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1.8 Digital Imaging

Digital images can have substantial impact on recording the process of forensic examinations. When biological evidence is being analyzed, proper documentation via digital imaging can help support investigative conclusions.

1.8.1 Available Equipment

1.8.1.1 Digital Camera Equipment

1.8.1.1.1 Digital SLR Cameras

While conventional 35mm-film formats have been in use for forensics for years, the advent of high-resolution digital SLR cameras have made this tool a viable option for forensic documentation. A SLR camera offers many options including the ability to have manual override settings, various lenses for different shooting situations, a detachable flash, and the ability to mount on a tripod.

1.8.1.1.2 High-End Point-and-Shoot Cameras

High-end point-and-shoot cameras also offer viable options for some situations. The newest versions of these cameras offer resolution comparable to the digital SLR cameras, without some of the optional manual settings. Special attention must be paid to the image quality and resolution when electing to utilize this type for digital photo equipment.

1.8.1.1.3 Computer & CD- or DVD-burner

In combination with using any digital camera, a computer must be used to transfer images to the 'original' storage format (see section 1.8.3.2.1). Any computer that works in conjunction with the appropriate camera system is acceptable if it also contains a CD- or DVD-burner to transfer the images from the temporary media card to the so-called originally-saved format.

1.8.1.2 MIDEO Systems Mobile Bio Expert Documentation System

Mideo Systems has collected a variety of image documentation equipment onto one portable cart for ease of documentation in a forensic laboratory. In this system, the camera(s) are attached to a flexible positioning arm for ease in shot setup. In addition, the cameras are wired into a computer contained on the cart with a monitor for use in displaying the images. This system is all accessed via the company's EZDoc Plus software to provide help in image capture, documentation, storage, and access. Images can be taken and stored on the system with one of several camera options available to the analyst. This system may include: a Canon G6 digital camera for general photography, a digital macro camera for specialized image capture, and a QICam digital microscope camera for image capture from the designated microscope or stereoscope.

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1.8.1.3 Digital Scanners

Flatbed or document scanners can be utilized to capture images in a two-dimensional format. The images that are able to be captured under this format are often limited by physical limitations of the scanner/evidence interaction. Transfer all images to a storage media format similar to a digital camera (section 1.8.3.2.1).

1.8.1.4 Other Systems

Other systems may be available to a laboratory on a site-specific basis. These can be used in casework documentation when appropriate and/or when primary systems are unavailable for use.

1.8.2 Digital Image Access

1.8.2.1

Access to images shall be limited to qualified personnel. Any analyst or technician utilizing any of the systems listed above should have basic training on the correct operation/utilization of the piece of equipment in use. This does not have to be a formal training course. However, if the analyst expects to spend substantial time utilizing a specific piece of equipment, a formal specialized training is recommended.

1.8.2.2

Archived original forms of media must be stored in a secured location. If using the Mideo Systems' Mobile Bio Expert Documentation System or other imaging systems software packages, the software must maintain password-protected access for each individual user on the system.

1.8.3 Imaging Procedures

1.8.3.1 Imaging Preparations

1.8.3.1.1

All evidentiary items shall be handled according to established Michigan State Police Biology Unit standards (Biology Procedure Manual Section 1.7).

1.8.3.1.2

Equipment selection for capturing digital images for documentation purposes should be based on available equipment and the type of evidence to be processed.

1.8.3.1.3

Good photography practices should be employed when setting up each shot, including (but not limited to) the use of a scale in the field of view, proper lighting conditions, photo composition of evidence within the field of view, the use of overview, midrange, and close-up shots, camera angles, sharpness of the shot,

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and exposure. For details on these specific photography procedures, please reference a quality photography manual or training course.

1.8.3.2 Digital Image Capture

1.8.3.2.1

When capturing digital images, the electronic data is transferred through several forms in the digital management process. The primary image is the first occasion that an image is recorded onto any media form (media cards in cameras). At this point the digital images may be binary copied exactly to a permanent, non-rewritable media form (CD+/-R or DVD+/-R, not CD-RW or DVD-RW) as original images. The primary images may also be binary copied exactly via USB from the camera to the analyst's hard drive or appropriate secured laboratory drive. Next, they can be binary copied exactly to a permanent non-rewritable media form (CD+/-R or DVD+/-R) and be imported into Forensic Advantage (FA) in the case record object repository. Images may be imported into FA before or after archiving original to non-rewritable media. The individual who captured the images should ensure that the original images are a true representation of the primary images. A working copy of the images are to be made when processing the images in any way, including cropping, reformatting to a different file format, digitally editing a a digital image's composition, or marking features contained within digital images (all processing steps done must be documented, see 1.8.3.3.2).

1.8.3.2.2

Minimum Requirements for digital imaging shall include:

1.8.3.2.2.1

Images should be stored in their original or master copy format. If digital images are taken for general documentation of the evidence items' condition, stain location and stain size, the analyst may capture these images as .jpg images. If photos are for comparison and identification (footwear impression on garment, physical match, etc.) the images should be captured as a .TIFF (.TIFF 4 or later) or .RAW file, avoiding lossy compression but using lossless compression when necessary.

1.8.3.2.2.2

Quality should be considered when evaluating which system is to be used for digital image capture. No minimum dpi is required at this time.

1.8.3.2.2.3

A photo may be taken in either color, bitonal (black and white) or greyscale, however it is recommended that for most applications color photos be taken. If supplemental bitonal or greyscale representations are needed, these can be done later via digital image processing (see section 1.8.3.2).

1.8.3.2.2.4

A statement of 'relevant supporting data' within the case report identifies that photographs have been taken for this case.

1.8.3.2.2.5

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Capture shall occur on a temporary media format as a primary image, then be transferred to a more permanent format as the original image. For digital cameras, the original images may be transferred to the analyst's hard drive via USB connection. Next, it should be binary copied exactly to a permanent, non-rewritable media form (CD+/-R or DVD+/-R) and be imported into Forensic Advantage (FA) in the case object repository. In the case of the Mideo Systems' Mobile Bio Expert Documentation System, the original image is stored on the computer's hard drive and archived to a CD±R or DVD±R format for long-term storage. If the laboratory has other archive data storage equipment (i.e. stand-alone CD/DVD burner with built in card reader or USB connectivity), the archiving of the primary images using this equipment should be done following the manufacturer's instructions.

1.8.3.3 Digital Image Use and Processing

1.8.3.3.1

Any use of a digital image must be done on a separate working copy of the image, ensuring that the original image remains unadulterated.

1.8.3.3.2

In addition, any changes that are made to a working copy image shall have a complete audit trail. The audit trail may be notes in the analyst worksheet or several photo processing documentation software packages are available for image enhancement and for evidentiary marking purposes. Within the Mideo Systems' EZDoc software, various tools are available for documentation on working copies of captured digital images. Another commonly used software package is the Photoshop-family of software packages. Each system is to be used on a working copy of the digital image, and the original shall be maintained secured separately from the working copy. Working copies may also be imported into FA in the case object repository.

1.8.3.3.3

A printout of a digital image is also considered a valid use of a digital image and is a working copy. Key photos within a case may be used for demonstrative purposes in consultation with investigators or in providing testimony.

1.8.3.3.4

Any digital image representations used in court shall be working copies, as the originals will be maintained at the laboratory.

1.8.3.4 Digital Image Retention

1.8.3.4.1

All original images will be retained at the laboratory, and backup copies shall be made to prevent catastrophic loss. All originals and backup copies will be stored in conditions that protect the integrity of the images.

1.8.3.4.2

When marking on CD+/-R and DVD+/-R discs, utilize markers that are specifically designated for this task as common markers may 'bleed-through' the media.

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1.8.3.4.3

Originals will be retained indefinitely, while any applicable working copy printouts and other forms of images should be shredded when no longer needed.

1.8.4 Equipment Maintenance and Calibration

1.8.4.1

All calibration and maintenance shall be performed in accordance with the manufacturers' recommendations.

1.8.4.2

For the Mideo Systems' Mobile Bio Expert Documentation System, one staff member should serve as the System's Administrator at each laboratory. This individual is charged with routine maintenance and archiving tasks, new user setup, and is to serve as a resource for other users on the system.

1.8.4.3

When using various systems, complex mathematical calculations and digitations steps are utilized in the process of digital image capture. Due to the fact that proprietary software is utilized in nearly every equipment system in use, these calculations are considered internal to the software for the system of focus.

1.8.5 Limitations of image capture & documentation

1.8.5.1

The first limiting factor is the quality of the equipment available for documentation. This quality is often determined by budgetary restraints and priorities and is rarely a subject of debate to the bench analyst. Utilizing the most advanced technology that is available to the analyst and appropriate to the task at hand is recommended.

1.8.5.2

The second limiting factor is the quality of the evidentiary item of investigation. While certain items of evidence lend themselves easily towards digital documentation, others may be difficult to record electronically. If digital techniques are unsuitable for an evidentiary item, a hand-drawn sketch may be acceptable for documentation of analysis for a specific item. Hand-drawn sketches must be scanned and uploaded to the appropriate case record object repository.

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1.8.6 Safety Considerations

1.8.6.1

Refer to the Michigan State Police Biology Procedure Manual section 1.7 and the specific testing procedures involved in serological/DNA analysis for further safety concerns related to the evidentiary materials of focus. These guidelines must be kept in mind as evidentiary documentation occurs.

1.8.6.2

Be sure to utilize caution when working with any electrical equipment.

1.8.7 Definitions

Digital image - an image that is stored in numerical form

Image - (American Heritage Dictionary of the English Language, Fourth Edition) An optically formed duplicate, counterpart, or other representative reproduction of an object, especially an optical reproduction formed by a lens or mirror

Imaging - (American Heritage Dictionary of the English Language, Fourth Edition) The visual representation of an object, such as a body part or celestial body, for the purpose of medical diagnosis or data collection, using any of a variety of usually computerized techniques

- **Archiving** - long term storage of an image
- **Audit trail** - an electronic or paper log used to track image integrity
- **Binary copy** - a duplication of data, bit for bit
- **Bitonal** - one bit per pixel representing black and white. Bitonal scanning is best suited to high-contrast documents such as printed text
- **Capture** - the process of recording an image
- **Capture device** - the device used in the process of recording an image
- **CD-R** - compact disc recordable - a format that allows CD writers to record data to a black disc
- **CD-RW** - compact disc rewritable - a format that allows CD writers to record data and allows it to be rewritten several times
- **Color** - multiple bits per pixel representing color
- **Compression** - the process of reducing the size of a data file
- **Differential backup** - a backup of files that have changed since a full backup was performed
- **Derivative images** - images that are commonly used in place of master copy images for general web access, including 'thumbnail' images
- **Duplicate image** - an accurate and complete replica of an original image
- **File format** - the structure by which data is organized in a file
- **Full backup** - all the files and folders on the drive are backed up every time you use that file set
- **Grayscale** - multiple bits per pixel representing shades of gray. Grayscale is suited to continuous tone documents, such as black and white photographs
- **Image processing** - any activity that transforms an input image into an output image
- **Image verification** - a process by which an individual identifies an image as being an accurate representation

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- **Incremental backup** - a backup of files that have changed or are new since the last incremental backup
- **Jpeg** - Joint Photographic Exchange Group, a method of file compression or file format (.jpg) using lossy compression
- **Lossless compression** - compression in which no image data is lost and the image can be retrieved in its original form
- **Lossy compression** - compression in which image data is lost and the image cannot be retrieved in its original form. The compression may or may not be visible, but the original data cannot be restored
- **Migration** - the process of moving records from one hardware and/or software platform to another
- **Original Image** - An accurate and complete replica of the primary image, irrespective of media. For 35mm film or analog video, the primary image is the original image.
- **Pixel** - the smallest component of a digital image
- **Primary image** - refers to the first instance in which an image is recorded onto any media that is a separate, identifiable object or objects. One example includes a digital image recorded on a flash card.
- **Raw** - A raster image file (.RAW) generated by the digital camera and contains uncompressed raw image data that can be adjusted using imaging software provided by the camera manufacturer or some image enhancement software (i.e. Adobe CS4 or newer).
- **Reformatting** - changing the format of the data containing an image, the process will change the actual configuration of the data and may result in the loss of some contextual information
- **Resolution** - the amount of digital information within a given area. It can refer to the density of pixels in an image or the number of pixels per inch
- **Storage** - the act of preserving an image
- **Storage media** - any object on which an image is preserved
- **TIFF** - a high-resolution image that is best for archival preservation, uncompressed in form to preserve color and details from the original item
- **Working image** - any image subjected to processing
- **WORM (Write Once Read Many)** - data storage technology that allows information to be written to a disc a single time and prevents the drive from erasing the original data

1.8.8 References

EZDoc Plus User Manual. Huntington Beach, CA: Mideo Systems Inc.

Owners' Manuals for specific Digital Cameras in use at each specific Laboratory
 Definitions and Guidelines for the Use of Imaging Technologies in the Criminal Justice System. Forensic Science Communications. 3, 3 (2001).

SWGFAST Friction Ridge Detail Imaging Guidelines (08/08/01). Retrieved March 20, 2007, from Scientific Working Group on Friction Ridge Analysis, Study and Technology Web site:
http://www.swgfast.org/Friction_Ridge_Digital_Imaging_Guidelines_1.0.pdf

Virginia Division of Forensic Science Procedures Manual. (2004). Forensic Imaging & Audio Analysis - Section 3 Still Image Capture (03/22/04 ed.), Virginia Division of Forensic Science.

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O'Malley, Troy. (Ed.). (2004). Australasian Guidelines for Digital Imaging Processes (2nd ed.). Crime Scene Photography (08/07/97) Retrieved March 20, 2007, from RCMP Learning Online Courses Web site: <http://www.rcmp-learning.org/docs/ecdd1004.htm>