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Information technology — JPEG Systems —

Part 1: Packaging of information using codestreams and file formats

Technologies de l'information — Systèmes JPEG —

Partie 1: Emballage des informations utilisant les flux de codes et les formats de fichier

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ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

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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.

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The committee responsible for this document is ISO/IEC JTC 1, *Information technology*, Subcommittee SC 29, *Coding of audio, picture, multimedia and hypermedia information*.

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Introduction

This part of ISO/TR 19566 provides an overview for users of ISO/IEC standards in the use of common JPEG syntax elements at the systems layer for current and future International Standards developed by ISO/IEC.

With the development of coding technologies, ISO/IEC has defined a number of different file formats and multiple variants of codestream syntax. Many of these are specialized to dedicated use cases or compression algorithms. Consequently, it is difficult to maintain an overview about existing file formats, their capabilities and their architectures.

This part of ISO/TR 19566 aims to describe common architectural concepts for file formats and codestream formats. By these means, it lays out guidelines for future file formats and codestream syntax. By observing these guidelines, future International Standards may fit into an overall operable Systems infrastructure that can handle all tools standardized by the ISO/IEC body.

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Information technology — JPEG Systems —

Part 1: Packaging of information using codestreams and file formats

1 Scope

This part of ISO/TR 19566 describes common elements of a system layer for JPEG standards, referred to as JPEG Systems.

This part of ISO/TR 19566 describes the common architecture of file formats and codestream formats used in JPEG standards. It is intended that all future Systems components support codestreams and file formats following these guidelines.

2 Terms, definitions, abbreviated terms and symbols

2.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

2.1.1
backward compatibility
inclusive of the old specification within the new specification

Note 1 to entry: Any devices implementing the new standard can also interpret all data compliant with the old version of the standard. However, an old device only compliant with the old version of the standard might not be able to interpret the data compliant with the new version of the standard.

2.1.2
bit stream
partially encoded or decoded sequence of bits comprising an entropy-coded segment

2.1.3
box
structured collection of data describing the image or the image decoding process

Note 1 to entry: See B.2 for the definition of boxes.

2.1.4
box-based file format
file format whose composing elements are well-defined, hierarchically structured boxes

2.1.5
byte
group of 8 bits

2.1.6
coder
embodiment of a coding process

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2.1.7
coding
umbrella term that defines both the encoding/compression of a signal as well as the decoding/decompression of a signal

2.1.8
coding model
procedure used to convert input data into symbols to be coded

2.1.9
coding process
process which transforms compressed data into a continuous-tone image and/or a continuous-tone image into its compressed representation

Note 1 to entry: It presents thus an umbrella term for “encoding process” and “decoding process”.

2.1.10
compression
reduction in the number of bits used to represent source image data

2.1.11
component
two-dimensional array of samples having the same designation in the output or display device

Note 1 to entry: An image typically consists of several components, for example, red, green and blue.

2.1.12
continuous-tone image
image whose components have more than one bit per sample

2.1.13
decoder
embodiment of a decoding process

3.1.14
decoding process
process which takes as its input compressed image data and outputs a continuous-tone image

2.1.15
dequantization
inverse procedure to quantization by which the decoder recovers a representation of the DCT coefficients

2.1.16
downsampling
procedure by which the spatial resolution of a component is reduced

2.1.17
encoder
embodiment of an encoding process

2.1.18
encoding process
process which takes as its input a continuous-tone image and outputs compressed image data

2.1.19
entropy-coded (data) segment
independently decodable sequence of entropy encoded bytes of compressed image data

2.1.20
entropy decoder
embodiment of an entropy decoding procedure

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2.1.21
entropy decoding
lossless procedure which recovers the sequence of symbols from the sequence of bits produced by the entropy encoder

2.1.22
entropy encoder
embodiment of an entropy encoding procedure

2.1.23
entropy encoding
lossless procedure which converts a sequence of input symbols into a sequence of bits such that the average number of bits per symbol approaches the entropy of the input symbols

2.1.24
forward compatibility
only compliant with the old specification but able to interpret the new specification

Note 1 to entry: Although devices only compliant with the old version of the standard are nevertheless able to interpret the data conforming with the new standard, it is possible that the obtained results are not as good as when using a device compliant with the new version of the standard.

2.1.25
grayscale image
continuous-tone image that has only one component

2.1.26
high dynamic range
image or image data comprised of more than eight bits per sample, coded in floating point representation

2.1.27
intermediate dynamic range
image or image data comprised of more than eight bits per sample

2.1.28
Joint Photographic Experts Group
JPEG
informal name of the committee which created this part of ISO/TR 19566

2.1.29
JPEG standards
collection of ISO/IEC/ITU standards developed by the Joint Photographic Experts Group for still imaging application as listed in the Bibliography

2.1.30
JPEG Systems
common elements of a system layer for JPEG standards

2.1.31
lossless
descriptive term for encoding and decoding processes and procedures in which the output of the decoding procedure(s) is identical to the input to the encoding procedure(s)

2.1.32
lossless coding
mode of operation which refers to any one of the coding processes defined in this part of ISO/TR 19566 in which all of the procedures are lossless

2.1.33
lossy
descriptive term for encoding and decoding processes which are not lossless

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2.1.34
low-dynamic range
image or image data comprised of data with no more than eight bits per sample

2.1.35
marker
two-byte code in which the first byte is hexadecimal FF and the second byte is a value between 1 and hexadecimal FE

2.1.36
marker segment
marker together with its associated set of parameters

2.1.37
metadata
additional data associated with the image data beyond the image data

2.1.38
minimum coded unit
MCU
smallest group of data units that is coded

2.1.39
pixel
collection of sample values in the spatial image domain having all the same sample coordinates

EXAMPLE A pixel may consist of three samples describing its red, green and blue value.

2.1.40
point transform
scaling of a sample or DCT coefficient by a factor

2.1.41
precision
number of bits allocated to a particular sample or DCT coefficient

2.1.42
procedure
set of steps which accomplishes one of the tasks which comprise an encoding or decoding process

2.1.43
quantization value
integer value used in the quantization procedure

2.1.44
quantize
act of performing the quantization procedure for a DCT coefficient

2.1.45
sample
one element in the two-dimensional image array which comprises a component

2.1.46
sample grid
common coordinate system for all samples of an image

Note 1 to entry: The samples at the top left edge of the image have the coordinates (0,0), the first coordinate increases towards the right, the second towards the bottom.

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2.1.47
table specification data
coded representation from which the tables used in the encoder and decoder are generated and their destinations specified

2.1.48
(uniform) quantization
procedure by which DCT coefficients are linearly scaled in order to achieve compression

2.1.49
upsampling
procedure by which the spatial resolution of a component is increased

2.1.50
vertical sampling factor
relative number of vertical data units of a particular component with respect to the number of vertical data units in the other components in the frame

2.1.51
zero byte
0x00 byte

2.2 Symbols

X width of the sample grid in positions

Y height of the sample grid in positions

Nf number of components in an image

$s_{i,x}$ subsampling factor of component i in horizontal direction

$s_{i,y}$ subsampling factor of component i in vertical direction

2.3 Abbreviated terms

For the purposes of this document, the following abbreviated terms apply.

API Application Programming Interface

AR Augmented Reality

ASCII American Standard Code for Information Interchange

DCT Discrete Cosine Transformation

EXIF Exchangeable Image File Format

HDR High Dynamic Range

IDR Intermediate Dynamic Range

JBIG Joint Bi-level Image experts Group

JFIF JPEG File Interchange Format

JP2 JPEG 2000 file format

JPEG Joint Photographic Experts Group

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