



Digital & Multimedia Section – 2009

B28 The Persistence of Image Files on Digital Camera Memory Cards

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After attending this presentation, attendees will learn that it is possible to recover image files from digital camera memory cards after they have been erased and the card reformatted. A number of experiments will be described that illustrate how easy it is to recover these images with commercially available software. Mechanisms will also be discussed which prevent image recovery.

This presentation will impact the forensic community by demonstrating how standard operating procedures (SOPs) are essential for implementing a successful digital imaging platform. This presentation will alert users to the persistence of image files on digital camera memory cards and demonstrate how to effectively clear these cards. This information should be incorporated into any agencies SOP.

The dramatic improvement in digital imaging technology has led to growing acceptance of digital photography by both the law enforcement and forensic community. As the cost of a good single lens reflex (SLR) style camera continues to drop and the image quality for these digital SLRs (dSLRs) continues to increase, many agencies have elected to replace their traditional film applications with digital photography.

One fundamental difference encountered when switching from film to a digital platform involves the mechanism in which the images are initially recorded. With traditional film, the image is recorded as either a negative or positive (e.g., slide film) image. Since both of these are tangible, it is easier to physically and mentally keep track of them. With digital photography, images are recorded onto memory storage devices in the camera. Once these images are transferred from the card, the cards are cleared and reused again. Often users will utilize the "delete all" or "format card" feature on the camera to clear the cards in between uses. After either of these processes, no images will be visible on the card with either the camera or an external device. Unfortunately, this does not mean that the images are permanently deleted. There are a number of commercially available softwares that are very good at recovering image files from digital camera memory cards. Since the security of images taken for forensic science or other law enforcement applications is paramount, it is important to realize that even "empty" cards may contain images.

To evaluate the parameters where image files can be recovered, experiments were devised using a Nikon D200 dSLR with a 60 mm Micro Nikor lens and a new 2 GB 133 speed CompactFlash™ card. The camera was set to ISO 100, auto white balance, and the quality was set to Raw + JPEG (large). Exposure was set manually based upon the TTL lens meter and was set to f 3.2 and 1/60 for all the exposures. PowerPoint was used to make slides with the experiment title, name, and sequential numbering. Each slide was then photographed with the D200 mounted on a tripod.

For the first experiment 99 images were recorded to fill the card. The images were saved onto an external hard drive and then the "delete all" feature on the camera was used to clear the card. The card appeared blank when evaluated through the camera or a computer. Commercially available image recovery software was then used to analyze the deleted card and recover any possible images. All of the RAW and JPEG images were recovered with no loss in resolution.

Without the aid of the image recovery software, the "deleted card" still appeared blank. The card was then reformatted on the same digital camera. Again, the card appeared blank to the camera or a computer. Using the image recovery software, all of the RAW and JPEG images were recovered from the deleted and now reformatted card with no loss in resolution. This same card was then reformatted an additional six times. After each reformatting, all of the original images were recovered with no loss in resolution.

In the second experiment 51 new images were recorded onto the deleted and reformatted card. The original images were stored onto an external hard drive and then the images were cleared from the camera using the "delete all" feature. All of the images from experiment 2 (RAW & JPEG) were recovered with the image recovery software as well as the last 46 RAW and JPEG images from experiment 1. There was no loss of resolution in any of the images.

A number of additional experiments were performed that fully evaluated the ability of the image recovery software to recover images off of cards thought to be empty. For those familiar with computers, it might not be surprising that deleted files can be recovered. Since the outward appearance of digital cameras still resembles that of their film ancestors, the fact that digital cameras are actually computers is often overlooked. Experiments such as these are necessary to define best practices and create standard operating procedures for digital photography.

Digital Photography, Memory Cards, Image Recovery