replaced by the chosen background color. In Fig. 5, the line endings on several letters have been erased (A, F, k, H, s).

Rotation

Another change that can be made to the signature is to rotate all or part of it. This is accomplished by drawing a box around

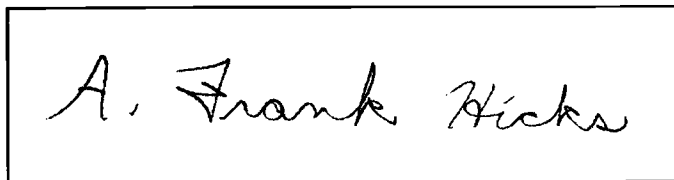


FIG. 2—The result of changing the perspective of the last name, pulling the tops of the letters toward the center and down.

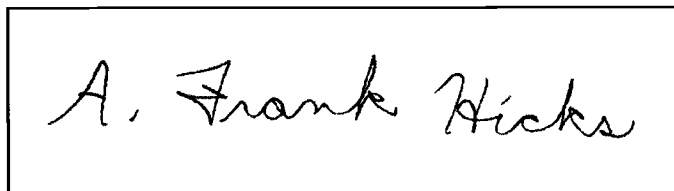


FIG. 3—The result of skewing the middle name up on the right end.

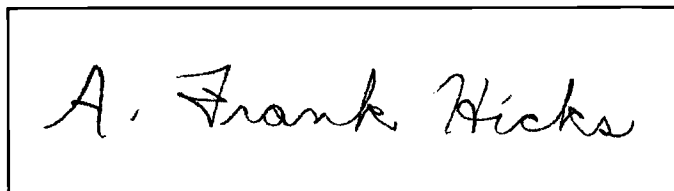


FIG. 4—The result of distorting the "A."

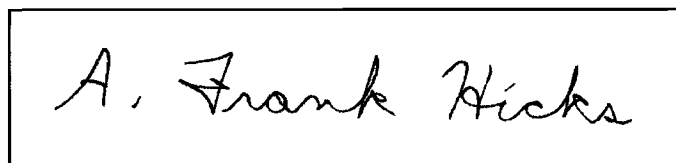


FIG. 5—The result of erasing line endings.

the target area and going to IMAGE, ROTATE. Five options are presented. The first three options designate specific degrees of rotation (90°, 180°) to be carried out on the selection. The Arbitrary option allows the user to designate a specific amount and direction of rotation. The Free option brings up handles in the corners of the selection box. These handles can be grabbed with the cursor and turned in any direction desired. The signature in Fig. 6 has had the period and the i dot rotated 45° in the clockwise direction.

Scaling

The appearance of the signature can be significantly altered by scaling the image. The Scale command allows the operator to extend or shrink the height or width of an image. This is done by drawing a box around the signature then going to IMAGE, EFFECTS, SCALE. Handles will appear in the corners of the selection box. By grabbing one of these handles, it is possible to change the length or width of the image. If the **Shift** key is depressed while the handle on the selection is being moved, the selection's height-to-width ratio will be maintained. The signature in Fig. 7 is the same as that in Fig. 1 with its width constricted by about 1/3.

If done properly, an endless series of alterations could be made to a genuine signature. As long as the changes were still within the writer's range of natural variation, there would be no cause for alarm. If saved in the proper format, any of these images could then be imported into a document in another application, such as a word processing program. In addition, it would be very easy to take the first name of one signature and combine it with the last name of a second signature to produce a third, composite, signature.

Shifting of Typewriting

Another potential abuse of Adobe Photoshop with which Forensic Document Examiners should be familiar is the ability to shift

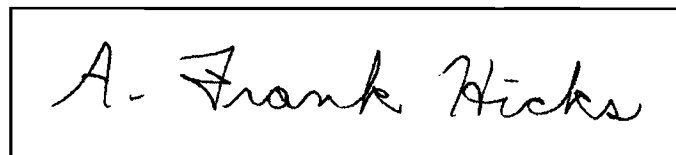


FIG. 6—Rotation of the period and the "i" dot 45° in the clockwise direction.

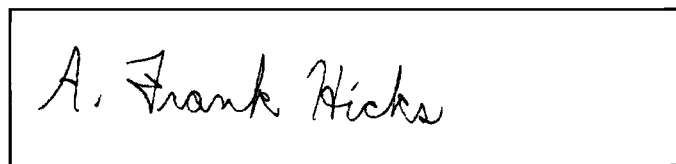
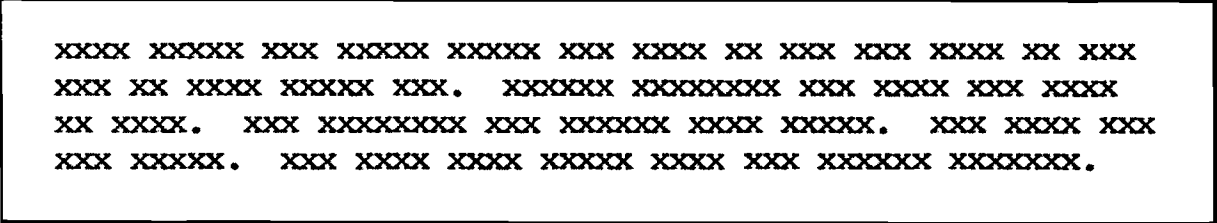
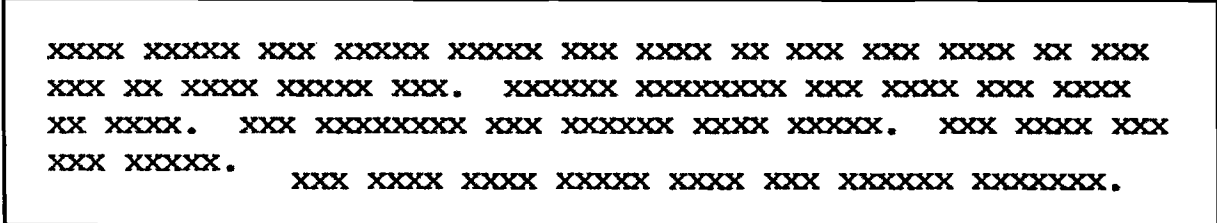


FIG. 7—Reduction of width roughly one-third through scaling.



XXXX XXXXX XXX XXXXX XXXXX XXX XXXX XX XXX XXX XXXX XX XXX
 XXX XX XXX XXXXX XXX. XXXXXX XXXXXXXXXXX XXX XXXX XXX XXXX
 XX XXXX. XXX XXXXXXXXXXX XXX XXXXXX XXXX XXXXXX. XXX XXXX XXX
 XXX XXXXX. XXX XXXX XXXX XXXXX XXXX XXX XXXXXX XXXXXXXXXXX.

FIG. 8—A sample of typewriting prepared in a continuous typing action.



XXXX XXXXX XXX XXXXX XXXXX XXX XXXX XX XXX XXX XXXX XX XXX
 XXX XX XXX XXXXX XXX. XXXXXX XXXXXXXXXXX XXX XXXX XXX XXXX
 XX XXXX. XXX XXXXXXXXXXX XXX XXXXXX XXXX XXXXXX. XXX XXXX XXX
 XXX XXXXX. XXX XXXX XXXX XXXXX XXXX XXX XXXXXX XXXXXXXXXXX.

FIG. 9—The typing from Fig. 8 after shifting the last sentence down and to the right.

images. This could be crucial in typewriter alignment cases. A portion of a typewritten document could be shifted, making it appear that this portion was not typed in the same continuous typing action that produced the remainder of the document. Figure 8 is a sample of typewriting prepared in a continuous manner. The last sentence can be shifted by drawing a box around it with the Rectangular Selection Tool. This selected area can be shifted with the use of the arrow keys on the keyboard or by placing the cursor inside the selection, holding down the mouse button and dragging the entire selection. This results in an image (Fig. 9) in which the shifted sentence appears to have been added to the document after the remainder of the typewriting.

In the same way, a typewritten entry that was out of alignment could be re-aligned. Thus, this technology could be used to raise questions about a perfectly legitimate document or to make a fraudulent document appear genuine.

Discussion

With all of the manipulations to an image that are possible with this type of software, Forensic Document Examiners certainly have reason to pause. Should conclusive opinions ever be issued on documents whose images are comprised of toner powder? This debate has raged for years in connection with photocopied documents [1-4] and, more recently, has been extended to include computer laser printers. In light of the possibility of image manipulation by digital imaging, each examiner should, once again, give serious consideration to this question. It is not the goal of this paper to provide a definitive answer to this question, just to make examiners aware of some of the possibilities and pitfalls of these examinations. It is also hoped that professional discussion on this

topic will be stimulated. Should these decisions be left to each examiner to develop their own standard? Should some professional body (ASQDE, ABFDE, AAFS, etc.) recommend a standard for the profession, similar to those made for handwriting opinion terminology by McAlexander, Beck and Dick [5]? Is it even possible to apply a single standard to every case of this type, or does each case stand on its own merits? One thing is certain—unless an original document is examined, it may not ever be possible to say that the toner powder images examined on a questioned document accurately reflect the appearance of the original images. Indeed, it may not be possible to say that an "original" ever existed!

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