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Information technology — Computer graphics and image processing — Image Processing and Interchange (IPI) — Functional specification —

Part 3:
Image Interchange Facility (IIF)

Technologies de l'information — Infographie et traitement de l'image — Traitement de l'image et échange (IPI) — Spécification fonctionnelle —

Partie 3: Accessoires pour l'échange d'images (IIF)

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Annexes

Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees, established by the respective organization, to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

In the field of international technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

International Standard ISO/IEC 12087-3 was prepared by the Joint Technical Committee ISO/IEC JTC 1, *Information technology.*

ISO/IEC 12087 initially consists of three parts, under the general title *Information technology — Computer graphics and image processing — Image Processing and Interchange (IPI) — Functional specification*:

- *Part 1: Common architecture for imaging*
- *Part 2: Programmer's imaging kernel system application program interface*
- *Part 3: Image Interchange Facility (IIF)*

Annex A forms an integral part of this part of ISO/IEC 12087. Annexes B to G are for information only.

Introduction

ISO/IEC 12087-1 establishes the conceptual and architectural framework for ISO/IEC 12087. In particular, it defines the types of all image data objects, image-related data objects, and attributes that may be interchanged by means of the IPI-IIF.

ISO/IEC 12087-2 establishes the specification of the Programmer's Imaging Kernel System (IPI-PIKS).

ISO/IEC 12087-3 provides a data format specification and an application program interface specification. The IIF data format may be used for image data interchange in open, heterogeneous environments. It may also serve as a local file format for imaging applications, especially in conjunction with ISO/IEC 12087-2. In future, the IIF data format could be used by telecommunication standards. Examples are future versions of File Transfer, Access, and Management (FTAM), ISO/IEC 8571; the Message Oriented Text Interchange Systems (MOTIS), ISO/IEC 10021 (also known as Message Handling System (MHS), CCITT Recommendation X.400). Thus the IIF data format could become part of application-oriented OSI communications protocols.

Within the IIF data format (IIF-DF), compressed images may be specified and interchanged. For this purpose, the following standards are referenced:

- CCITT Recs. T.4 and T.6 (Facsimile)
- ISO/IEC 11544 (JBIG)
- ISO/IEC 10918 (JPEG)
- ISO/IEC 11172 (MPEG-1)

Image data streams that conform to the encoded representation of compressed image data specified by these standards may be included in the IIF-DF. For instance, a time series image can be represented as an array of time slices, each of which is encoded according to the JPEG Standard. Furthermore, the IIF-DF allows images to be represented through the combination of compressed parts with uncompressed parts. It is also possible to use multiple compression methods within a single IIF-DF-conformant image. For instance, a colour image can be represented as tiled images whereby some tiles are encoded according to the lossy mode of the JPEG Standard and others according to the lossless mode. For detailed information concerning compressed data streams and compression/decompression functionality, refer to 5.3.3 and 7.1.6, respectively.

There are various possibilities for interaction and data exchange between the IPI-PIKS domain and the IPI-IIF domain. Both domains are controlled by the application via application program interfaces (APIs). For a detailed description of the interworking between the IPI-PIKS and the IPI-IIF refer to clause 4 (the IPI-IIF architecture) and clause 7 (the IPI-IIF Gateway functionality). For a description of the relation between the types of objects that may be interchanged by means of the IPI-IIF and those types of objects that may be processed by the IPI-PIKS, refer to clause 6 (the profiles for the IIF data format). Refer also to ISO/IEC 12087-1.

Information technology — Computer graphics and image processing — Image Processing and Interchange (IPI) — Functional specification — Part 3:
Image Interchange Facility (IIF)

1 Scope

This part of ISO/IEC 12087 facilitates the interchange of digital images. For this purpose, conceptual, architectural, and functional definitions of the Image Interchange Facility (IPI-IIF) are established. ISO/IEC 12087-3 consists of two major parts, the:

a) IIF data format (IIF-DF) definition (by means of a formal syntax, described according to the Abstract Syntax Notation One (ASN.1) -- refer to clause 5), and the

b) IIF Gateway definition (by means of a manual page description of the functionality of an Application Program Interface (API) -- refer to clause 7).

An IPI-IIF-conformant implementation has to fulfill the functionality specification of the IIF Gateway, as outlined in clause 7. Besides the IIF Gateway, there may be information processing systems (software such as parsers, generators, etc.) which read and/or write the IIF-DF.

The IPI-IIF is based on the definitions described in ISO/IEC 12087-1, the "Common Architecture for Imaging". The IPI-IIF, as a whole, may be characterized briefly as follows:

c) By means of the IIF data format and Gateway, image data objects and image-related data objects are transported to and from application environments.

d) By means of the full PIKS profile of the IPI-IIF data format (i.e., a format for data interchange between IPI-IIF and IPI-PIKS), image data objects and image-related data objects are imported to and exported from the Programmer's Imaging Kernel System (IPI-PIKS), defined in ISO/IEC 12087-2.

e) The IPI-IIF facilitates the storage of image data objects and image-related data objects in a variety of pre-defined storage modalities, including different periodicity organizations, such as pixel-interleaving or band-interleaving.

f) This part of ISO/IEC 12087 defines syntax of image data (and image-related data) streams. The encoding of IIF data types is defined in ISO/IEC 12089. See also 5.3.3.

g) The IPI-IIF supports a concept of standardized conformance profiles. Initially, three conformance profiles are defined within ISO/IEC 12087.

h) An IIF data stream may be stored in devices such as file systems. An IIF data stream may be interchanged and communicated in data networks (e.g., LANs and WANs) or in other data communication facilities. All low-level data storage and transfer is delegated, for instance, to the operating system of the target hardware.

i) The IIF Gateway performs compression and decompression of image data objects using standardized compression and decompression techniques. These techniques are referenced in this part of ISO/IEC 12087. See 1.4.5 and 5.3.3 and 7.5 for further definition.

j) The IIF Gateway is accessible via an API to perform image interchange functions. See clause 7 for a definition of IIF Gateway functionality.

Reference shall be made to this part of ISO/IEC 12087, and its definitions shall be employed, whenever images are interchanged, according to the IPI-IIF, among different imaging applications environments or among imaging devices. The IPI-IIF is applicable to scenarios requiring the interchange of digital images, as outlined in Annex C.

The use of the IIF data format as a superset of the functionality of most of the existing image interchange formats solves the problem of application-independent syntactical and semantical interpretation and understanding of image data.

The IPI-IIF is applicable to image interchange in and among different application domains. The following application areas have been considered:

- Medical imaging
- Remote sensing
- Publishing
- Industrial vision
- Computer graphics arts
- Computer animation
- Scientific visualization
- Mission planning
- Document processing
- Outdoor scene surveillance

The limiting of the IPI-IIF scope to certain application domains is a matter of profiling. This is treated in clause 6.

NOTE - Whether an image interchange format may also be regarded as a device format, depends on the (local) processing power of the device itself. Thus a conceptually "high-level" format which has become an industrial standard page description language for desktop electronic publishing, can be regarded as a device format. The IPI-IIF may well be considered a device format if, for instance, there is an IPI-IIF-compatible printer which is able to receive, process, and hardcopy an image according to the IPI-IIF. In the same sense, it is reasonable to design IPI-IIF-compatible image sources, e.g. IPI-IIF camera systems.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO/IEC 12087. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO/IEC 12087 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 2022:1986, *Information processing - ISO 7-bit and 8-bit coded character sets - Code extension techniques.*

ISO/IEC 8613:1994, *Information processing systems - Text and office systems - Open Document Architecture (ODA) and Interchange Format (ODIF).*

ISO/IEC 8632:1992, *Information processing systems - Computer graphics - Metafile for the storage and transfer of picture description information.*

ISO/IEC 8824:1990, *Information technology - Open Systems Interconnection - Specification of Abstract Syntax Notation One (ASN.1).*

ISO/IEC 8825:1990, *Information technology - Open Systems Interconnection - Specification of Basic Encoding Rules for Abstract Syntax Notation One (ASN.1).*

ISO/IEC 8879:1986, *Information processing systems - Text and office systems - Standard Generalized Markup Language (SGML).*

ISO/IEC 9069:1988, *Information processing systems - SGML support facilities - SGML Document Interchange Format (SDIF).*

ISO/IEC TR 10000-1:1990, *Information technology - Framework and taxonomy of International Standardized Profiles - Part 1: Framework.*

ISO/IEC TR 10000-2:1994, *Information technology - Framework and taxonomy of International Standardized Profiles - Part 2: Principles and taxonomy for OSI Profiles.*

ISO/IEC 10031-1:1991, *Information technology - Text and office systems - Distributed office application model - Part 1: General model.*

ISO/IEC 10031-2:1991, *Information technology - Text and office systems - Distributed office application model - Part 2: Distinguished object reference and associated procedures.*

ISO/IEC 10918-1:1994, *Information technology - Digital compression and coding of continuous-tone still images - Part 1: Requirements and guidelines.*

ISO/IEC 10918-2: To be published., *Information technology - Digital compression and coding of continuous-tone still images - Part 2: Compliance testing.*

ISO/IEC 11172-1:1993, *Information technology - Coding of moving pictures and associated audio for digital storage media up to about 1,5 Mbit/s - Part 1: Systems.*

ISO/IEC 11172-2:1993, *Information technology - Coding of moving pictures and associated audio for digital storage media up to about 1,5 Mbit/s - Part 2: Video.*

ISO/IEC 11172-3:1993, *Information technology - Coding of moving pictures and associated audio for digital storage media up to about 1,5 Mbit/s - Part 3: Audio.*

ISO/IEC 11544:1993, *Information technology - Coded representation of picture and audio information - Progressive bi-level image compression.*

ISO/IEC 12087-1:1995, *Information technology - Computer graphics and image processing - Image Processing and Interchange (IPI) - Functional specification - Part 1: Common architecture for imaging.*

ISO/IEC 12089:—[1], *Information technology - Computer graphics and image processing - Encoding for the Image Processing and Interchange Standard (IPI) - Encoding for the Image Interchange Facility (IIF).*

CCITT Rec. G.711(1984), *Coding of analogue signals by pulse code modulation.*

CCITT Rec. G.721(1984), *32 Kbit/s Adaptive Differential Pulse Code Modulation (ADPCM).*

CCITT Rec. T.4(1988), *Standardization of Group 3 Facsimile Apparatus for Document Transmission.*

CCITT Rec. T.6(1988), *Facsimile Coding Schemes and Coding Control Functions for Group 4 Facsimile Apparatus.*

CCITT Rec. T.30(1988), *Procedures for Document Facsimile Transmission in the General Switched Telephone Network.*

NOTES

1 All normative references which are common to Parts 1 to 3 of ISO/IEC 12087 are included in ISO/IEC 12087-1. In ISO/IEC 12087-3, only the IIF-specific references are listed.

2 References to documents which are neither ISO/IEC Standards nor CCITT Recommendations are given in Annex G.

3 Some ISO Standards are technically aligned with CCITT Recommendations, in particular the ASN.1 Standard (ISO Standards 8824/8825 and CCITT Recs. X.208/X.209). The differences between the International Standard definitions and the CCITT definitions are quite small, and should not affect interoperability between implementations written against either document. Within this part of ISO/IEC 12087, the ISO Standards are referenced whenever possible.

1) To be published.