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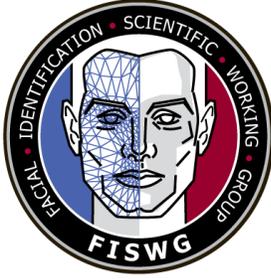
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Section 1

Glossary

ACE-V

Acronym for Analysis, Comparison, Evaluation - Verification.

Ad Hoc Image

See *Uncontrolled Image*.

AFR

Acronym for automated facial recognition.

Analysis

(1) The assessment of an image to determine suitability for comparison, including the ability to discriminate significant features. (2) The first step of the ACE-V method.

Anthropometric Analysis

Explicit measurement of landmarks on the face and a comparison of these measurements between two samples.

Aspect Ratio

Ratio of width to height. This can be specific to pixels or images.

Attempt

The submission of a single set of biometric samples to a biometric system for identification or verification. Some biometric systems permit more than one attempt to identify or verify an individual.

Backlight

A light source placed behind a subject in a controlled capture that reduces background shadows.

Batch Mode Search

A mode of searching in which a group of probes are simultaneously or sequentially launched. Such computer-resource intensive searches are usually performed during non-peak usage hours (e.g., nights or weekends). Also known as batch search mode.

Bias

See *Cognitive Bias*, *Confirmation Bias*, and *Contextual Bias*.

Binning

(1) Any technique used by a facial recognition (FR) system to organize or optimize searching based upon some piece(s) of metadata. (2) Process of parsing (examining) or classifying data in order to accelerate and/or improve biometric matching.

Biometric Match

A determination that two samples correspond to the same source based on some level of computer-evaluated similarity. Does not inherently imply that the probe and candidate are the same person.

Biometrics

A general term used alternatively to describe a characteristic or a process. (1) As a characteristic: a measurable biological (anatomical and physiological) and behavioral characteristic that can be used for automated recognition. (2) As a process: automated methods of recognizing an individual based on measurable biological (anatomical and physiological) and behavioral characteristics.

Capture

The process of collecting a biometric sample from an individual via a sensor.

Certification Authority

A body that issues a biometric document and certifies that the data stored on the document is genuine in a way that will enable detection of fraudulent alteration.

Class Characteristics

Characteristics common to many individuals (e.g., the overall shape of the nose, eyes, or mouth).

Cognitive Bias

(1) A mental error caused by one's simplified information processing strategies. It does not result from any emotional or intellectual predisposition toward a certain judgment, but rather from subconscious mental procedures for processing information. (2) A mental error that is consistent and predictable. (3) Influences that may affect the reliability and validity of one's observations and conclusions.

Comparison

(1) The observation of two or more faces to determine the existence of discrepancies, dissimilarities, or similarities. (2) The second step of the ACE-V method.

Compression

The process of reducing the size of a data file.

Conclusion

A reasoned deduction or inference.

Confirmation Bias

Tendency to search for data or interpret information in a manner that supports one's preconceptions.

Control

A sample or standard against which other conditions can be compared in a scientific experiment.

Controlled Image

An image captured in accordance with facial identification (FI) or facial recognition (FR) standards or guidelines (e.g., a driver's license photo).

CSI Effect

The perception of the near-infallibility of forensic science in response to popular media.

Digital Zoom

A digital camera function used to make the image seem more close up by cropping and enlarging a photo. Digital zoom could be misleading because it enlarges the image without adding extra details.

DMV

Acronym for Department of Motor Vehicles or Division of Motor Vehicles.

Enroll

The act of capturing a facial image, creating a template, and entering the template into a FR gallery.

Evaluation

(1) Ascertaining the value of dissimilarities and similarities between two facial images. (2) The third step of the ACE-V method, where an examiner assesses the value of the details observed during the analysis and comparison steps and reaches a conclusion.

EXIF

(1) Acronym for exchangeable image file format. (2) EXIF is a specification for the image file format used by some digital cameras to add image capture metadata to file formats such as JPEG, TIFF, and RIFF WAV.

Expression

Facial aspects resulting from muscle movement or position.

Face Detection

Automated determination of the locations and sizes of human faces in digital images.

Face Recognition**- In Automated Systems**

The automated searching of a facial image in a biometric database (one-to-many), typically resulting in a group of facial images ranked by computer-evaluated similarity.

- By Humans

The mental process by which an observer identifies a person as being one they have seen before.

Facial Examination

Formal systematic examination (e.g., ACE-V) of two images to determine if the same person is depicted in both.

Facial Identification

The manual examination of the differences and similarities between two facial images or a live subject and a facial image (one-to-one) for the purpose of determining if they represent the same person.

Facial Review

(1) The review of a FR system candidate list to identify a possible match. (2) One-to-one comparison (verification) conducted in a high-throughput environment (e.g., border crossing).

Facial Mapping

(1) The process of landmarking defined anthropological points. (2) A colloquial term often mistakenly used to describe facial comparison.

Facial Recognition

The automated searching of a facial image in a biometric database (one-to-many), typically resulting in a group of facial images ranked by computer-evaluated similarity.

Features

(1) Observable class or individual characteristics. (2) The components of biometric templates.

FI

Acronym for Facial Identification.

FR

Acronym for Facial Recognition.

Frontal Pose

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

The FR system's database, which typically contains all known-person templates.

Guideline

Recommended practice that allows some discretion or leeway in its interpretation, implementation, or use.

HDMI

(1) Acronym for High-Definition Multimedia Interface. (2) An audio/video interface for transmitting uncompressed digital data.

Histogram

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

Holistic Comparison

The process of comparing faces by looking at the face as a whole and not the component parts in isolation.

Hot Spots

Bright areas of light reflecting on a face that reduce visibility of features.

Identification

(1) A task where the biometric system searches a database for a reference matching a submitted biometric sample and, if found, returns a corresponding identity. (2) See *Individualization*.

Identity

Within a biometric system, the collective set of biographic data, images, and templates assigned to one person.

Individual Characteristics

Characteristics allowing one to differentiate between individuals having the same class characteristics (e.g., freckles, moles, and scars).

Individualization

The determination of an examiner that there is sufficient quality and quantity of detail in agreement to conclude that two images depict the same person.

Interpolation

A method of image processing whereby one pixel, block, or frame is stored based on the differences between the previous and subsequent pixel, block, or frame information (Encyclopedia of Photography, 3rd edition). This is often done to increase the apparent clarity of an image.

Known image

The image of an individual associated with a known or claimed identity and recorded electronically or by other medium (also known as exemplars).

Levels of Conclusion

A verbal or numeric scale that indicates the level of confidence regarding identification or exclusion of a subject.

Lights Out

An automated conclusion based upon threshold scores with no human involvement.

Lossless Compression

File size reduction process in which no data is lost and all data can be retrieved in its original form (e.g., TIF with LZW compression).

Lossy Compression

File size reduction process in which data is lost and cannot be retrieved in its original form (e.g., high-compression JPEG).

Match/Matching

See *Identification*.

Metadata

Non image-based information associated with an image file.

Morphological Analysis

The direct comparison of class and individual facial characteristics without explicit measurement.

Occlusion

The obscurrence of features (i.e., features blocked by sunglasses or objects in the environment, such as a tree).

Perspective

Camera to subject geometry, including both camera to subject distance and orientation of the camera relative to the subject.

Perspective Distortion

Warping or transformation introduced of an object's appearance in an image introduced by insufficient subject to camera distance (e.g., larger nose or smaller ears). Photographs made from a distance of less than two meters tend to introduce noticeable perspective distortion.

Photo-Anthropometry

The application of anthropometric analysis to images.

Photographic Comparison

An assessment of the correspondence between features in images and known objects or images for the purpose of rendering an expert opinion regarding identification, elimination, or a qualified conclusion (as opposed to a demonstrative exhibit).

Pitch

The rotation in degrees about the (horizontal) x-axis. Frontal poses have a pitch angle of 0 degrees. Positive angles represent faces looking down (a counter-clockwise rotation around the x-axis). (ISO/IEC 19794-5).

Pose

The orientation of the face with respect to the camera, consisting of pitch, roll, and yaw. Common poses are frontal and profile.

Probabilistic Model

Statistical analysis tool that estimates, on the basis of past (historical) data, the probability of an event occurring again.

Probe

The facial image or template searched against the gallery in an FR system.

Questioned image

The image of an individual whose identity is unknown or in question and has been recorded electronically or by other medium.

Raw

A digital camera or scanner file format, usually proprietary, for minimally processed digital image data.

Recognition

(1) See *Facial Recognition*. (2) See *Face Recognition*.

Registration

(1) Enrollment of an identity in an application using a biometric system. (2) The process by which two facial images are sized and aligned with each other for direct comparison.

Relative Frequency

How often facial features or combinations thereof occur in a given population.

Resolution

The act, process, or capability of distinguishing between two separate but adjacent elements of detail in an image. Resolution normally has three components: spatial (e.g., pixels per inch), spectral (e.g., number of colors), and radiometric (e.g., number of shades).

Roll

The rotation in degrees about the z-axis (the horizontal axis from front to back). Frontal poses have a roll angle of zero degrees. Positive angles represent faces tilted toward their right shoulder (counter-clockwise rotation around the z-axis). A roll angle of zero degrees denotes that the left and right eye centers have identical Y coordinates (ISO/IEC 19794-5).

SAP

Acronym for Subject Acquisition Profile.

Search

The act of comparing a probe against a gallery.

Search Result Set

The candidate list returned from a search.

Spoofing

In a biometric system, the process by which an imposter intentionally attempts to be recognized as another person or intentionally attempts to be missed as an existing identity in the gallery.

sRGB

(1) Acronym for standard red, green, and blue. (2) Standard default color space used for the Internet and for displaying or printing images.

Standard

Protocols established and recognized by the relevant community.

Subject Acquisition Profile

Facial image capture criteria described in ANSI/NIST-ITL 1-2007 (e.g., SAP Level 40 includes the requirement for 768 x 1024 pixels).

Superimposition

The use of a registered overlay as an aid to comparison.

System Bias

(1) Errors repeatedly introduced through automation (e.g., errors in template generation or comparison). (2) Errors repeatedly introduced through operational practices in an organization or unit (e.g., improper lighting or camera position guidance).

Template

A set of biometric measurement data prepared by an FR system from a facial image.

Third Party Imagery

Images utilized in FR or FI that were not captured by the agency performing the comparison (e.g., family snapshots of a missing person).

Uncontrolled Image

An image not captured in accordance with FI/FR standards or guidelines (e.g., a surveillance image).

Verification

(1) In a biometric system, the process of conducting a one-to-one comparison. (2) A review and independent analysis of the conclusion of another examiner. (3) The final step of the ACE-V method.

Yaw

The rotation in degrees about the y-axis (vertical axis). Frontal poses have a yaw angle of zero degrees. Positive angles represent faces looking to their left (a counter-clockwise rotation around the y-axis). (ISO/IEC 19794-5).

YUV422

A color space standard used by many digital video cameras.

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