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# Standard Terminology for Digital and Multimedia Evidence Examination<sup>1</sup>

This standard is issued under the fixed designation E2916; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope

1.1 This is a compilation of terms and corresponding definitions used in the examination of digital and multimedia evidence to include the areas of computer forensics, image analysis, video analysis, forensic audio, and facial identification.

1.2 Legal or scientific terms that generally are understood or defined adequately in other readily available sources may not be included.

1.3 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

## 2. Referenced Documents

### 2.1 ANSI/NIST Standards:<sup>2</sup>

ANSI/NIST-ITL 1-2011 Data Format for the Interchange of Fingerprint, Facial, and Other Biometric Information

NIST SP 800-86 Guide to Integrating Forensic Techniques into Incident Response

NIST SP 800-88 Guidelines for Media Sanitization

### 2.2 IEEE Standards:<sup>3</sup>

IEEE 100-2000 The Authoritative Dictionary of IEEE Standards Terms, 7th Edition

### 2.3 ISO Standards:<sup>4</sup>

ISO/IEC 10918-1:1994 Information Technology — Digital Compression and Coding of Continuous-Tone Still Images: Requirements and Guidelines

<sup>1</sup> This terminology is under the jurisdiction of ASTM Committee E30 on Forensic Sciences and is the direct responsibility of Subcommittee E30.12 on Digital and Multimedia Evidence.

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<sup>2</sup> Available from National Institute of Standards and Technology (NIST), 100 Bureau Dr., Stop 1070, Gaithersburg, MD 20899-1070, <http://www.nist.gov>.

<sup>3</sup> Available from Institute of Electrical and Electronics Engineers, Inc. (IEEE), 445 Hoes Ln., Piscataway, NJ 08854, <http://www.ieee.org>.

<sup>4</sup> Available from International Organization for Standardization (ISO), ISO Central Secretariat, BIBC II, Chemin de Blandonnet 8, CP 401, 1214 Vernier, Geneva, Switzerland, <http://www.iso.org>.

## 3. Significance and Use

3.1 This terminology includes general as well as discipline-specific definitions as they apply across the spectrum of image analysis, computer forensics, video analysis, forensic audio, and facial identification.

## 4. Terminology: Terms and Definitions

### 4.1 Definitions:

**achievable resolution, resolving power**, *n*—the measure of imaging system's practical limit to distinguish between separate adjacent elements, typically by imaging a known reference standard.

**acquisition**, *n*—*in computer forensics*, the process of using an access interface to read digital data from a digital source and to create a destination object.

*ad hoc image*, *n*—see **uncontrolled image**.

**allocated space, allocated storage**, *n*—*in computer forensics*, the portions of storage that are assigned or reserved for active instructions or for data.

IEEE 100-2000, (C) 610.10-1994w

**anthropometric analysis**, *n*—*in facial identification*, an explicit measurement of landmarks on a face and a comparison of these measurements between two samples.

**anti-forensics**, *n*—the application of a process to modify, conceal or destroy information to inhibit or prevent the effectiveness of forensic science examinations.

**archive image**, *n*—*in computer forensics*, a **bit stream** duplicate of data placed on media that is suitable for long-term storage.

**artifact**, *n*—a by-product, artificial feature, or change resulting from human activity or a technical process. (Compare **noise**.)

DISCUSSION—Examples include speckles in a scanned picture, “blocking” in compressed images, distortion in over-saturated audio, and the automatic creation of temporary files due to normal usage of a computer.

**aspect ratio**, *n*—the ratio of the width to the height of a rectangle, such as an image, a pixel, or an active video frame.

**attempt**, *n*—*in facial identification*, a submission of a single set of biometric samples to a biometric system for identification or verification. (Compare **biometric search**.)

**audio enhancement**, *n*—the processing and filtering of audio recordings to improve the signal quality and intelligibility of the signals of interest, such as speech, by attenuating noise or otherwise increasing the signal-to-noise ratio.

**backlight**, *n*—*in facial identification*, a light source placed behind a subject in a controlled capture that reduces background shadows.

**backlit**, *adj*—a characteristic of a subject or an object that is illuminated from behind.

**batch mode search**, *n*—*in facial identification*, a mode of searching records in an automated system in which a group of probes are simultaneously or sequentially launched.

*batch search mode*, *n*—see **batch mode search**.

**binning**, *n*—*in facial identification*, (1) any technique used by a facial recognition (FR) system to organize or optimize searching based upon some piece(s) of metadata; (2) the process of parsing (examining) or classifying data to accelerate or improve biometric matching.

**biometric search**, *n*—the submission of a biometric reference as a probe against a biometric system for identification (one-to-many) or verification (one-to-one). (Compare **attempt**.)

**bit stream**, *n*—a continuous stream of bits transmitted over a channel with no separators between the character groups.  
**IEEE 100-2000, (C) 610.7-1995, 610.10-1994w**

**bit stream duplicate**, *n*—*in computer forensics*, an exact, bit-for-bit reproduction of all data objects independent of any physical media upon which that data is stored. (Compare **copy**.)

**cache**, *n*—*in computer forensics*, a temporary storage area set aside on a processor, in memory, or in a filesystem to keep frequently needed data readily available, designed to speed up processing and improve performance.

**candidate list**, *n*—*in facial identification*, a rank ordered list generated from a facial recognition search.

**capture**, *n*—(1) the process of recording data such as an image, video sequence, or audio stream; (2) *in facial identification*, the process of collecting a biometric sample from an individual via a sensor.

**capture**, *v*—to record data, such as an image, video sequence, audio stream, or biometric sample to digital storage, often by means of a sensor.

**capture card, frame grabber**, *n*—a piece of computer hardware that accepts an analog or digital signal and outputs the signal as digital data.

**capture device**, *n*—device used in the recording of data.

**carve**, *v*—*in computer forensics*, to extract a portion of data for the purpose of analysis.

**certification authority**, *n*—(1) *in computer forensics*, a trusted third party entity that issues digital certificates certifying the ownership of a public key by the subject named in the certificate, and trusted by both entities engaged in a digital transaction; (2) *in facial identification*, a body that issues biometric documents and certifies that the data stored on the documents are genuine.

*clarification*, *n*—see **enhancement**.

*clarify*, *n*—see **enhance**.

**clean room, clean chamber, positive air flow cabinet**, *n*—to the extent possible, a limited particulate environment.

DISCUSSION—For example, requirements would follow ISO 5 or Class 100 standard for air quality.

**clear**, *v*—*in computer forensics*, to overwrite storage space on a medium with non-sensitive data, which may include overwriting not only the logical storage location of files, but may include all addressable locations. **NIST SP 800-88**

**cluster**, *n*—*in computer forensics*, a group of contiguous sectors on storage media, typically the smallest unit of allocation in a filesystem.

**codec**, *n*—an algorithm to encode and decode digital data, typically to reduce the amount of data for transmission or storage.

DISCUSSION—A codec is not a storage format, but may be required to interpret stored data.

**cognitive image analysis**, *n*—*in image and video analysis*, a process used to extract visual information from an image by human evaluation.

*color range*, *n*—see **gamut**.

**composite video signal**, *n*—a single analog video signal that combines a base-band luminance signal with color information by modulating a subcarrier with chroma signals, typically using one of the National Television System Committee (NTSC), Phase Alternating Line (PAL), or Sequential Color with Memory (SECAM) systems.

**compression**, *n*—a process to reduce the size of a data file or stream while attempting to retain the original semantic meaning of that data.

**compression ratio**, *n*—the ratio of the size of the data before compression to that of after compression.

**computer forensics**, *n*—the scientific examination, analysis, or evaluation of digital evidence in legal matters.

**controlled image**, *n*—*in facial identification*, a photographic image captured in accordance with facial identification (FI) or facial recognition (FR) standards or guidelines (for example, a driver's license photo).

**copy**, *v*—to reproduce information with some level of accuracy.

DISCUSSION—Depending on the process used, copying might result in the loss of data. (Compare **bit stream duplicate**.)

**data**, *n*—information in analog or digital form that can be transmitted or processed.

**data file**, *n*—a file consisting of stored data (that is, text, numbers, graphics, etc.) as compared to a program file of commands and instructions for a digital device.

**deblur**, *v*—to restore an image by attempting to reverse degradation caused by blur.

**deinterlace**, *v*—to separate an interlaced video frame into its two discrete fields.

**digital device**, *n*—electronic equipment which can create, process or store digital data.

**digital evidence**, *n*—information of probative value that is stored or transmitted in binary form.

**digital image**, *n*—*in image analysis*, a photographic image that is represented by discrete numerical values organized in a two-dimensional array.

**Focal Encyclopedia of Photography<sup>5</sup>**

**digital object**, *n*—a collection of logically related information.

**digital source**, *n*—a container of digital data that can be acquired by an acquisition tool.

**digital video recorder, DVR**, *n*—a stand-alone embedded system or a computer-based system for recording video and, optionally, audio data.

**directory**, *n*—*in computer forensics*, an object or structure used to group files together within a filesystem.

**directory listing**, *n*—*in computer forensics*, a list of files and, optionally, file properties contained within a filesystem.

**download**, *v*—(1) *in audio, image, and video analysis*, to retrieve audio, video, image, or transactional data from a recording device (for example, DVR system); (2) *in computer forensics*, to receive data from another digital source.

**dynamic range**, *n*—(1) *in image analysis*, the difference between the brightest highlight and darkest value that a sensor can detect and record in a single image; (2) *in audio and video analysis*, the ratio of the strongest (undistorted) signal to that of the weakest (discernible) signal in a unit or system as expressed in decibels (dB); (3) a way of stating the maximum signal-to-noise ratio.

**enhance**, *v*—*in audio, image, and video analysis*, to improve the perceptual recognition or quality of a signal of interest.

**enhancement**, *n*—*in audio, image, and video analysis*, the process of improving the perceptual recognition or quality of a signal of interest.

**enroll**, *v*—to capture a biometric sample, extract the relevant features, convert them to a template, and use it to form a reference for matching.

**DISCUSSION**—Enrollment most often is performed to populate a gallery, but it can also refer to the creation of a probe.

**examiner**, *n*—*in facial identification*, an individual whose role it is to perform a **facial examination**.

*export*, *n*—see **download** (1).

**extraction**, *n*—any method of exporting data from a source.

**face detection**, *n*—*in facial identification*, the automated determination of the presence of human faces in digital images.

**face recognition**, *n*—*in facial identification*, (1) *by automated systems*, the automated searching of a facial image as a probe in a facial recognition system (one-to-many), typically resulting in a group (candidate list) of facial images being returned to a human operator in ranked order based on system-evaluated similarity; (2) *by humans*, the mental process by which an observer identifies a person as being one they have seen before.

**facial comparison**, *n*—*in facial identification*, a manual process to identify similarities or dissimilarities between two (or more) facial images or facial image(s) and a live subject for the purpose of determining if they represent the same person or different person.

**facial examination**, *n*—*in facial identification*, a formal systematic **facial comparison**.

**facial identification, FI**, *n*—the discipline of image-based comparisons of human facial features.

**facial mapping**, *n*—the process of landmarking defined anthropological points.

*facial recognition, FR*, *n*—see **face recognition**.

**facial review**, *n*—*in facial identification*, an adjudication of a **candidate list**.

**feature**, *n*—*in facial identification and image analysis*, an observable class or individual characteristic.

**field**, *n*—*in video analysis*, a set of odd or even scan lines comprising one half of an interlaced video frame.

**DISCUSSION**—For interlaced video, the scanning pattern is divided into two sets of spaced lines (odd and even) that are displayed sequentially. Each set of lines is called a field, and the interlaced set of the two sets of lines is a frame.

**file**, *n*—*in computer forensics*, a collection of information logically grouped into a single object and referenced by an identifier, such as a filename.

**file format**, *n*—*in computer forensics*, a standard structure by which data is organized in a file for a specific purpose.

**file header**, *n*—*in computer forensics*, the data within a file that contains identifying information about the file and possibly metadata with information about the file contents.

**filename**, *n*—*in computer forensics*, an identifier used to uniquely identify a file object within a directory object in a filesystem.

<sup>5</sup> *Focal Encyclopedia of Photography*, 3rd edition, Richard D. Zakia and Leslie Stroebel, Eds., Focal Press, 1996.

**file slack**, *n*—*in computer forensics*, the data between the logical end of a file and the end of the last storage unit for that file.

**filesystem, file system**, *n*—*in computer forensics*, a specified method for naming, storing, organizing, and accessing files on logical volumes.

**fixed focal length lens, prime lens**, *n*—a lens with a focal length that is not adjustable.

**focal length**, *n*—the distance from the optical center of a lens to its point of focus at the sensor or image plane when focused at infinity.

*forensic video analysis*, *n*—see **video analysis**.

**forensic audio**, *n*—the scientific examination, analysis, comparison, or evaluation of audio.

**forensic cloning**, *v*—creating a **bit stream duplicate** of the available data from one physical media to another.

*forensic image*, *n*—see **image**.

**forensic wipe**, *n*—*in computer forensics*, a verifiable procedure for sanitizing a defined area of digital media by overwriting each byte with a known value.

**format**, *n*—the structure by which data are organized on a device.

DISCUSSION—A format can refer to a physical medium, a type of signal, a file format, encoding parameters, or combinations thereof.

**format**, *v*—to prepare a hard disk or a removable data storage device to enable data storage using a specified filesystem or data structure.

**format conversion**, *n*—*in audio, image, and video analysis*, the transfer of audio or video information, or both, from one format to another.

**frame**, *n*—*in video analysis*, the lines of spatial information of a video signal.

DISCUSSION—For interlaced video, a frame consists of two fields, one of odd lines and one of even lines, displayed in sequence. For progressive scan (non-interlaced) video, the frame is written through successive lines that start at the top left of the picture and finish at the bottom right.

*free space*, *n*—see **unallocated space**.

**frontal pose**, *n*—*in facial identification*, a facial image captured from directly in front of the subject with the focal plane approximately parallel to the plane of the subject's face.

**gallery**, *n*—*in facial identification*, a FR system's database, which typically contains all known-person biometric references (samples or templates, or both).

**gamut**, *n*—the portion of the colorspace that can be represented or reproduced by a device or process.

**Gaussian blur**, *n*—*in image and video analysis*, a function typically used to reduce image noise and detail using a specific mathematical function known as the "Gaussian Kernel" or "bell-curve."

**grayscale image, greyscale image**, *n*—an image encoded with a single channel or component.

**grayscale transformation, greyscale transformation**, *n*—operation that modifies a single channel or component of image data (for example, a single color).

**hash, hash value**, *n*—a string of numerical values used to substantiate the integrity of digital evidence or for inclusion/exclusion comparisons against known value sets or both.

**hashing function**, *n*—an established mathematical calculation that generates a numerical value based on input data.

**hidden data sector**, *n*—*in computer forensics*, a sector in the current configuration of a drive that cannot be accessed by read and write commands without changing the drive configuration.

DISCUSSION—Sectors in a host protected area would be hidden data sectors.

**histogram**, *n*—a graph of a frequency distribution in which rectangles with bases on the horizontal axis are given widths equal to the class intervals and heights equal to the corresponding frequencies.

DISCUSSION—In digital images, a histogram is frequently used to document the number of pixels of a given brightness value (for example, 0-255).

**holistic comparison**, *n*—*in facial identification*, a process of comparing faces by looking at the face as a whole and not the component parts in isolation.

**hot spot**, *n*—*in facial identification*, a bright area of light reflecting on a face that reduces the visibility of features.

**image**, *v*—*in computer forensics*, to create a bit stream duplicate of the original data.

**image**, *n*—(1) *in image and video analysis*, an imitation or representation of a person or thing drawn, painted, or photographed; (2) *in computer forensics*—see bit stream duplicate.

**image analysis**, *n*—the application of image science and domain expertise to examine and interpret the content of an image, the image itself, or both in legal matters.

**image averaging**, *n*—*in image and video analysis*, the process of averaging similar images, such as sequential video frames, to reduce noise in stationary scenes.

**image comparison, photographic comparison**, *n*—*in image analysis*, the process of comparing images of questioned objects or persons to known objects or persons or images thereof and making an assessment of the correspondence between features in these images for rendering an opinion regarding identification or elimination.

**image content analysis**, *n*—*in image analysis*, the drawing of conclusions about an image and targets for content analysis include, but are not limited to, the subjects/objects within an image; the conditions under which, or the process by which, the image was captured or created; the physical aspects of