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.

Designation: E3115 – 17 (Reapproved 2023)

An American National Standard

Standard Guide for Capturing Facial Images for Use with Facial Recognition Systems[1]

This standard is issued under the fixed designation E3115; 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 (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This guide is intended for use by practitioners who are choosing, setting up, and operating photographic equipment designed to capture facial images for use with an automated Facial Recognition System or used for manual comparisons by a trained facial examiner. This guide provides an overview of how to achieve the specifications defined in Annex E of ANSI/NIST-ITL-1-2011, Update 2015, for capturing facial images.

1.2 Annex E of ANSI/NIST-ITL-1-2011 defines a well-controlled capture environment and subject whereas this document will give guidance where tight controls in the capture environment and subject control cannot be achieved.

1.3 This guide addresses equipment considerations for two-dimensional (2D) conventional images. It does not address video, scanners, or three-dimensional (3D) capture.

1.4 The values stated in SI units are to be regarded as standard. The values given in parentheses are mathematical conversions to non-SI units that are provided for information only and are not considered standard.

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.6 *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 *ASTM Standards:*[2]

E2916 Terminology for Digital and Multimedia Evidence Examination

2.2 *Other Biometric Standards:*

ANSI/NIST-ITL-1-2011, Update 2015 Data Format for the Interchange of Fingerprint, Facial and Other Biometric Information[3]

NIST Special Publication 500-280v2 Mobile ID Device Best Practice Recommendation, Version 2.0[3]

3. Terminology

3.1 *Definitions:*

3.1.1 For terms relating to digital and multimedia evidence, refer to Terminology E2916.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *fish eye effect, n*—a type of distortion, where central objects of the image erroneously appear closer than those at the edge typically resulting in what appear to be unusually large noses in the image.

3.3 *Acronyms:*

3.3.1 *2D*—two-dimensional

3.3.2 *FR*—facial recognition

4. Significance and Use

4.1 The key factors that determine image quality for highly controlled facial images (for example: passports, police mugshots, drive motor vehicle, etc.) are well understood with respect to their use in automated FR systems and are a critical factor which directly affects the searching accuracy of the FR system.

[1] This guide 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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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

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

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4.2 Image quality also plays a major role in determining the extent to which a trained facial examiner is able to reach a conclusion as to whether two images containing faces are likely to be of the same person or not. This applies to either reviewing a FR system candidate result set or 1:1 image comparisons.

4.3 This guide provides guidance for the capture of facial images under controlled, semi-controlled, and uncontrolled scenarios for constraints which can be categorized into the following types of requirements:

4.3.1 *Scene,* refers to the content, subject and background in the image,

4.3.2 *Photographic,* refers to lighting, focus and other constraints required for image capture, and

4.3.3 *Digital,* refers to the conversion of the captured image into a digital record.

5. Scenarios

5.1 *Controlled Acquisition:*

5.1.1 This scenario is when all constraints can be controlled including equipment, the photographic environment (camera position, lighting, distance, background, and resolution), and the pose and positioning of the subject. The subject can be directed or positioned, the environment can be arranged to provide ideal illumination, and suitable equipment is available.

5.1.2 Referenced document ANSI/NIST-ITL-1-2011, Update 2015, Annex E, provides specifications on all aspects of controlled acquisition scenarios.

5.1.3 Annex A1 in this guide presents illustrative examples for controlled capture scenarios.

5.1.4 Fig. 1 provides an example of an optimal setting for a controlled capture environment. The selection and placement of the lighting addresses the following variables:

5.1.4.1 There is sufficient and uniform lighting to capture all visible skin characteristics (that is, blemishes, moles, marks, etc.).

5.1.4.2 To avoid hot spots and shadows on the subject's face.

5.1.4.3 The 0.3 m to 0.6 m (1 ft to 2 ft) distance (with or without a backlight) between the background and the subject is intended to reduce background shadows.

5.1.5 Fig. 2 provides examples of optimal facial images captured. Frontal, right, left, and three-quarter profile images should be captured as these provide additional value for examiners undertaking forensic comparison. The subject's head is positioned in the image as shown.

5.1.6 Automated image quality software is available from various commercial suppliers that can help to determine if the frontal image is captured as per the recommendations. However, in all cases, a manual check is advised as the software may not take into account all of the constraints.

5.2 *Semi-Controlled Acquisition:*

5.2.1 This scenario refers to when some, but not all, constraints can be controlled. Examples of this include passport photos not taken in a controlled environment, law enforcement mobile capture, crime scenes, access control, walk-through automated gates.

5.2.2 In a semi-controlled environment, the following constraints should be considered as a priority:

5.2.2.1 Illumination,

5.2.2.2 A single full frontal face with open eyes and neutral expression.

5.2.2.3 Elimination of convex lens distortion (subject should be more than 1 m (3 ft) from the camera),

5.2.2.4 Elimination of occlusions, and

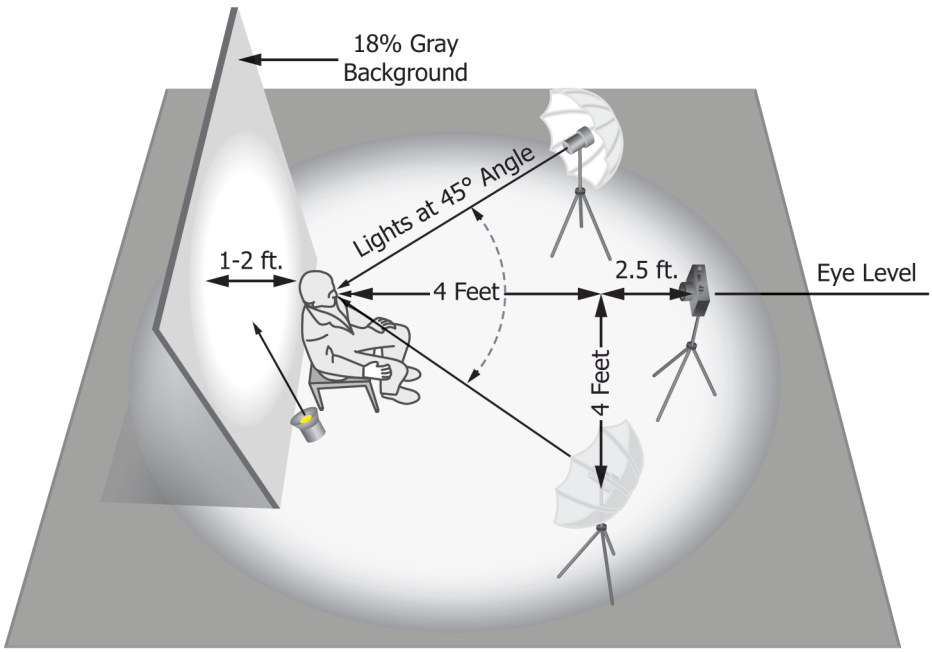

FIG. 1 Example of a Controlled Acquisition Environment

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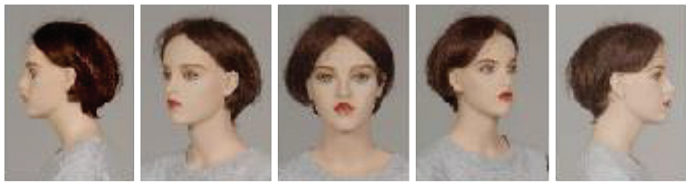

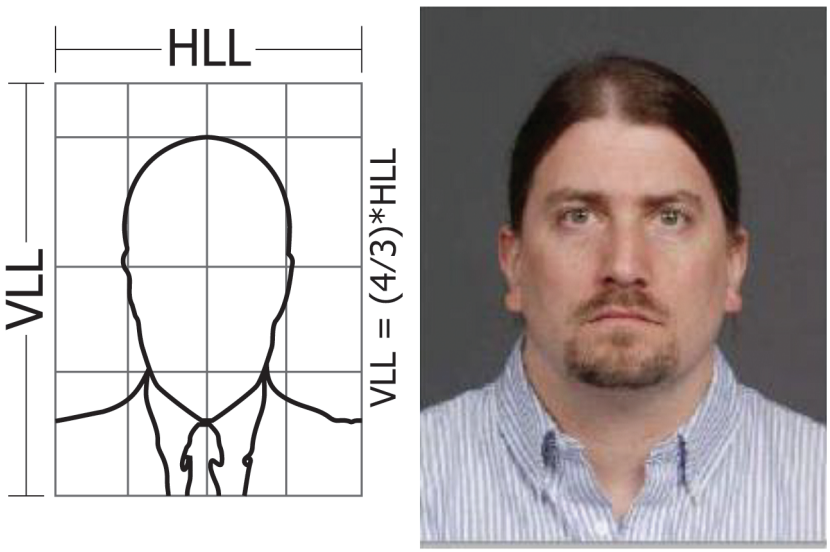

FIG. 2 Example Poses from a Controlled Acquisition Environment

5.2.2.5 Where available, multiple images should be captured to compensate for shortcomings in individual images.

5.3 *Uncontrolled Acquisition:*

5.3.1 This scenario refers to when neither the environment nor the subject can be controlled (for example, surveillance, hand held camera, body cameras, cell phones, etc.). It is characterized by high variations in quality and content and typically requires human review and specialized tools to identify and extract usable facial content. (See NIST Special Publication 500-280v2.)

5.3.2 In these situations, the person capturing the image should improvise to get the best image possible (see Fig. 3):

5.3.2.1 When appropriate, use a camera flash or additional lights source(s) to improve illumination,

5.3.2.2 Position the camera to get the best pose possible or provide a visual attractor to influence the pose,

5.3.2.3 A single full frontal face with open eyes,

5.3.2.4 Elimination of convex lens distortion (subject should be more than 1 m (3 ft) from the camera), and

5.3.2.5 In these uncontrolled scenarios, multiple images should be captured to compensate for shortcomings in individual images.

6. Keywords

6.1 capture equipment; facial image; facial recognition

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