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American National Standard

for Information Technology –

*Face Recognition Format
for Data Interchange*

Developed by



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INCITS 385-2004
(R2009)

American National Standard
for Information Technology –
**Face Recognition Format
for Data Interchange**

Secretariat

Information Technology Industry Council

Approved May 13, 2004

American National Standards Institute, Inc.

Abstract

This standard specifies definitions of photographic (environment, subject pose, focus, etc.) properties, digital image attributes and a face interchange format for relevant applications, including human examination and computer automated face recognition.

American National Standard

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Foreword (This foreword is not part of American National Standard ANSI INCITS 385-2004.)

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This document contains four informative annexes, all of which are not considered part of this standard.

Requests for interpretation, suggestions for improvement or addenda, or defect reports are welcome. They should be sent to InterNational Committee for Information Technology Standards (INCITS), ITI, 1250 Eye Street, NW, Suite 200, Washington, DC 20005.

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Introduction

Face images (also commonly referred to as *displayed portraits*) have been used for many decades to verify the validity of documents. The images used have evolved in some cases into standardized photographic formats.

Those digital images can now be used by many applications independently of how the data is stored or transmitted, including use by computer-automated face recognition applications.

Face recognition records can, in general, be used for human examination, computer identification (a one-to-many search), and computer verification (a one-to-one match).

This document contains specific definitions of photographic and digital image attributes, and specific coding formats for relevant applications, *including human examination and computer automated face recognition*.

The functional requirements that are addressed are:

- 1) A format shall be specified with sufficient resolution to allow a human examiner to ascertain small features such as moles and scars that might be used to verify identity.
- 2) Photographic (environment, subject pose, focus, etc.) properties of the face shall be specified for optimal one-to-many search identification using face recognition algorithms.
- 3) A face format shall be provided to satisfy requirements of a small storage footprint that can be used for both human and computer verification.
- 4) The records shall be in a common format that can be used with nonproprietary data readers and image display programs.
- 5) The records shall be interoperable by allowing different face recognition algorithms to undertake matching on the supplied electronic facial data.

Establishing standard formats of a facial image will:

- Allow interoperability among facial recognition vendors;
- Minimize the amount of data needed to be stored for interoperability;
- Facilitate the use of face information with applications that have limited storage;
- Encourage adoption of biometrics in applications where interoperability is vital;
- Ensure that enrolled images will meet a quality standard needed for face recognition;
- Improve system throughput by saving the intermediate data instead of the raw data.

American National Standard
for Information Technology –

Face Recognition Format for Data Interchange

Document Overview

Multiple **Face Image Types** are proposed to satisfy subsets of function requirements associated with face recognition applications briefly discussed in the Introduction:

- **Basic:** All face data types shall adhere to the properties of this fundamental type as it specifies the actual data storage format including header and image data format. Photographic (including lighting and pose) or resolution (size or scale) requirements have not been specified for basic images, for flexibility reasons.
- **Frontal:** A frontal image is a basic image that adheres to additional photographic requirements appropriate for frontal 2D face recognition and/or human examination. Two types of Frontal images are defined in this document, Full Frontal and Token Frontal (or simply Token).
- **Full Frontal:** This specifies minimal requirements of a grayscale or color face image with sufficient resolution for human examination as well as reliable computer face identification. The image will include the full head with all hair in most cases, as well as neck and shoulders. This image is suitable for permanent storage of the face information, and the minimum specifications are to be satisfied for passport, driver license, and “mugshot” images.
- **Token Frontal Image:** This is a grayscale or color face image with a specific geometric size and eye positioning based on the width and height of the image. The purpose of this image type is to minimize the storage requirements for computer face recognition tasks such as verification while still offering vendor independence and human verification (versus examination which requires more detail) capabilities.
- **Other:** This image type is reserved for Basic images that do not fall into the Frontal category.

As the face biometric field matures, additional data types may be added to this list through the standards process. For example, one might envision a texture and depth face data type that would allow for the interchange of information for so-called "3D" face recognition applications.




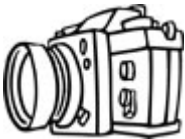



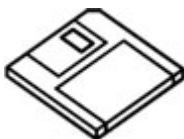

**Table 1 – Relationships between Facial Image Types
Using the Notion of Inheritance**

Face Data Format	Inherits From	Normative Clauses	Informative Annexes
Basic	None	1,2,3,4,5,6	None
Frontal	Basic	7	A
Full Frontal	Frontal	8	B
Token	Frontal	9	A3
Other	Basic	None	None

NOTE: An example of the relationships between Facial Image Types using the notion of inheritance is as follows: Frontal inherits properties from Basic, which means that all normative clauses that apply to Basic also apply to Frontal.

Up to 256x256 images can be stored in a single data record, for the purposes of video capture and processing and modern face recognition enrolment techniques.

For each Facial Image Type, four types of requirements are addressed: scene composition, photographic properties, digital properties, and the storage of captured information in a data format. The general overview of the requirements is shown in Figure 1.

Requirements			
Scene	Photographic	Digitization	Data Format
 Image and Subject	 Lighting  Positioning  Camera Attributes	 Digital Camera  Analogue to Digital  Image Scanning	 Digital Specifications  Record Format and Organization
<i>Clauses:</i> Basic Face None	<i>Clauses:</i> Basic Face None	<i>Clauses:</i> Basic Face None	<i>Clauses:</i> Basic Face 5 6.3 6.4
Frontal Face 7.2 Full Frontal Face 8.2	Frontal Face 7.3 Full Frontal Face 8.3	Frontal Face 7.4 Full Frontal Face 8.4 Token Face 9.2	Frontal Face 7.5 Full Frontal Face 8.5 Token Face 9.3

NOTE: The Basic Facial Image Type has no scene, photographic, or digitization requirements.

Figure 1 – The Types of Imaging Requirements Specified in this Document

1 Scope

This biometric data interchange format specification accommodates:

- 1) Detailed human examination of facial images
- 2) Human verification of identity by comparison of persons against facial images
- 3) Computer automated identification (one-to-many searches)
- 4) Computer automated verification (one-to-one searches)

This standard specifies the proposed record format.

The cryptographic protection of the biometrical data structures defined in this document is out of the scope of this standard.

2 Conformance

Systems claiming conformance with this standard shall be capable of encoding and decoding facial image data and the associated parameter data used in the transmitting and/or receiving of facial images as defined by this standard.

3 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this American National Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this American National Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

- NISTIR 6529-A, *Common Biometric Exchange Formats Framework*
- ISO/IEC 10918, *Information Technology – Digital Compression and Coding of Continuous-tone Still Images (JPEG) – Parts 1-4*
- ISO/IEC 15444, *Information Technology – JPEG 2000 Image Coding System – Parts 1-10*
- C-Cube Microsystems, *JPEG File Interchange Format (JFIF)*, Version 1.02
- Reference for CCIR, Recommendation 601 for Color Representations
- I3A IT10.7667-2002, *Photography – Electronic Still Picture Imaging – Extended sRGB Color Encoding – e-sRGB*