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

Part 1:
Common architecture for imaging

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

Partie 1: Architecture commune pour l'image

Reference number
ISO/IEC 12087-1:1995(E)

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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 information 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 12087-1 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 24, *Computer graphics and image processing*.

ISO/IEC 12087 consists of the following 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 programme interface*

— *Part 3: Image Interchange Facility (IIF)*

Annexes A to D form an integral part of this part of ISO/IEC 12087. Annex E is for information only.

Introduction

The processing of images is a requirement of many application areas of information processing. Early work in these areas led to the development of many application program interfaces and a large number of image representations for interchange. The purpose of ISO/IEC 12087 is to provide an application program interface and an image interchange representation in order to increase the portability of application software.

ISO/IEC 12087 provides an architectural model for the representation and manipulation of images in a digital form. Based on this model, it defines an application program interface and an image interchange format. It is applicable to all application areas that involve the processing, manipulation, or transfer of image data.

ISO/IEC 12087 includes notes and exemplary material. Such material is non-normative: it is included solely to aid understanding and does not form part of ISO/IEC 12087.

ISO/IEC 12087 initially comprises three parts:

1 *Common architecture for imaging*, which describes the common architectural material on which the entire Standard is based;

2 *Programmer's imaging kernel system application program interface*, which defines processing operations to be carried out on image data;

3 *Image Interchange Facility (IIF)*, which defines how images may be interchanged between application programs.

Information may be interchanged between the application program, Programmer's Imaging Kernel System (IPI-PIKS), and Image Interchange Facility (IPI-IIF) (see figure). Data paths between all three components are standardized in ISO/IEC 12087, as indicated by the solid lines; however, it is also permitted that implementations may use private, implementation-dependent data paths, shown by dashed lines; such data paths are outside the scope of ISO/IEC 12087.

There are a great many types of application that involve the use of images. The Computer Graphics Reference Model [ISO 11072] identifies six main function classes (see figure 0.1):

image analysis — transformation of digital images to image and non-image data; this encompasses basic functions such as histogram generation, mean value determination, image classification, *etc.*, but does not include image understanding using artificial intelligence techniques.

image interpretation — the process of inferring symbolic scene descriptions from image data.

image presentation — transformation of image data to a form suitable for an observer; *e.g.*, via video monitors, printers, film recorders, *etc.*

image processing — transformation of digital images to digital images; *e.g.*, grey value contrast enhancement, edge detection, *etc.*

image sensing — transformation of real-world information to digital images; *e.g.*, via cameras, optical scanners, *etc.*

image synthesis — transformation of non-image data to image data; this encompasses functions such as the rendering of lines, creation of test images, simulation of sensor functions, letters of graphical text and symbols, *etc.*

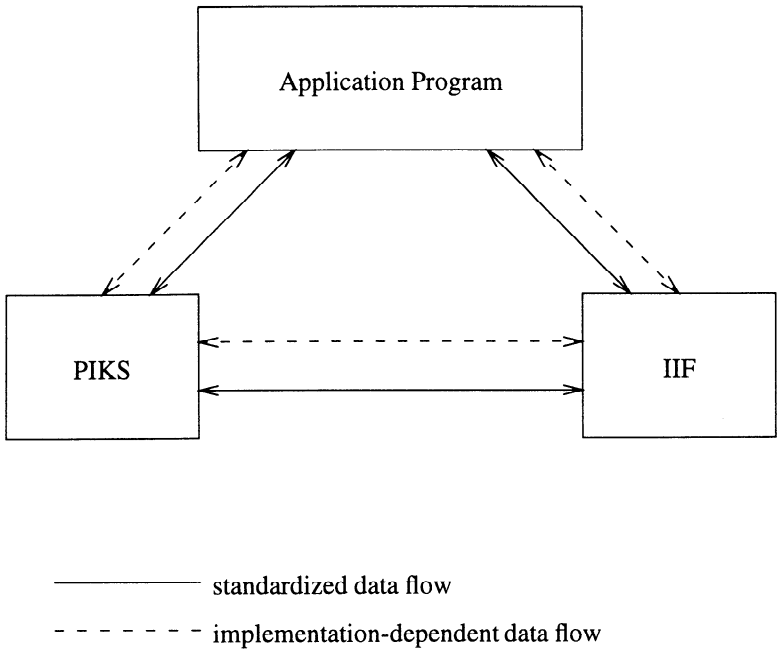

Figure 0.1 — Data flow between the application program, IPI-PIKS, and IPI-IIF

As figure indicates, all these function classes involve the manipulation of a digital image; some function classes also require information that is related to the data contained in the digital image but is itself non-image in nature. This *image-related* information is essential to many of the common operations performed on digital images and is therefore also described by ISO/IEC 12087.

ISO/IEC 12087 is also concerned with *image interchange,* the interchange of digital images among imaging applications; this serves for the communication of image data and related non-image data among imaging applications.

The term 'digital image' used in [ISO 11072] is synonymous with the term 'image' as used in ISO/IEC 12087. It is important to realize the distinction between 'image' (or 'digital image') as used in ISO/IEC 12087 and the term 'image' as it may be used colloquially: in ISO/IEC 12087, 'image' (or 'digital image') refers to a particular representation of image data within a computer system. An image may not be viewed directly. To view an image, an explicit presentation step is involved, as figure indicates. Image data that are in a form suitable for viewing by an observer are termed 'presentable' image data in ISO/IEC 12087.

NOTE 1 Some application areas, which might loosely be termed "image understanding," utilize data derived from an image by means of some analysis; such applications are therefore omitted from this ISO/IEC 12087. However, ISO/IEC 12087 may be used by such applications.

This part of ISO/IEC 12087 fulfills the following purposes:

a) It provides an overview of ISO/IEC 12087;

b) It defines a Common Architecture for Imaging, an abstract architectural model for the representation

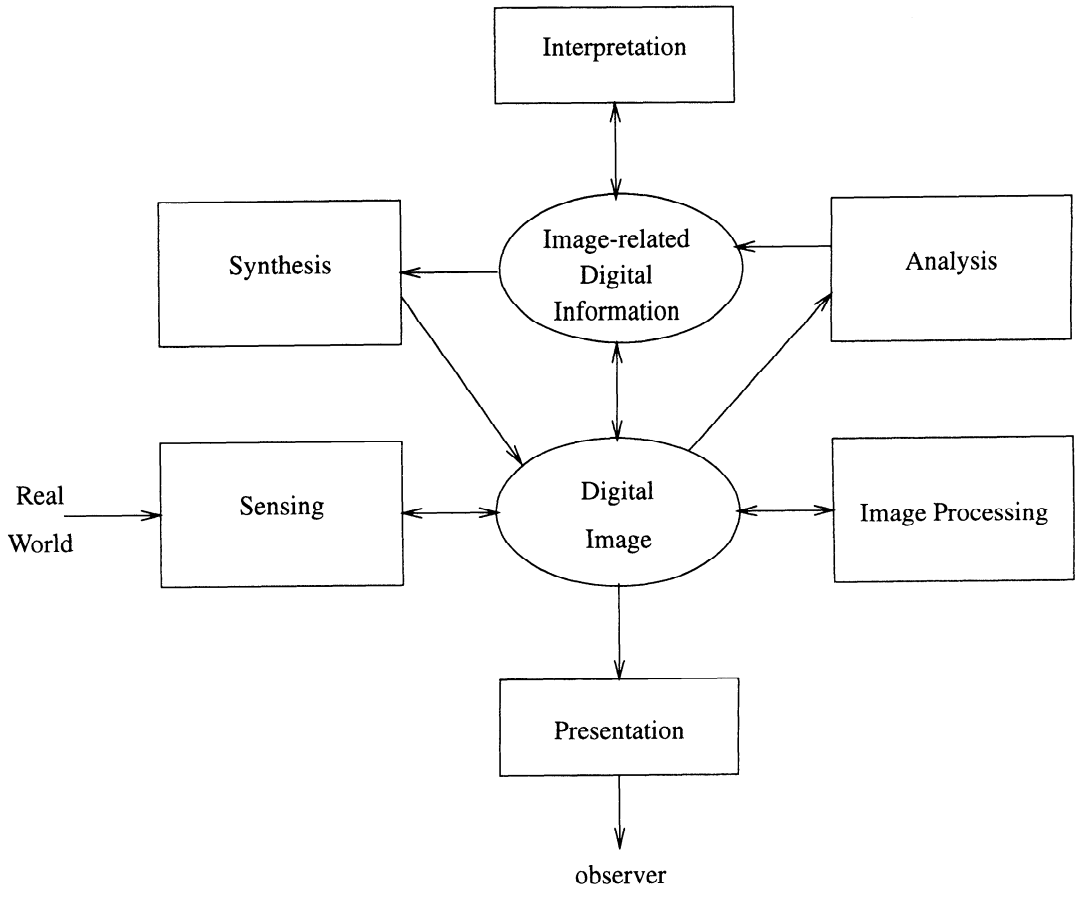

Figure 0.2 — Classes of operations on images

and processing of image data. The purpose of this model is to define a common set of data types and a common image representation for use with all other parts of ISO/IEC 12087 and to provide a standardized framework upon which future imaging standards may be built, allowing simplified conversion of existing applications to the new standard.

c) It defines rules to which conforming implementations shall adhere and the mechanism by which conformance is achieved.

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

Part 1:

Common architecture for imaging

1 Scope

ISO/IEC 12087 is concerned with the manipulation, processing, and interchange of all types of digital images. The main purpose of this part is to define a generic, unifying imaging architecture to which other parts of ISO/IEC 12087 conform. This part of ISO/IEC 12087 also defines those "specializations" or "delineations" of the generic imaging architecture that are required to support IPI-PIKS and IPI-IIF.

The relationship of the different parts of ISO/IEC 12087 is shown in figure 1. This part of ISO/IEC 12087 describes material that applies throughout ISO/IEC 12087, including topics such as data types available for use in image data and image-related data, and a model for the processing of digital images by operators. These topics are presented in a general form, since it is intended that subsequent imaging standards will conform to the same architectural model.

Derived from this general description are more constrained descriptions of the same topics. The principal reason for this process of delineation is to restrict the range of data representations for IPI-PIKS and IPI-IIF, while simultaneously ensuring that IPI-IIF is capable of interchanging both IPI-PIKS data objects and objects that cannot be represented or manipulated within IPI-PIKS.

ISO/IEC 12087 permits multiple Application Program Interface (API)s to be developed, each of which must be

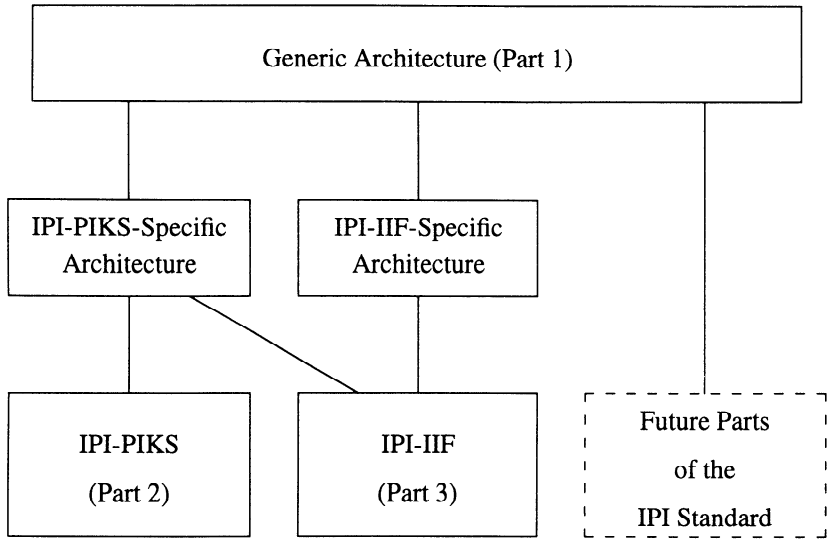

Figure 1 — Relationship of the parts of ISO/IEC 12087

based on specific delineations of the imaging model described herein. Each API will be specified in a separate part of ISO/IEC 12087. Any subsequent APIs developed as part of ISO/IEC 12087 must conform to the common architecture described in this document, and must be extensions of the APIs described in ISO/IEC 12087-2 and ISO/IEC 12087-3.

ISO/IEC 12087 is intended for use in a wide variety of environments where digital images are handled.

NOTE 2 Application areas that are addressed by Image Processing and Interchange (IPI) include: image manipulation; image enhancement; image analysis; and image transport. Application areas that are not addressed by IPI include: computer graphics; image understanding; multimedia; device control; and window systems.

ISO/IEC 12087 is intended to conform with other International Standards developed to handle digital images. Such standards include the JPEG [ISO/IEC 10918-1:1994], and MPEG [ISO/IEC 11172-1:1993] compression standards, Open Systems Interconnect [ISO/IEC 8824:1990], and Office Document Architecture [ISO/IEC 8613]. Those aspects of ISO/IEC 12087 that are concerned with the acquisition and display of digital images conform with the Computer Graphics Reference Model [ISO 11072]. Furthermore, annex B of [ISO 11072] describes how imaging fits within the general framework of that model. ISO/IEC 12087-3 uses Abstract Syntax Notation 1 [ISO/IEC 8824:1990] in the definition of the image interchange format.

ISO/IEC 12087 complies directly with all standards listed in clause 2.

2 Normative References

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

ISO/IEC 646:1991, *Information technology, ISO 7-bit coded character set for information interchange.*

ISO/IEC 8613:1989, *Information processing — Text and office systems — Office Document Architecture (ODA) and interchange format.*

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 9973:1994, *Information technology, Computer graphics and image processing — Procedures for registration of graphical items.*

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

ISO/IEC 11072:1992, *Information technology — Computer graphics — Computer Graphics Reference Model.*

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.*

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