DIGITAL IMAGING TRACING

TECHNOLOGY FOR PRINT MEDIA

A Thesis

by

STEWART WILLIAM MILNE

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

August 1997

Major Subject: Visualization Sciences

DIGITAL IMAGING TRACING

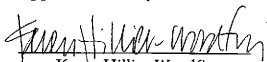# TECHNOLOGY FOR PRINT MEDIA

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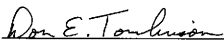
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ABSTRACT

Digital Imaging Tracing Technology

for Print Media. (August 1997)

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This thesis examines and analyzes the existing state of digital technology use in print media and the attitudes of those using the technology to develop a technology that would help prevent the unethical manipulation of images in mass media. The ethical issues and credibility of digital imaging are examined as the basis for the need for a tracing technology. The tracing technology is not a prevention of digital manipulations, only a device that would allow photo editors and editors to view altered images and their original to determine what kind, and to what degree manipulations have been performed on the image.

ACKNOWLEDGMENTS

I would like to express my appreciation to all of the faculty, staff, and students of the Visualization Sciences Laboratory at Texas A&M University. Special thanks to Don Tomlinson, Karen Hillier-Woodfin, and Alan Stacell for their advice and knowledge in their respective fields.

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INTRODUCTION

Since photography's inception, photographers have had the means to perform certain darkroom manipulations while producing a print. Simple techniques such as filtering to alter image contrast or burning and dodging to perform localized changes in exposure are often utilized to improve image quality. Multi-imaging and compositing are methods used to create illusions of reality from more than one image source. Three commonly used darkroom techniques of compositing include cut-and-paste, negative sandwiching and multiple exposure. With these methods, naturally-appearing environments can be created from two or more separate images. Outside the darkroom there are several ways to digitally manipulate a photograph.

Newspapers and magazines have been incorporating computers into their production for over a decade. Beginning with word processing, computers are now an integral part of the writing, design, graphics, pagination and photography of such publications. The first digital image editing system was introduced by Scitex in 1979 at a print industry trade show. A few years earlier in 1974, Hell produced the first high resolution scanner to the market. The two were used together to convert photographs into digital images, then manipulated using electronic tools modeled after traditional retouching tools [1].

Today, once the image information is stored in the computer's memory, it

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The format used follows the style of *Leonardo*.

becomes easy to manipulate the file. Parts of the image can be distorted, cloned, picked-up and moved or combined with other image's parts to create an image that never existed before. At first, these digital manipulations required working on large Mainframe computers, but with the rapid growth in computer technology, these manipulations can now be performed on the microcomputer level.

Another method of converting images to digital form is more recent. Digital cameras use a charged couple device (CCD) to record a scene. The image is captured electronically, eliminating the need for film. With film gone, also goes the need for a darkroom and hazardous processing chemicals. The current limitations of cost and image quality have prevented the total transition from analog to digital. The digitally captured image is not as high quality as a high resolution digital scan of a film negative. Currently the newsprint media industry is using a hybrid combination of digital and analog technologies. With these technologies, every picture appearing in major newspapers and news magazines has been digitally altered to some degree. It is possible that in the next five years, digital photography will replace traditional film based cameras in mass media production.

PROBLEM OF TRACEABILITY

Once images have been digitized it is almost impossible to tell whether or not the image has been altered. If the original negative is destroyed after scanning, or the original digitally captured file is overwritten with a modified version, then the original, unaltered image is permanently and irretrievably lost. Without an original for comparison, manipulations can be performed and the resulting image published, deceiving the reader, affecting the future credibility and ethics of the photojournalism field. Currently the newsprint industry lacks traceability of digital manipulations. The negative is the standard of the original, but when the industry moves more completely from analog to digital, the established ethics and credibility may be in serious jeopardy, due to the fact that there is no way to trace image manipulations. How will photographers and photojournalists along with publishers address this problem? It is the intent of this research to examine and discuss possible solutions to the problem of traceability in digital imaging.

TRADITIONAL DARKROOM MANIPULATIONS

Photographers have, since the beginning, been able to perform "traditional" manipulations or enhancements while producing a print. The most common types are contrast control, dodging and burning, which are used to improve image quality and reproducibility.

These manipulations are generally considered to be acceptable enhancements throughout the newsprint media. The reason is that the photograph is not manipulated beyond the physical limits of the medium. Nothing has been added to or removed from the image to change the content or original meaning of the photograph.

The simplest form of enhancement that can be performed to a print is altering contrast. Contrast is the difference in density between tones of an image. A contrasty image has its limited gray scale range dominated by black and white with very little tones in between. A flat image consists mostly of gray tones, with no pure black or white tones.

Contrast expansion is performed on flat negatives, while reduction is used on contrasty negatives. Both techniques are accomplished with the use of contrast filters and multi-contrast paper. Although systems for filter contrast differ, generally low number filters are used on contrasty images and high number filters are used to create contrast on flat negatives.

Another common enhancement is dodging and burning. Both are simi-

lar, in that they are localized changes in exposure to parts of the image. Dodging is reducing the amount of exposure in a specific area, usually to bring out detail that would print dark. This is easily accomplished by putting some opaque object between the light source and the paper over the area to be dodged. Burning is the overexposure of an area to darken it or bring in detail that would otherwise be "washed-out" or too light. This is done by allowing extra light to fall on the particular area needing burning.

<div align="center">Other Darkroom Manipulations</div>

Multi-imaging and compositing are manipulations that can be performed in the darkroom, but are not considered acceptable for news photographs by newsprint media. These methods are used to create the illusion of reality from more than one image source. Three commonly used techniques include cut-and-paste, negative sandwiching, and multiple exposures.

An old and basic form of compositing is the cut-and-paste method. Image scenes are staged separately and physically pieced together later by cutting and pasting them together. Several photographs are combined to create an image that is not a documentation of a real scene.

A second method to combine images is to use the sandwich technique. More than one negative is sandwiched together in the enlarger, producing an image on paper that contains elements from each of the included negatives. It is

often easier to combine the images on paper rather than on the same negative.

Another method of producing composite images on one piece of paper is to expose the film more than once. Simply, two or more images are captured on the same piece of film. It is possible, with the aid of a black backdrop, to take two people who have never been in the same room together and combine them in a single negative. After the first person is photographed, the second person is positioned and the same piece of film is re-exposed. The result is an image with both individuals.

Composite photographs are not typically used in photojournalism, however, many examples exist in non-news, entertainment and advertising applications.

DIGITIZING TECHNOLOGY

The two most widely used methods of converting photographic images into digital form both utilize a CCD. The first, original method is scanning the image, whether it be a photographic print, transparency or negative film. The scanning light beam passes over the image, recording each grain onto a light sensitive CCD. The CCD is made of a metal oxide and silicon grid of microscopic squares. As the light beam scans, each square receives a different amount of light depending on the make up of the image scene. Each square on the grid generates an electrical charge proportional to the amount of light received. The information of the grid is stored magnetically in computer memory [2].

Currently, the most utilized type of scanner in the newsprint media is a negative scanner. It allows scanning of the negative directly, eliminating the timely process of printing and then scanning on a flatbed type of scanner. The whole process, from analog film to digital information in the computer takes less than a minute. A negative scanner also produces a higher quality of scan, since it is reading the original image data as opposed to a second generation print that a flatbed scanner utilizes.

The second method of digitizing is to use a digital camera. The camera reads the scene using a CCD instead of film. Just as the film in a conventional camera records an image when light hits it, the CCD records the image electronically. The CCD is a large scale integrated circuit, containing a series of tiny,

light sensitive photosites. The photosites convert the light received into electrons, which pass through a analog-to-digital converter into a file of digital information [3]. The computer then, with the aid of an imaging program, can display the digitally captured image.

Digital cameras eliminate another stage in the photo process, making them a valuable tool in the newsprint industry. An image can be captured digitally and instantly transferred to a computer for viewing and editing, saving time spent processing film. The need to handle hazardous chemicals is also eliminated.

The first method of digitizing is currently used the most, because the high cost of digital cameras, and the CCD chips in digital cameras record at a lower resolution than scanned film, affecting image quality.

Comparison of Digital and Traditional Photography

The differences between traditional and digital photography exist in the tools and technology. Both capture an image by recording light, whether it be on film or through a CCD into digital information. Manipulations can be performed on each medium, however, the ability to manipulate digitally is easier and undetectable. Traditional photographers rely heavily on camera tricks, darkroom manipulations and airbrush artists to create images that can be done in a fraction of the time and by one individual on the computer. Digital images,

unlike traditional photography, can be modified, manipulated or enhanced with no loss of image quality, since the manipulations are done on digital information and not physically to the photographic paper or film negative.

Today's high-end digital cameras, used by the Associated Press and several major newspapers, capture 1.6 million pixels-per-frame and cost $16,000. A high-end, professional 35mm camera costs around $2,000. Film can be scanned using a negative scanner (cost of $2,000) producing an image with approximately 8.87 million pixels-per-frame. Even though Kodak has just introduced a digital camera capturing 6.23 million pixels-per-frame (cost of $28,000), this still falls short of scanned film, but is acceptable for most newsprint applications.

In a study, conducted by this investigator, a digital camera and traditional film camera captured the same scene to compare the quality of the image between digital capture and film scanned images. The digital camera was a Nikon NC2000e that the Associated Press (AP) uses for most assignments. The film image was scanned using a Nikon LS-1000 negative scanner. The Nikon LS-1000 uses a 2592 element monochrome CCD to achieve 2700 dots-per-inch (DPI). It scans in a single pass, pulsing red, green and blue LEDs over each pixel to achieve full RGB color [4]. The digital camera captures 1268 x 1012 pixels on its CCD. The capture area of the digital camera is 16.4mm x 20.5mm, which is smaller than the total area captured on 35mm film (Fig. 1). The 24mm x 36mm picture area of 35mm film has the equivalent of 2400 x 3600 pixels. For comparison purposes the film was scanned using the equivalent area captured
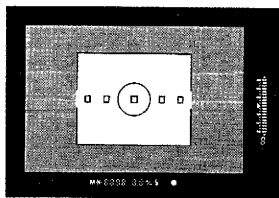
Fig. 1. Digital Camera Viewfinder. Gray area
is the normal 35mm viewing area (24 x 36mm).
The inner box is the capture area of the digital
camera (16.4 x 20.5mm) or 1286 x 1012 pixels.

by the digital camera and at the same pixel dimensions, so resolution would not be a factor in image quality. Also, the scenes were photographed at the same position and distance with the traditional and digital cameras. Scenes were photographed using Fuji Super G Plus 200 ISO color print film, Fuji Super G Plus 800 ISO color print film and Kodak Ektapress Plus 1600 ISO color print film and captured digitally with equivalent ISO settings.

Overall, the digitally scanned film had a better image quality over the digitally captured images. The images captured digitally all exhibited artifacts in shadow and highlight areas similar to gain noise in a video camera. In areas that were clearly black or white, color pixels were present. Out of place color pixels were also visible between high contrast regions. The film images had warmer tones and more accurately portrayed flesh tones. Color and tones shifts, however could be corrected in the computer if necessary.

The 200 ISO rating of the digital camera produced a cleaner image than the 200 ISO film. Both images were sharp under magnification, but grain was visible in the film. Since the digital camera is not dependent on grain to capture light, the image had no grain and continuous areas of color were clean. Some noise was visible in the shadow areas of the digitally captured image. Flesh tones had a blue cast to them and were slightly contrasty. RGB artifacts still existed in the highlight regions of the digitally captured image (Fig. 2).

At 800 ISO the images appeared equivalent in grain or noise content. The increased noise of the higher ISO setting was similar to the increased grain of the 800 ISO film. The digital camera image had a slight blue foggy screen and the colors were muted. The film had better contrast and crisper colors. The film also produced warmer flesh tone (Fig. 3).

The noise of the 1600 ISO digital capture image was more noticeable than the film grain of the 1600 ISO film image. Also, the digital capture was more pixellated. There were noticeable RGB artifacts in shadow and highlight areas with washed out highlights. The film still had warmer flesh tones, while the digital image had a blue color shift (Fig. 4).

Digitally captured images are limited to the size of enlargement without losing image quality. Images captured digitally are equivalent to a 5 x 7 inch 180 DPI photo. If the image is enlarged the quality suffers. However, images captured on film can be enlarged and still maintain image quality, since the grain that makes up film is much smaller than the pixels that make up a digital

FILM @ 200 ISO DIGITAL @ 200 ISO

Fig. 2. Digital Camera vs. Scanned Film @ 200 ISO. Comparison between images captured on film and images captured using a digital camera. The film images were scanned using a Nikon LS-100 negative scanner. The digital captured images were taken with a Nikon NC200e digital camera. All images were shot at 200 ISO setting.

FILM @ 800 ISO   DIGITAL @ 800 ISO

Fig. 3. Digital Camera vs. Scanned Film @ 800 ISO. Comparison between images captured on film and images captured using a digital camera. All images were shot at 800 ISO setting.
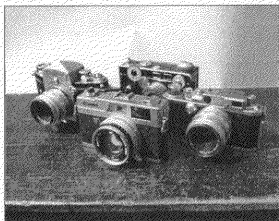
FILM @ 1600 ISO   DIGITAL @ 1600 ISO
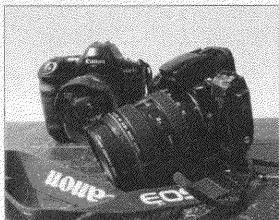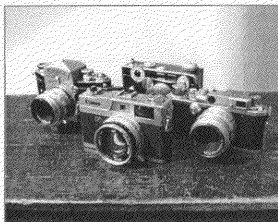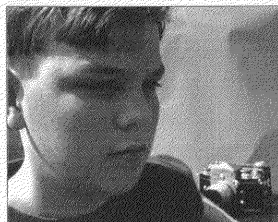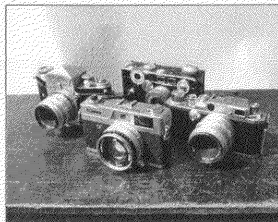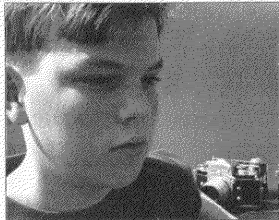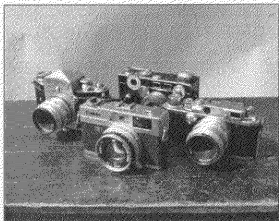

Fig. 4. Digital Camera vs. Scanned Film @ 1600 ISO. Comparison between images captured on film and images captured using a digital camera. All images were shot at 1600 ISO setting.

image. In this study, the scanned film was constrained to the limitations of the digitally captured images. A maximum resolution scan of the film produces a superior image that is equivalent to a 14 x 21 inch 180 DPI photo.

It was possible to scan the film at a higher resolution, producing a better quality image. With the negative scanner an image measuring 2403 x 1918 pixels was scanned into the computer using the same amount of negative area (16.4mm x 20.5mm) that a digital camera captures. This is roughly 4.6 million

Fig. 5. High Resolution Scan. Image captured on 200 ISO film and scanned with a Nikon LS-100 negative scanner, measuring 2403 x 1918 pixels, producing a 4.6 million pixel image. A Nikon NC2000e digital camera can only capture 1.6 million pixels (1268 x 1012 pixels).

pixels compared to the 1.6 million pixels captured by the digital camera (Fig. 5). If the scene was recomposed and the whole negative area (24mm x 36mm) were scanned the resulting image would have over 8.8 million pixels. Film still offers superior image quality, even when digitized.

DIGITAL MANIPULATIONS

The tools of digital manipulations are derived from standard darkroom techniques and retouch artists. Image manipulation or retouching software such as Adobe Photoshop can generally do anything to a digital photographic image that can be done to traditional photographs in the darkroom or in the hands of a retouch artist. However, in the computer these manipulations take a fraction of the time.

Images are stored in computer memory as binary code. The pixel is the smallest unit of a digital image. Each pixel is represented in memory in terms of its color and relationship to other pixels. In RGB systems, the color of each pixel is represented with a series of numbers which describe the amount of red, green and blue in that pixel. Other systems record the hue, saturation and intensity of the pixel. Once in the computer, pixel values can be altered individually or in groups to change the image. The following are some of the tools used by popular imaging programs to manipulate digital images:

• The <u>burning</u> and <u>dodging</u> tool in photo manipulation software adjusts the pixel values by increasing or decreasing them, which in turn effectively lightens or darkens a specific area. The tool also controls the size, location and amount of burning or dodging. It is often used to bring in detail in washed out or dark areas, but can be used to eliminate distract-

ing elements by making them too dark or too light to see. Adobe's sponge tool changes the color saturation in an area, either increasing or decreasing it.

• The smudge tool simulates the actions of dragging a finger through wet paint. It picks up a color from where the stroke begins and pushes it in the direction of the smudge. The pressure and amount can be controlled. The smudge tool can blend in edges of separate images that have been pasted together by smearing any hard edges out.

• The focus tool can either blur hard edges or areas to reduce detail or sharpen soft edges to increase clarity or focus. With the blur tool, the pixel values in a selected area are averaged and brought closer to one another. The sharpen tool takes the pixel values farther apart from each other, increasing the contrast of neighboring pixels making it appear sharper.

• Paint tools change the color of pixels to modify or create areas in an image.

The types of paint tools vary allowing soft strokes, gradual sprayed tones or hard edged free-hand lines.

• The cloning tool takes a sample of the image, which can be applied or painted over another image or over another part of the same image. It copies a portion of an image that is then applied using a paintbrush to another area of the image. The clone tool is very powerful and useful

tool. A person or object can be removed from a photo and the void filled in with portions from another part of the image. Cloning is useful in the elimination of dust and scratches.

• <u>Selection</u> tools are used to modify parts of an image. Once an area is selected, a variety of manipulations can be applied to it. A gray sky can be selected in an image and replaced with a blue one, or a person's face can be selected and lightened for better reproducibility in print. <u>Masks</u> are closely related to selection areas. The area that is not selected is masked or protected from editing. Masks can be edited with paint tools to add or subtract from the selected area. A semitransparent mask can also be created to apply partial effects to an area of the image.

• The <u>Color Correction</u> tools adjust the color levels in the image. The color adjustment is based on the color wheel and any adjustment affects the overall color balance of the image. The different methods of adjustment work essentially the same way: by mapping existing ranges of pixel values to the new ranges of values. The difference in the tools is the amount of control over the ranges of values [5].

These tools (Fig. 6) are used everyday to help in the production of news media publications. However, they can also be utilized in manners that are unethical, creating new images or changing the content of original photos. Many other tools and ways of manipulating are available, but the above men-

mon to most digital imaging software packages. It is easy to combine the tools with each other to manipulate images.
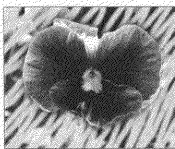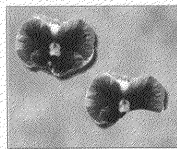
Fig. 6. Digital Imaging Tools. Common tools used by imaging programs to manipulate images.

DIGITAL TECHNOLOGY

The newsprint industry has been using digital technology in its production for over a decade. Everyday, major newspapers and magazines digitally alter photographs running in their publications. Michael Morse of the National Press Photographers Association noted that, "When you're looking at the *Redbook* or *Mademoiselle* or *Sports Illustrated* tomorrow, there's a good chance somebody has done something to that picture " [6]. These manipulations range from needed retouching and spotting to removing people from a photo.

The following are a few examples of photographic manipulation done by the media, showing the nature and extent of computer manipulation. None of the alterations were noted to the readers.

- In February 1982, *National Geographic* digitally moved one of the great pyramids at Giza to fit the vertical cover of the magazine [7]. (Fig. 7)
- A man was removed from a news photo and the void space filled in by cloning part of an adjoining wall by the editor at the *Ashbury Park Press*. [8].
- The picture editor of *TIME* magazine, Tom Bentowski, in 1984 removed a walkie-talkie antenna that appeared to stick out of the chin of Olympian runner Mary Decker, who had fallen and was being helped by track officials. [9]
- The *St. Louis Post-Dispatch* digitally removed a Diet Coke can from a

front page photo of Ron Olshwanger, winner of the 1989 Pulitzer Prize for photography [10].

• The *Orange County Register* electronically zipped-up a boy's fly in a photograph appearing in the paper to avoid embarrassing the boy [11].

• *TIME* and *Newsweek* each ran the mugshot of O.J. Simpson on their covers, however, *TIME*'s cover had been digitally enhanced by Matt Mahurin, a freelance illustrator (Fig. 8). Mahurin, in a panel discussion on photo manipulating, said, "I did the same thing to him (Simpson) that I do to practically every image, which is to make it moodier, make it darker ... he was already a convicted wife beater. I felt it was a dark moment, ... and I made a choice to show that " [12].
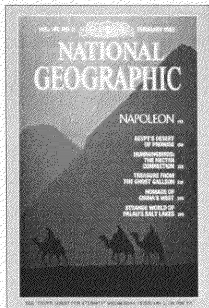
*Reprinted with permission from National Geographic Society, 1982. *National Geographic*, **161**, No. 2.

© 1982 by *National Geographic* (see Appendix J)

Fig. 7. *National Geographic* Cover

Fig. 8. *Time* and *Newsweek* Covers. Magazine covers from June 27, 1994. Both used the same mugshot O.J. Simpson provided by the Los Angelos Police Department.

The newsprint media has adopted the new technology into everyday production. But, for the most part, the above examples are extreme cases of how the technology may be used. Manipulations usually consist of dust and scratch removal and adjusting contrast and color for better print reproducibility. Students at the University of Missouri's Electronic Imaging Lab demonstrated some legitimate uses of the digital imaging technology for pure news purposes. Students electronically enhanced an AP wirephoto of a Romanian soldier with a washed out poster in the background and brought back the detail in the poster so it could be read [13]. Another example by the Missouri students involved an AP Leafax transmission of a photo of President Bush and Mikhial Gorbachev

standing on the White House lawn. The transmitted image was washed out, with the foreheads of the leaders blending into the white sky (Fig. 9). The students, using a Macintosh and Adobe Photoshop enhanced the contrast, brightened and sharpened the image to restore the details of the original photo [14].
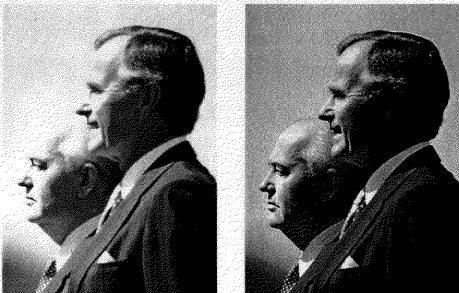
*Reprinted with permission from the Associated Press, 1986.   © 1986 by *AP* (see Appendix M)

Fig. 9. Photo Enhancement. Students at University of Missouri Electronic Imaging Lab received a washed out AP photo (left) over the wire and using Adobe Photoshop, sharpened, enhanced and restored the original photo (right).

Trends and Implications

Newspapers and magazines are relying more heavily on digital imaging technology in their production. The technology has also moved out of the office and into the field, with photographers taking digital darkrooms on location. Besides a camera, photojournalists will carry film processing equipment, a lap-

top computer and a negative scanner, in order to get images back to the office faster. With some major papers and news organizations, film, processing equipment and the scanner have been replaced with a digital camera. The photographer only needs a lap-top computer to read the digitally captured images. Once the images are in the computer, either from a scan or digital capture, images can be transmitted over a phone line to main office for editing. Also, many photographers are buying their own computers for the studio or home, allowing them, with the aid of imaging programs, to modify and send images digitally. It is likely that digital images will arrive at news organizations already modified, either by freelance photographers or photographers on location.

Several news organizations have already switched to totally digital set ups, and it appears to be a trend in the industry. Digital cameras replace the need for film, processing chemicals and negatives scanners. It is possible that more image altering will occur, because the manipulated image, if captured digitally, cannot be compared to its negative. There is also the temptation to use digital imaging technology to make a good photo into an award-winning photo for the sake of personal gain, either for monetary or career advancement. In an interview with freelance photographer and former *Houston Post* photographer Craig Hartley, he warned that, "there is a real temptation for artists to improve photographs ... to remove a distracting telephone pole or drop in a blue sky " [15]. Newspapers are also losing their share on the market. Editors might be tempted to improve the visual quality of photos to sell more newspapers.

ETHICAL ISSUES

With the advancement of technology comes questions of new responsibilities. There is always the possibility of using technology in an unethical manner, including digital imaging. Ethics is not a new issue in newspapers or news magazines. Photographers have been dealing with the ethics of imaging long before digital technology was introduced. Photographs have been faked or staged to get the needed image for many news publications.

One example of unethical behavior illustrates how photographs can be staged to create an event that did not happen naturally. Norman Zeisloft, a photographer for the *St. Petersburg Times*, was covering a baseball game between Eckerd and Florida Southern Colleges, and noticed three men with their bare feet up on a railing. He approached them and asked to write "yea eckerd" on the bottom of their feet. The men agreed, and Zeisloft's photo ran two days later. He was fired when another publication's photograph showed Zeisloft writing the words on the fans' feet got back to his boss [16].

With the advancement of new technologies, the "perfect" photo can be created after the image is captured, either on film or digitally. Once in digital form, manipulations within the computer are incredibly easy to perform and increasingly difficult to detect. The *Orange County Register* changed the sky to a smog-free blue in every 1984 Summer Olympics outdoor photo to maintain California's tourism image of clear blue skies [17].

The question of ethics in photo manipulations can be broken down into three schools of philosophical thought, in deciding how far is to too far when altering an image. Photographers and photo editors can follow one of three well-know schools of thought: Merdock, Kantian or Utilitarianism.

Merdock's theory of ethics is one of non-ethics. He would do whatever necessary, including digitally manipulating photographs, to sell a newspaper or magazine. Merdock is a businessman, motivated by profit. In this theory, if removing distracting elements or people from a photograph improves its aesthetic quality, the alterations are acceptable in order to improve business [18]. This theory leads to sensationalism and is not practical when discussing the ethics and credibility of digital technology use in the newsprint industry.

Kantian theory is rule based. It is important that codes are established and never broken. According to Kantian theory, the critical issue in photojournalism is telling the truth. Photographs are representative documents of reality and should never be altered to depict anything other than reality. If everyone digitally manipulated photographs, the public would lose confidence in the ability of the photograph to tell the truth [19]. Terrible consequences would arise if the news media manipulated images without informing the public. There is no room for tolerance regarding photographic manipulation according to Kantian theory.

Finally, the Utilitarian point of view. Each situation must be judged upon its own merits, flaws and consequences. It doesn't matter how a particular pho-

tograph is going to be used, whether in the news section, entertainment section or front cover. Utilitarianism is a result oriented approach. The decision to manipulate a photograph is based on what will produce the greatest good for the greatest number of people [20]. If good results come from the deceiving the public through altering a photograph, then the manipulation is warranted. For example, in order for police detectives to convict a murderer, they fake photographs used in the trial as evidence. The detectives know the accused is a murderer, but the existing evidence is lacking for a conviction and the witnesses will not testify. It is for the common good that this criminal is punished even though the evidence was faked [21].

It is unknown which of these theories would work best for maintaining credibility in the newsprint industry. Perhaps a combination of Kantianism and Utilitarianism would be effective. Photographs intended for news coverage could never be altered, but photographs appearing in entertainment or lifestyles sections or as illustrations could be altered as long as the public was informed of the enhancement.

Codes of Ethics

Many professional newsprint publications and organizations, such as the Associated Press, have guidelines and codes governing the manipulation of images, but no industry wide protocol has been established. The National Press

Photographers Association (NPPA) code of ethics states in part:

> • It is the individual responsibility of every photojournalist at all times to strive for pictures that report truthfully, honestly and objectively.
> • No Code of Ethics can prejudge every situation, thus common sense and good judgment are required in applying ethical principles [22].

In order to address the emerging electronic technologies, the NPPA affirmed their Statement of Principle on November 12, 1990; in part it reads;

> This technology enables the manipulation of the content of an image in such a way that the change is virtually undetectable. Accurate representation is the benchmark of our profession. Altering the editorial content of a photograph, in any degree, is a breach of the ethical standards recognized by the NPPA [23].

Also, the Associated Press had a policy regarding the use of electronic imaging technology, released on November 12, 1990 by Vin Alabiso, AP executive photo editor. It states in part;

> • The content of a photograph will never be changed or manipulated in any way.

• Only the established norms of standard photo printing methods, such as burning, dodging, black-and-white toning and cropping, are acceptable. Retouching is limited to removal of normal scratches and dust spots [24].

These codes cover the issue of photographic truth. Yet not all photographers adhere to these codes, nor are they accepted by all professionals. Individual agendas may cause photographers to disregard the codes of ethics. Also, the truth can be interpreted differently by those manipulating photographs. The codes may not be adopted by those who are and will be performing the digital alterations. Photojournalism has always been susceptible to ethics problems, but technology has increased the potential for abuse.

Codes exist but even large newspapers have no written policies regarding photo manipulation. The *Houston Post* , like most papers, had a firm hands off policy. Standard darkroom techniques are fine when using digital imaging equipment, such as burning, dodging, color correction, contrast control and removal of dust and scratches. Many photographers believe that news photos are taboo beyond standard darkroom manipulations [25].

Craig Hartley, a freelance photographer and former photographer for the now defunct *Houston Post* thinks an "industry-wide set of guidelines should be discussed and adopted by the NPPA. People could discuss possible pitfalls or special circumstances and adopt a set of common-sense rules." Hartley goes on

to note that, "these guidelines should be explained and posted to everyone who works on digital images" [26]. It would be impossible to enforce the codes, but publications like *Editor and Publisher* or *News Photographer* would be good outlets to display examples of how news organizations used digital technology in either unethical manners or in common-sense circumstances.

CREDIBILITY AT RISK

As the power and flexibility of image processing software and hardware continue to increase, the well-known phrase "photographs don't lie" will continue to become an anachronism. To some degree, the public has the awareness that photos can be manipulated.

Traditional photographs can be compared to the original negative or retouched photographs can be detected with the use of ultraviolet imaging systems. With digital images, no hard-copy exists and the original file or image can be written over, leaving no original for comparison. Photo critic and author A. D. Coleman warned that "the credibility of photographs as a witnessing device will invariably deteriorate" with the ease of manipulation technology [27].

The credibility of photography was questioned in the civil trial of O. J. Simpson in 1997, in which the defense argued that a photograph showing Simpson wearing the same kind of shoe as one that left a bloody footprint at the crime scene, was a fake. Because of the mere existence of the technology, the credibility of photographs used as evidence in court cases was in question. The prosecution went on to produce 30 other photographs, taken by the same photographer, showing Simpson wearing the shoes in question. It is theoretically possible that all 31 of the photographs were altered, but highly unlikely. The defense argued that all 31 of the photographs were fake. The film negatives of

the photos were eventually brought in as evidence and compared to the photographic prints, showing that no alterations were made. This incident displays that existence of digital imaging casts a doubt over the credibility of photography in the public's eye.

To many people, a news photo is a documentation of a real event. They believe what they see. John Long, chief photographer for the *Hartford Courant* and president of the NPPA (1990) remarked, "If the public thinks we're lying, even in a small way, how can they know we're not lying in a big way " [28].

NEED FOR TRACING TECHNOLOGY

Even if industry-wide codes and guidelines are established concerning photo manipulations, they could not prevent photographers and editors from manipulating photographs. "It would be impossible for the NPPA or any other organization to police these rules, and we would look foolish trying " [29]. Despite the problem that codes could not be enforced, the public perception benefits when these codes exist and may protect photojournalism's credibility. In Daniel Terry's master thesis, he suggests that a framework be adopted for informing editors of the nature of digital photo manipulations performed on each submission. "When a digital image is ... transmitted to a news network ... a disclaimer should be sent to inform editors of any and all digital manipulations that have been applied to the image " [30]. A model of such a disclaimer might read as follows:

"This photograph has not been modified in any way that is incompatible with standard photojournalistic practice as suggested by the Association of Newspaper Editors and Publishers' Code of Ethics. Manipulation of the image has only been applied in regard to enhancing its reproduction quality for news purposes. Such manipulation includes and is limited to • digital sharpening, • overall contrast enhancement, • overall contrast reduction. Any manipulation beyond the scope of the

above are outlined in detail in the paragraph that follows: (at this point detailed description of all other manipulations or alterations of the image taken should be explained) " [31].

Terry goes on to suggest that news organizations should only accept photos that are accompanied by a disclaimer and that a printed notification in the photo caption should accompany digitally altered images so the public comes to trust that they will be informed when photos are manipulated beyond accepted reproduction purposes [32]. An industry-wide printed notification could state *image illustration* on photos that are illustrative or when the content has been altered. Some publications currently label altered photos as *photo illustrations*, but the public is not informed of the meaning behind the notification. If *image illustration* is adopted, the confusion between a photo and a *photo/image illustration* might be clarified. Either way, altered images need to be accompanied by a printed notification.

These recommendations are all good steps to improvingand maintaining the credibility of photojournalism, however, they still do not prevent someone from performing unethical manipulations on images and not informing the news organization of such manipulations. A person who was digitally altering photos before, is not likely to stop because of unenforceable new codes or a disclaimer.

Thus, a new technology that informs news organizations of manipula-

tions performed on photos is needed. This technology could trace and keep a histogram of the manipulations and automatically attach a disclaimer to the file notifying an editor of the alterations. Or, the tracing technology could always keep the original photograph as an attachment to the final image that reaches the photo desk. The editor can then compare the received photograph with the original. Either way, the photo editor could then decide if the manipulations are *unethical or whether a printed notification is necessary in the caption informing* the reader of the digitally altered image. This technology is not intended to prevent digital manipulations to images, only automatically notify editors and news organizations of the manipulations.

The technology has uses outside of photojournalism. Courts of law could now admit digitally recorded photographs as evidence. In the past, courts could not use digital images, because of the potential misuse of digital imaging and the lack of a hard copy such as a negative. Questions of authenticity, as seen in the earlier discussion of the O.J. Simpson civil trial, would not arise. The credibility of the photographic images as evidence of an event would be sustained.

TRACING TECHNOLOGY

Earlier discussions have proven the need for digital, manipulation-tracing technology. Tracing technology incorporates a digital signature to authenticate electronic data, by the use of public key encryption techniques.

The concept of tracing is built upon a recent encryption techniques called "Public Key Encryption." Past techniques required the sender and receiver to possess the same secret key for encryption and decryption of the data. The problem with this scheme is the security of the keys. Public key encryption enables the sender and receiver to possess different keys. Public key cryptography is based on the idea of multiplying two large prime numbers together to encode into the data. It is difficult to work backwards to recover the original numbers that were used to generate the resulting encoding number.

Public key encryption utilizes two different keys: a private key for the secure party and a corresponding public key, which does not need to be kept a secret. The public key is generated from the private key, producing a unique pair. The public key works as follows (Fig. 10).

To send data that only the receiver can read, the recipient makes the public key known to the sender. Using the public key for encryption, anyone can send a secure file to the recipient. The recipient is the only person able to decrypt the file since they have sole possession of the corresponding private key. Only the receiver can read the file, but anyone with the public key can

transmit a file with anonymity [33].

This process can be implemented backwards for a different effect. The sender possesses the private key and anyone with the corresponding public key can decipher the data file. This procedure does not provide confidential communication between two parties, but it does provide a way to ensure the file has not been forged. Only the private key could produce a file that can be deciphered by the public key [34].
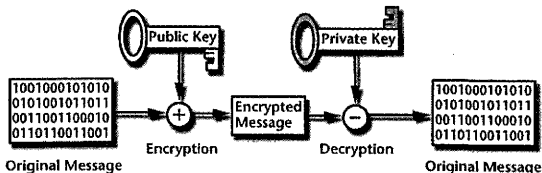
Fig. 10. Public Key Encryption. With public key encryption, the encoding key and decoding keys are different, and it is computationally difficult to derive, given the other. To send a message that only the receiver can read, the non-secret public key is used to encrypt; the secret private key is used to decrypt [42].

The backwards public key encryption is the foundation for image authentication. Only the private key holder can produce images decipherable by the public key, if the private key remains private. It is extremely difficult to ascertain the original private key from the public key and a counterfeit file cannot be forged without the knowledge of the private key [35].

Digital signatures utilize these public key encryption techniques to

authenticate the contents of a file and the sender without obscuring the original data. Signatures are produced by creating a hash of the original file (Fig. 11). A hash is a mathematical function which maps values from a large domain into a smaller range. The hash is then encrypted using the sender's private key. A second digital file, the hash, accompanies the original file. The original file is not touched, only the hash of the original is encrypted. The original file can be read by all, but to authenticate it, the reader must decrypt the signature with the public key. The integrity of the file and the authenticity of the sender are assured if the hash and the file match [36].
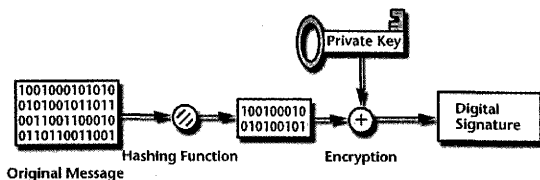
Fig. 11. Digital Signature. The digital signature is created by producing a complex checksum called a "hash", which is then encrypted using the private key. Attempting to forge this signature without knowledge of the private key would take decades using today's supercomputer technologies [43].

Gary Friedman, of the Jet Propulsion Laboratory at California Institute of Technology, proposed a digital camera that would use the digital signature technology to authenticate the initial image file as it emerges from the camera. His camera produces two output files for each digitally captured image (Fig. 12).

The first is an all-digital industry-standard file format representing the image, and the second would be an encrypted digital signature produced using the camera's private key to a hash file of the image file. The unique private key is embedded within the camera's secure microprocessor. Once the two files are generated and stored in computer memory, the image file's integrity can be affirmed using a public key decoding program distributed to users [37].
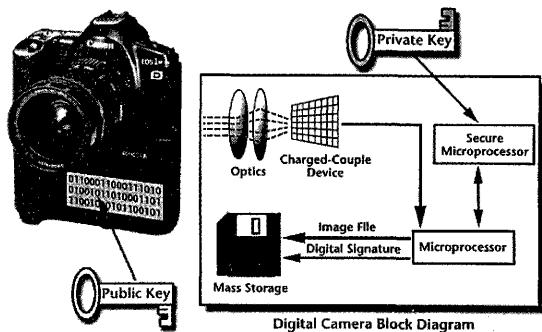
Fig. 12. Secure Digital Camera. This camera starts with a digital sensor instead of film, and delivers the image directly in a computer-compatible format. The secure microprocessor responsible for the encryption of the digital signature is programmed with the private key at the factory. The public key necessary for later authentication appears in the camera body [44].

The verification program takes as input the digital image file, the digital signature, and the camera's unique public key. The program calculates its own hash of the digital image file and uses the camera's public key to decrypt the

digital signature, revealing the hash created originally by the camera at the time the image was captured (Fig. 13). If the hashes match, then the digital image is identical to what the camera captured originally. If even one bit is different, the two hashes will not match and the image's integrity will not be affirmed [38].
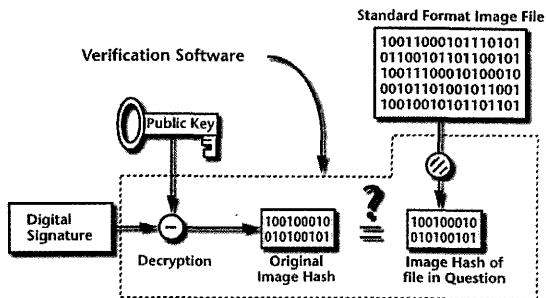
Fig. 13. Verification Software. It computes its own hash of the image in question, and compares it to the original hash which has been decrypted using the public key. If the image in question has not been manipulated, the decrypting digital signature and the program's own hash function will match, resulting in an authentication. If even a single bit is different, the two hashes will not even closely match, yielding an authentication failure [45].

Friedman's digital camera is resistant to forgery attempts, since only the camera's manufacturer knows the secret private key embedded in a probe-proof microprocessor in the camera's system. A forged digital signature placed into the camera's chip would produce non-decodable images by any public key [39].

The verification software can be freely distributed and built into popular digital imaging packages. The algorithms and private key are hard coded into

the camera by the manufacturer so the Read-Only-Memory (ROM) contents cannot be observed outside the factory [40].

Friedman's digital camera is the basis for digital manipulation tracing technology. By utilizing his technology in digital cameras and in image scanners, the original image file can always be authenticated as it emerges from the capture device. Verifying the original status of an image is the first process in tracing technology. Once the original image is confirmed, it then is locked using a (WORM) write-once-read-many storage area similar to CD technology. The original image file can be accessed for viewing only. Any alterations or manipulations performed on the image are actually performed on a writable copy of the original that accompanies the original at all times. The copy can be read, altered and written back over itself like usual digital information. The original attachment is equivalent to stapling the original negative to a print of a photograph.

The purpose of the unalterable original file attachment is to allow editors, photographers and publishers to view the original image of a photograph. The two images can then be compared to detect what manipulations or alterations have been performed (Fig. 14). The tracing technology does not prevent users from manipulating an image. Alterations such as color correction, burning, dodging and sharpening are necessary for reproduction. Photo illustrations require the manipulation of photos through digital imaging programs as well.

The digital signature technology is also useful for authenticating photographs sent into news media publications through digital or phone wires.

Original, Unalterable Image
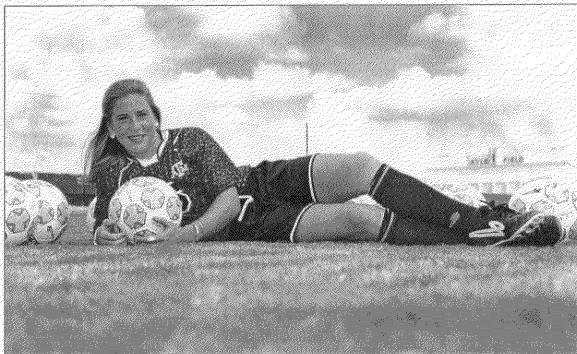
Altered Image
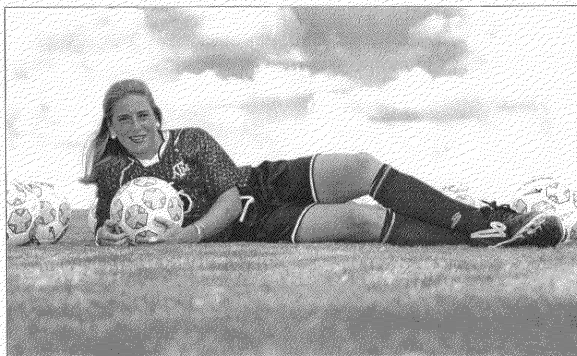
Fig. 14. Tracing Technology. The technology allows editors to view the originally captured image against the latest version of the image. In this case, the altered image has been manipulated beyond traditional darkroom techniques, distracting elements were removed.

Freelance workers as well as remote photographers send their images to publications using digital means. By using digital signatures, the image received at the office via transmission can be verified against its original capture. This would prevent freelancers from digitally sending possible unethically altered images to news publications. Photo editors could also check on the images received from remote photographers concerning possible questionable alterations to images. The uses of such a system also extend into situations where proof of image authenticity is necessary, such as for courtroom evidence or insurance claims.

Further additions to the tracing software could include keeping a histogram of the manipulations performed or possibly categorizing alterations. A histogram could record in sequence any and all manipulations performed on a photograph, such as amount of sharpening, color correction values or cropping vertices. Each version of the image could not be kept though, due to the amount of storage space it would require.

Nikon recently introduced the F5 35mm SLR camera which utilizes a 3D color matrix metering system. The metering sensor consists of a 1,005 pixel CCD, in which each pixel has one red, green or blue filter. The sensor evaluates each scene's brightness, contrast, color, focus area and distance. Then its microcomputer and built-in database of over 30,000 scenes, guides the exposure control. The system recognizes scenes. For example, "if the meter *sees* a scene which has a band of blue across the top with green across the bottom, and an

extremely bright area in the upper corner, it will interpret this scene as a land-scape with the sun in the upper area " [41].

Nikon's technology can be adapted in the future to recognize changes in scene information of an existing image. After each manipulation of an image, the resulting image could be evaluated against the previous version of the image to determine the extent of the alteration. Combine the scene identification technology with the histogram record and each manipulation can be categorized as either a simple enhancement for reproduction purposes or as a image alteration that possibly changes the content of the image. Since one manipulation may not change the content of the image, but perhaps a series of alterations might, the tracing technology would keep track of layers of manipulations to see if the final version of the image has changed the content of the original photo. Once the degree of alteration has been determined, a notification can be attached to the image describing the manipulations. Again, this technology does not prevent users from altering images, only notifies others of the manipulations that have been performed.

Digital watermarking is currently available. It embeds a digital, invisible watermark into an image to store copyright information. The watermark only informs others that the image is copyrighted and who owns the copyright. A digital watermark filter produced by Digimarc for Adobe Photoshop contains the creators ID, type of use (restricted or royalty free), adult content notification, and allows the user to control the durability of the watermark. The more

durable the watermark, the more visible it is. The water mark survives copying, either digitally or hard copy, and scanning. Digimarc's technology can also be added to the tracing software for means of copyright notification.

The digital imaging tracing technology is an application of existing technology toward a solution of the eroding credibility of the photographic image. It will always be possible to lie with a photograph, but this technology could diminish the growing concern of altered image being passed off as truth.

DISCUSSION, SUMMARY AND FUTURE DIRECTIONS

How This Study Adds to the Literature

The literature to date, on the topic of digital imaging, has been limited to discussions of manipulation ethics and the loss of credibility in the photojournalism field. The articles and studies found were numerous, but focused on the discussion of unethical behavior or the problems associated with digital manipulation. Many of the articles addressed uses of the technology in the newsprint industry and whether the use was ethical. The studies or articles did not offer any solutions, they just passed judgment on digital, manipulating technology. Most articles reported incidents of possible improper digital manipulations and the harm posed to the credibility of photojournalism.

Fully understanding the technology and how it is used, ethically or unethically, is needed if ethics and credibility are to be discussed. For a discussion of the implications of the technology, it is necessary to review the different theories of ethical behavior. The major difference between this study and past studies, is that this research addresses the problem of digital, manipulation tracing by investigating ethical and credibility issues to demonstrate the need for the technology. Past studies have discussed new codes as the solution to digitally manipulating images. Industry-wide codes are needed, but hard to enforce. A technology that would allow photo editors to view the original and

manipulated versions of an image simultaneously was the intent. The editor could then decide if the manipulated version had been altered to a degree considered unethical.

This study makes the need for digital image traceability clear. This research is unique in that it uses past studies combined with current attitudes in the industry to develop a tracing technology. The technology could be a solution to the problem of unethical photographic manipulations and the impact of such manipulations on credibility. The tracing technology would be a significant contribution to the field of photography and photojournalism. If tracing is adopted, then unethical behavior can be monitored and photographic credibility can be sustained.

Future Directions

One of the primary areas of future research is the development, coding and implementation of the digital imaging tracing technology into the hardware and software of imaging systems. This technology need not be limited to still images. With advancements in technology, tracing could be engineered into digital video cameras and digital audio recording devices. In digital cameras, to aid in the authentication of evidence, information concerning the captured scene could accompany the image file. Textual information about the scene could include: date and time of the capture, light levels, focus distance of the lens,

shutter and aperture readings, serial number of the camera and the geographi-
cal coordinates of the camera (using Global Positioning System technology)
when the photo was taken.

Tracing technology could be adapted for uses in areas other than photog-
raphy or photojournalism. Possible uses include archiving systems for museum
artwork, copyright authentication for legal issues, protection of Internet images,
and authentication or protection of images in stock photo houses.

Future research will encourage the development of technology that will
further benefit photography. It is hoped that this investigation into image
ethics, photographic credibility and digital imaging tracing technology will lead
to the further study of the subject.

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APPENDIX A

INTERVIEW QUESTIONS

1. Do you / or your organization allow manipulations to photos?

    If so, what kind of manipulations?

2. Do you think that the ease of manipulation of photo images through computer technology will encourage some in the news industry to alter photos used in newspapers and news magazines?

3. Do you think potential abuses of digital imaging technologies will create credibility problems for the news industry?

    If so, how?

4. Does your organization / publication have a written policy or set of guidelines dealing specifically with altering digital images?

5. Should industry-wide ethical guidelines be developed and adopted to address the issues that digital imaging raise?

6. If codes and guidelines are established, how would they be enforced and

what would be the punishment for breaking them?

7. What are your thoughts on hardware / software that would stamp the original image to any version of the image and would detect when an image has been altered. The stamp would be as if the negative was stapled to the document. The stamp could be viewed for reference, but not manipulated.

8. Do you think such technology would prevent the unethical use of digital imaging technology and maintain credibility of photos?

APPENDIX B

INTERVIEW: CRAIG HARTLEY,

FREELANCE PHOTOGRAPHER

1. The Houston Post, like most newspapers, had a firm "hands off" policy on photo manipulation. Most newspapers have decided that standard darkroom techniques are fine when handling a digital image: burning, dodging, cropping, color correction, changing contrast, removing dust and scratches. Also, the "sharpness" filter in Photoshop is fine for most. My personal ethical values are comfortable with this: news pictures are taboo beyond standard darkroom techniques.

Now that I am a freelancer, however, images shot for commercial and advertising purposes are not so pristine. Though the subject has not arisen, if I needed to remove a telephone pole or power lines growing from someone's head, I would do it. News is still taboo, but freelance stuff is already a manipulated and staged event. The freelance stuff I shoot is usually for in-house ad campaigns and brochures. I don't have a problem with purely staged events that are not presented as news and do not appear in newspapers or magazines.

2. Yes, I think there is a real temptation for unknowledgeable editors or artists to "improve" photographs that cross their screen. There are fewer and fewer of these people these days, but some "old timers" or kids fresh out of school might be

tempted to play fast and loose with a picture: to remove a distracting telephone pole or drop in a blue sky. They need the rules clearly explained to them and posted by the Mac stations. Also, the rules REALLY need to be pounded in when dealing with advertising and promotions people who want to use a news photo for some reason. These people frequently don't have a clue.

3. I think the public's PERCEPTION of the news industry is vital. Unfortunately, they also view us as the "liberal media," "liberal rags," arrogant, vultures, ghouls, etc., etc., etc. The transgressions by the television "news magazines" and supermarket tabloids tars everyone in news business with the same brush. There is little reputable organizations can do about it other than maintain firm ethical standards.

4. The Houston Post didn't have a written policy concerning D.I., but we did discuss it frequently and everyone coming in contact with an image was clear on our "hands off" policy. I attended an ethical decision making seminar at the Poynter Institute in Florida and picked up a nice little set of guidelines that I posted by the Mac stations.

5. I think an industry-wide set of guidelines should be discussed and adopted by the NPPA. People could discuss possible pitfalls or special circumstances and adopt a set of common-sense rules. The NPPA and similar organizations are per-

fect for this sort of thing. These guidelines should be explained and posted to everyone who comes in contact with an image.

6. It is impossible for the NPPA or any other organization to police these rules, and we would look foolish trying. *News Photographer, Editor and Publisher*, etc. are good outlets to display examples of a news organization that blew it or just made an tough decision one way or another.

7. I think your "digital stamp" software is a terrific idea, though even it is not a perfect safeguard. You can't digitally stamp an original film negative unless the photographer is using an electronic camera. An original film image could always be scanned into a computer that isn't running the stamping software. Commercial and advertising photographers are still going to do what they want with a picture.

That said, I think news organizations would find it an invaluable safeguard to avoid the pitfalls of unknowledgeable or unethical people in-house from manipulating photographs. Also, what a boon for photographers transmitting pictures to a wire service, stock photo agency or another publication! They would be guaranteed that the electronic image would appear as they shot it. Software of this nature would be a key element in maintaining ethical standards and making our jobs less of a headache. Also, the same technology would be a great copyright safeguard for photographers re-selling image rights from a Kodak CD, transmission, disk or other electronic media.

APPENDIX C

INTERVIEW: KENNETH IRBY,

POYNTER INSTITUTE

1. Poynter does publish some product: catalogs, reports, etc. We have not used any manipulations to my knowledge. Remember we are a journalism school not a publication. The St. Petersburg Times is owned by Poynter but we have a arms length relationship.

2. Absolutely, the new photographic imaging software is very powerful and very seductive. It gives organizations the ability to make seamless changes to photographs in real time. This is the issue, we have always had the ability to alter photos and his shows that we done so. Now, the changes can be made instantaneously. Individuals can now change the content and meaning of photographs to disseminate them with ease. That is a major reason for concern in my mind

3. Indubitably! Through my early and informal surveys, I am seeing the negative affect on photojournalistic credibility. People are often saying, is that real and how do you think the made that? There is such mixture of photographic imagery in the market place today, people are inundated with all kinds of

images. The mass media sends such mixed messages via movies, advertisements and information sources.

4. We are teaching the difference to journalists and asking them to advocate clarification at there sites.

DIGITAL PHOTOGRAPH: Simply is a photograph that has been captured electronically on a hard drive (storage device) or converted from film to digital format through an electronic scanning process.

IN-CAMERA MANIPULATION: refers to certain measures and steps taken by the photographer to produce a desired effect, such as filters, lens choice, angles, and/or multiple exposures.

COMPUTER ENHANCEMENT: refers to contrast adjustments, toning, color correcting dodging and burning to prepare an image or photograph for production.

PHOTO ILLUSTRATION: is either a set-up photograph (usually in a studio with no digital alteration) that is illustrative in nature and is clearly out of the realm of reality. Traditionally, it is an approach used for fashion, food and product photographs.

5. It will never happen. Newspapers pride themselves on being autonomous and every paper has it+s own culture and structure. I teach folk to examine the process and intent of all photography in their publications and to seek maxi-

mum truth telling and to not deceive their readers.

6. We all make mistakes, so punishment amongst colleagues is a strong term. Albeit, we should have guidelines and protocols that aid our decision making.

7. The European photojournalism community have advocated such a measure for several years now. This has not been embraced here in the states. I personally do not feel that because we label a lie or deceptive image that it makes it ok. It is my feeling that we need to define the way by which we will use this new genre of imaging (thus my definitions) and inform the readers and citizens of what we are doing and what they are seeing.

8. Nope, not necessarily. People make decision not the computers or software.

APPENDIX D

INTERVIEW: RON HEFLIN,

ASSOCIATED PRESS PHOTOGRAPHER,

DALLAS BUREAU

1. No, the only manipulations the Associated Press allows are the ones that have been around for years. Cropping, toning and touching up the dust hickeys.

2. Yes, it has already happening but any respectable news organization will not knowingly allow it. I am aware of an incident in the 70s, well before we had computer technology, that a photographer altered the expiration date on an auto license plate in a photograph he had in his file so it would go with a story he was working on. The person in the photo with the car called the newspaper and complained. The newspaper ran a retraction, apologized to the person in the photo and its readers.

Grocery store tabloids have been guilty of manipulation of photos for years and surely the computer technology will make it easier for them to alter photos to support their stories. Texas Monthly magazine has been guilty. In July 1992 they placed then Texas Gov. Ann Richards' head on a model sitting on a Harley-Davidson motorcycle on its cover. The only disclaimer they had was given to the photostylist and model in the photo. Yes the photo looked real and persuasive.

3. Yes, the media is not trusted by a vast majority of the public now and I believe as the public becomes more aware of the technology available to us the more they will question our integrity.

4. Yes, and I believe you said you had a copy of it.

5. I believe that industry-wide guideline already exist within the credible news industry. Either a publications ethical or they are not. It has been my experience that the news media watches itself very closely. No one is sacred. If a newspaper or television station does something unethical you can bet the rest of the industry will be all over the offender.

6. As stated in question five. I believe the media is self policing and any employee will be dealt with severely.

7. Hopefully the media will never have to resort to hardware/software that would stamp the original image to determine if the image has been altered. If we did have such technology I don't believe it would prevent unethical use of a photo. Someone would find a way around it.

8. It comes down to the fact whether a person is honest or not. As in the example give in question number two. The photographer's main goal in life was to

become the NPPA regional photographer of the year and would do anything to submit clips that would help his standing.

APPENDIX E

INTERVIEW: DAVE McDERMAND,

CHIEF PHOTOGRAPHER,

THE BRYAN-COLLEGE STATION EAGLE

1. Yes, but only in special circumstances. If we're going to make obvious illustrations, we do them and we call them photo illustrations. But beyond that, no. We do not allow manipulations other than lifestyle, sports illustration... strictly known commodity, and we let the reader know that too.

2. Must certainly it will. Texas Monthly's cover of the Aggie, the Aggie with the big mouth. What a great manipulation. I hope that they manipulate in that regard. But then again that is mostly an illustration, and it will be extremely useful in illustrations.

3. Yeah, there will always be some guys who are looking to cop some undeserved kudos. Comes to mind the pictures of the teacher who went up on the Challenger when it exploded and those pictures of her family were taken before the thing (space shuttle) exploded. Way before. They were crying tears of joy. And out of five or six photographers who shot the image, only one of them said look this was shot before the explosion, when they uncovered it ... a lot of guys

had that shot, but one of them said his paper can't use it ... it's not legit, yeah it's great, but it's not legit, they took this thing a full minute before the thing exploded and they didn't do anything when it exploded. He wasn't about to pawn it off as true. There will always be those types who aren't like that in our business, who toe the line as much they can, try to enhance the images for their own gains. It doesn't have anything to do with the reader or anything to do with journalism. People who manipulate pictures in our industry for telling lies are doing it for their own reasons, they want to advance their careers. Most times they end up self-destructing. They do destroy what credibility the news business has anymore, by their actions. I think newspapers have more credibility than television media, simple because we're the acknowledged chroniclers. We're the ones with the largest reports, and most extensive reports everyday. We're used to strict reporting of things. If you condensed all the words said on a full half-hour TV newscast it would not fill the front page of a newspaper. We're the chroniclers of the ages. I think we have more credibility than anyone in the news business media, however I don't think the news media has much credibility anyway. The atmosphere is very distrustful of everything anymore.

4. The a—s who do it are going to f—k the rest of us. But that's their problem as far as I'm concerned. And anyone who is interested enough is going to look beyond that. And their going to know that one bad apple. It's the people that don't take the time to read the news, who are going to make general assump-

tions when they hear stories of fraud , which undoubtedly will grab headlines as a result of people who are fraudulently altering pictures and getting caught. There isn't too much of that. I don't think there will be a lot of that. I think it will stick to the illustrations, where it should be. It's not going to get into legitimate moment event news reporting. There's the potential though, but I don't think there's much to worry about.

5. No, not really. Unless it's an illustration, leave it alone. We clean it up sure, we get the crap off of it. We are permitted to do anything that was formally possible in a darkroom. Burning, dodging, any type of manipulation that enhances the appearance, that cleans it up, that enhances the fidelity of the image is permitted. But beyond that, not to remove objects like the Coke can. I would think that would probably going overboard. The Coke can was a Coke can. It's a freaking coke can. It's not like you're putting Lee Harvey Oswald on the scene of the JFK assassination digitally. You got a Coke can that's ugly, somebody thought is was ugly, they shucked it and I think is just scared everybody, because it was the first time that it was used. Now, it's so old hat, we've been using digital for so long, who gives a s—t.

6. They largely have. Associated Press has pretty well taken the lead. NPPA also has rather strict guidelines. There's now reason why they should be violated. Except for somebody who's scared that they are not going to get where they

want to go. That they have to cheat in order to get there. And they are going to try to cheat, and it's probably not the only way they are cheating. But they end up cheating themselves right out of the business. You here about them every now and then you'll here about one or two of them. They are gone. They f—k up. They are gone.

7. There's no punishment. The only punishment is your ass is fired. There's no way, since there's no general governing body of our business, each publication is pretty well ran independently of the others, although we're associates throughout the world , a network of associates. There's now way to enforce any sort of code. Any violations that are caught, will raise such havoc in their readership communities, that the guys ass will be out of the office and a public apology will be written in the next days issue. It's unnecessary to enforce any codes or guidelines on an industry-wide basis. It's such an obvious violations of ethics for someone to tweak a photo to represent something that really didn't happen. That if someone got caught doing it. It really would only hurt you in a news picture, a picture that supposed to tell the truth and appears in the news section. Outside of prettying them up, which the digital technology does so well, anything else is clearly wrong. And it's unnecessary too. It's either there or it's not. And if it's not on the negative and you can't legitimately transfer it from the negative into digital information on the screen, then get your ass out there and try again, cause there's plenty more opportunities ahead. You want to

f—k up those opportunities and erase them from your future, go ahead a freak digitally. Go ahead and mess around with some images. There's no way you're not going to get caught. People will to call. Witnesses at the various sees will know that it's a lie and will call, and you're going to get your ass caught. That's all there is to it.

8. No doubt about it. That's nice. Are you trying to market this. If you are, you may be onto something. I don't know where the idea came from, but it's a damn good one. If it didn't cost much to implement and newspapers and other vehicles of information were paranoid enough then it might sell. Looking at it right now, I think that it is unnecessary. Because the checks and balances are so immovable there. That any real bulls—ting digitally will be, anybody who does that will not last long in the photo business. You can in copy in the stories and fudge on headlines. and kind of mislead in headlines, you can mess with graphics and be persuasive and add editorializing, but with pictures it's just to much truth. If you start f—king with the truth it's easy to see, clear as a bell. And those guys, a kin to the guy who keeps a teddybear in his truck at accident scenes and throws down the teddybear until his editor says, didn't I see this teddybear last month.

APPENDIX F

INTERVIEW: VICTORIA AROCHA,

GRADUATE STUDENT,

ROCHESTER INSTITUTE OF TECHNOLOGY

1. Manipulations that DO NOT alter content or scene integrity are allowed. Such manipulations include those possible in a traditional darkroom; dodging, burning, cropping and color correction.

2. What technology offers us today is no different than what a good darkroom craftsmen was capable years before. What technology does offer is convenience and speed in any such content altering manipulations. Representatives of the news industry must weigh out there mission and there goals and understand the influence they have in the community. The news industry is an estate that has a
responsibility to the people in telling the truth. If truth be altered based on "ease of technology," the integrity and legitimacy of the news industry will soon falter in its duty.

3. Abuses of the current technological advances will soon place a lumming black mark over the industry. As seen with the OJ trial where several counts of

film were contested as to their legitimacy. Current technology, filmless photog-
raphy, does not have the luxury of original creation such does film. It is for
this reason that care must be taken not to abuse its truthfulness or integrity.

4. As an independent photojournalist I do not have a written policy, but stand
by the side of keeping image manipulation to the minimal and its intended goal
being that of achieving proper tone reproduction.

5. I think industry-wide ethical guidelines though a good idea would be diffi-
cult to police. What is needed is self policing by the peers we work with.

6. If guidelines were introduced it would be tough to weigh out a punishment
for misleading the public and mistruth.

7. Hardware and software to identify originality of and image would be good
but I do not believe that this would prevent the unethical use of digital images.

APPENDIX G

AMERICAN SOCIETY OF NEWSPAPER EDITORS,

CANONS OF JOURNALISM

The primary function of newspapers is to communicate to the human race what its members do, fell, and think. Journalism, therefore, demands of its practitioners the widest range of intelligence, of knowledge, and of experience, as well as natural and trained powers of observation and reasoning. To its opportunities as a chronicle are indissolubly linked its obligations as teachers and interpreters.

To the end of finding some means of codifying sound practice and just aspirations of American journalism these canons are set forth:

I

Responsibility. The right of a newspaper to attract and hold readers is restricted by nothing but considerations of public welfare. The use a newspaper makes of the share of public attention it gains serves to determine its sense of responsibility, which it shares with every member of its staff. A journalists who uses his power for any selfish or other unworthy purpose is faithless to a high trust.

II

Freedom of the Press. Freedom of the press is to be guarded as a vital right

of mankind. It is the unquestionable right to discuss whatever is not explicitly forbidden by law, including the wisdom of any restrictive statute.

<div align="center">III</div>

Independences. Freedom from all obligations except that of fidelity to the public interest is vital.

1. Promotion of any private interest contrary to the public welfare, for whatever reason, is not compatible with honest journalism. So-called news communications from private sources should not be published without public notice of their source or else substantiation of their claims to value as news, both in form and substance.

2. Partisanship in editorial comment which knowingly departs from the truth, does violence to the best spirit of American journalism: in the news columns it is subversive of a fundamental principle of the profession.

<div align="center">IV</div>

Sincerity, Truthfulness, Accuracy. Good faith with the reader is the foundation of all journalism worthy of the name.

1. Be every consideration of good faith a newspaper is constrained to be truthful. It is not to be excused for lack of thoroughness or accuracy within its control or failure to obtain command of these essential qualities.

2. Newspaper headlines should be fully warranted by the contents of the article they surmount.

<div align="center">V</div>

Impartiality. Sound practice makes clear distinction between news reports and expressions of opinion. News reports should be free of opinion or bias of any kind.

1. This rule does not apply to so-called special articles unmistakably devoted to advocacy or characterized by a signature authorizing the writer's own conclusions and interpretations.

VI

Fair Play. A newspaper should not publish unofficial charges affecting reputation or moral character without opportunity given to the accused to be heard: right practice demands the giving of such opportunity in all cases of serious accusations outside judicial proceedings.

1. A newspaper should not invade private rights or feelings without sure warrant of public right as distinguished from public curiosity.

2. It is the privilege, as it is the duty, of a newspaper to make prompt and complete correction of its own serious mistakes of fact or opinion, whatever their origin.

VI

Decency. A newspaper cannot escape conviction of insincerity if while professing high moral purpose it supplies incentives to base conduct, such s are to be found in details of crime and vice, publication of which is not demonstrably for the public good. Lacking authority to enforce its canons, the journalism here represented can but express the hope that deliberate pandering to vicious

APPENDIX H

NATIONAL PRESS PHOTOGRAPHERS ASSOCIATION
CODE OF ETHICS

The National Press Photographers Association, a professional society dedicated to the advancement of photojournalism, acknowledges concern and respect for the public's natural-law, right to freedom in searching for the truth and the right to be informed truthfully and completely about public events and the world in which we live.

NPPA believes that no report can be complete if it is possible to enhance and clarify the meaning of the words. We believe that pictures, whether used to depict news events s they actually happen, illustrate news that has happened, or to help explain anything of public interest, are indispensable means of keeping people accurately informed, that they help all people, young and old, to better understand any subject in the public domain.

NPPA recognizes and acknowledges that photojournalists should at all times maintain the highest standards of ethical conduct in serving the public interest.

1. The practice of photojournalism, both as a science and art, is worthy of the very best thought and effort of those who enter into it as a profession.

2. Photojournalism affords an opportunity to serve the public that is equaled by few other vocations and all members of the profession should strive by example and influence to maintain high standards of ethical conduct free of mercenary considerations of any kind.

3. It is the individual responsibility of every photojournalist at all times to strive for pictures that report truthfully, honestly and objectively.

4. As journalists, we believe that credibility is our greatest asset. In documentary photojournalism, it is wrong to alter the content of a photograph in any way (electronically or in the darkroom) that deceives the public. We believe the guidelines for fair and accurate reporting should be the criteria for judging what may be done electronically to a photograph.

5. Business promotion in its many forms is essential but untrue statements of any nature are not worthy of a professional photojournalist and we severely condemn any such practice.

6. It is our duty to encourage and assist all members of our profession, individually and collectively, so that the quality of photojournalism may constantly be raised to higher standards.

7. It is the duty of every photojournalist to work to preserve all freedom-of-the-press rights recognized by law and to work to protect and expand freedom-of-access to all sources of news and visual information.

8. Our standards of business dealings, ambitions and relations shall have in them a note of sympathy for out common humanity and shall always

require us to take into considerations our highest duties as members of society. In every situation in our business life, in every responsibility that comes before us, our chief thought shall be to fulfill that responsibility and discharge that duty so that when each of us is finished we shall have endeavored to lift the level of human ideals and achievement higher that we found it.

9. No Code of Ethics can prejudge every situation, thus common sense and good judgment are required in applying ethical principles.

APPENDIX I

SOCIETY OF PROFESSIONAL JOURNALISTS,

SIGMA DELTA CHI,

CODE OF ETHICS

The Society of Professional Journalists, Sigma Delta Chi, believes the duty of journalists is to serve the truth.

We believe the agencies of mass communications are carriers of public discussion and information, acting on their Constitutional mandate and freedom to learn and report the facts.

We believe in public enlightenment as the forerunner of justice, and in our Constitutional role to seek the truth as part of the public's right to know the truth.

We believe those responsibilities carry obligations that require journalists to perform with intelligence, objectivity, accuracy, and fairness.

To these ends, we declare acceptance of the standards or practice here set forth.

Responsibility

The public's right to know of events of public importance and interest is the overriding mission of the mass media. The purpose of distributing news

and enlightened opinion is to serve the general welfare. Journalists who use their professional status as representatives of the public for selfish or other unworthy motives violate a high trust.

Freedom of the Press

Freedom of the press is to be guarded as an inalienable right of people in free society. It carries with it the freedom and the responsibility to discuss, question, and challenge actions and utterances of our government and of our public and private institutions. Journalists uphold the right to speak unpopular opinions and the privilege to agree with the majority.

Ethics

Journalists must be free of obligations to any interest other than the public's right to know the truth.

1. Gifts, favors, free travel, special treatment, or privileges can compromise the integrity of journalists and their employees. Nothing of value should be accepted.

2. Secondary employment, political involvement, holding public office, and serving in community organizations should be avoided if it compromises the integrity of journalists and their employers. Journalists and their employers should conduct their personal lives in a manner which protects them from conflict of interest, real or apparent. Their responsibili-

ties to the public are paramount. That is the nature of their profession.

3. So-called news communications from private sources should not be published or broadcast without substantiation of their claims to news value.

4. Journalists will seek the news that serves the public interest, despite the obstacles. They will make constant efforts to assure that the public's business is conducted in public and that public record are open to public inspection.

5. Journalists acknowledge the newsman's ethic of protecting confidential sources of information.

Accuracy and Objectivity

Good faith with the public is the foundation of all worthy journalism.

1. Truth is our ultimate goal.

2. Objectivity in reporting the news is another goal, which serves as the mark of an experienced professional. It is a standard of performance toward which we strive. We honor those who achieve it.

3. There is no excuse for inaccuracies or lack of thoroughness.

4. Newspaper headlines should be fully warranted by the contents of the articles they accompany. Photographs and telecasts should give an accurate picture of an event and not highlight a minor incident out of context.

5. Sound practice makes clear distinction between news reports and expressions of opinion. News reports should be free of opinion or bias and rep-

resent all sides of an issue.

6. Partisanship in editorial comment which knowingly departs from the truth violates the spirit of American journalism.

7. Journalists recognize their responsibility for offering informed analysis, comment, and editorial opinion on public events and issues. They accept the obligation to present such material by individuals whose competence, experience, and judgment qualify them for it.

8. Special articles or presentations devoted to advocacy or the writer's own conclusions and interpretations should be labeled as such.

Fair Play

Journalists at all times will show respect for the dignity, privacy, rights, and the well being of people encountered in the course of gathering and presenting the news.

1. The news media should not communicate unofficial charges affecting reputation or moral character without giving the accused a chance to reply.

2. The news media must guard against invading a person's right to privacy.

3. The media should not pander to morbid curiosity about details of ice and crime.

4. It is the duty of news media to make prompt and complete corrections of their errors.

5. Journalists should be accountable to the public for their reports and the

public should be encouraged to voice its grievances against the media. Open dialogue with our readers, viewers, and listeners should be fostered.

Pledge

Journalists should actively censure and try to prevent violations of these standards, and they should encourage their observance by all newspeople. Adherence to this code of ethics is intended to preserve the bond of mutual trust and respect between American journalists and the American people.

APPENDIX J

LETTER OF PERMISSION

NATIONAL GEOGRAPHIC

**NATIONAL
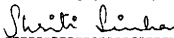GEOGRAPHIC
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Public Affairs

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From: Shriti Sinha

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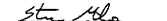in any form and is to be used for academic purposes only.

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Shriti Sinha   Stewart Milne
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APPENDIX K

LETTER OF PERMISSION

TIME

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APPENDIX L

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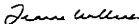
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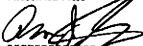
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From: Tom Stathis
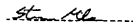   Associated Press, Sr. Photo Editor for North America

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                                          Stewart Milne

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Photo Editor, *The Battalion*, Texas A&M University	1994-1996
Photographer, *The Battalion*, Texas A&M University	1994