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Information technology — JPEG 2000 image coding system: Core coding system

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

This third edition cancels and replaces the second edition of ISO/IEC 15444-1:2004 which has been technically revised. It also incorporates ISO/IEC 15444-1:2004/Cor.1:2007, ISO/IEC 15444-1:2004/Cor.2:2008, ISO/IEC 15444-1:2004/Cor.3:2015, ISO/IEC 15444-1:2004/Cor.4:2015, ISO/IEC 15444-1:2004/Amd.1:2006, ISO/IEC 15444-1:2004/Amd.2:2009, ISO/IEC 15444-1:2004/Amd.3:2010, ISO/IEC 15444-1:2004/Amd.4:2013, ISO/IEC 15444-1:2004/Amd.5:2013, ISO/IEC 15444-1:2004/Amd.6:2013, ISO/IEC 15444-1:2004/Amd.7:2015 and ISO/IEC 15444-1:2004/Amd.8:2015.

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INTERNATIONAL STANDARD
ITU-T RECOMMENDATION

Information technology – JPEG 2000 image coding system: Core coding system

1 Scope

This Recommendation | International Standard defines a set of lossless (bit-preserving) and lossy compression methods for coding bi-level, continuous-tone grey-scale, palletized colour, or continuous-tone colour digital still images.

This Recommendation | International Standard:

- specifies decoding processes for converting compressed image data to reconstructed image data;
- specifies a codestream syntax containing information for interpreting the compressed image data;
- specifies a file format;
- provides guidance on encoding processes for converting source image data to compressed image data;
- provides guidance on how to implement these processes in practice.

NOTE – As this specification was first published as common text only after ISO/IEC JTC1 had approved the first edition in 2000, edition numbers in the ITU and ISO/IEC versions are offset by one. This is the second edition of ITU-T T.800 and the third edition of ISO/IEC 15444-1.

2 References

The following Recommendations and International Standards contain provisions which, through reference in this text, constitute provisions of this Recommendation | International Standard. At the time of publication, the editions indicated were valid. All Recommendations and Standards are subject to revision, and parties to agreements based on this Recommendation | International Standard are encouraged to investigate the possibility of applying the most recent edition of the Recommendations and Standards listed below. Members of IEC and ISO maintain registers of currently valid International Standards. The Telecommunication Standardization Bureau of the ITU maintains a list of currently valid ITU-T Recommendations.

2.1 Identical Recommendations | International Standards

- Recommendation ITU-T T.81 (1992) | ISO/IEC 10918-1:1994, *Information technology – Digital compression and coding of continuous-tone still images: Requirements and guidelines*.
- Recommendation ITU-T T.84 (1996) | ISO/IEC 10918-3:1997, *Information technology – Digital compression and coding of continuous-tone still images: Extensions*.
- Recommendation ITU-T T.84 (1996)/Amd.1 (1999) | ISO/IEC 10918-3:1997/Amd.1:1999, *Information technology – Digital compression and coding of continuous-tone still images: Extensions – Amendment 1: Provisions to allow registration of new compression types and versions in the SPIFF header*.
- Recommendation ITU-T T.86 (1998) | ISO/IEC 10918-4:1999, *Information technology – Digital compression and coding of continuous-tone still images: Registration of JPEG Profiles, SPIFF Profiles, SPIFF Tags, SPIFF colour Spaces, APPn Markers, SPIFF Compression types and Registration Authorities (REGAUT)*.
- Recommendation ITU-T T.87 (1998) | ISO/IEC 14495-1:2000, *Lossless and near-lossless compression of continuous-tone still images – Baseline*.
- Recommendation ITU-T T.88 (2000) | ISO/IEC 14492:2001, *Information technology – Lossy/lossless coding of bi-level images*.
- Recommendation ITU-T T.810 (2006) | ISO/IEC 15444-11:2007, *Information technology – JPEG 2000 image coding system: Wireless*.
- ISO/IEC 646:1991, *Information technology – ISO 7-bit coded character set for information interchange*.
- ISO 8859-15:1999, *Information technology – 8-bit single-byte coded graphic character sets – Part 15: Latin alphabet No. 9*.

2.2 Additional references

- Recommendation ITU-R BT.601-6 (2007), *Studio encoding parameters of digital television for standard 4:3 and wide screen 16:9 aspect ratios*.

- Recommendation ITU-R BT.709-5 (2002), *Parameter values for the HDTV standards for production and international programme exchange*.
- IEC 61966-2-1:1999, *Multimedia systems and equipment – Colour measurement and management – Part 2-1: Colour management – Default RGB colour space – sRGB*.
- IEC 61966-2-1:1999/Amd.1:2003, *Multimedia systems and equipment – Colour measurement and management – Part 2-1: Colour management – Default RGB colour space – sRGB*.
- IETF RFC 2279 (1998), UTF-8, *a transformation format of ISO 10646*.
- ISO 11664-1:2007 (CIE S 014-1/E:2006), *Colorimetry – Part 1: CIE standard colorimetric observers*.
- ISO 14721, *Space data and information transfer systems – Open archival information system – Reference model*.
- ISO 15076-1, *Image technology colour management – Architecture, profile format and data structure – Part 1: Based on ICC.1:2010*.
- ISO 26428-1:2008, *Digital cinema (D-cinema) distribution master – Part 1: Image characteristics*.
- ISO/IEC 11578:1996, *Information technology – Open Systems Interconnection – Remote Procedure Call*.

3 Definitions

For the purposes of this Recommendation | International Standard, the following definitions apply.

3.1 $\lfloor x \rfloor$, **floor function**: This indicates the largest integer not exceeding x.

3.2 $\lceil x \rceil$, **ceiling function**: This indicates the smallest integer not exceeded by x.

3.3 **5-3 reversible filter**: A particular filter pair used in the wavelet transformation. This reversible filter pair has 5 taps in the low-pass and 3 taps in the high-pass.

3.4 **9-7 irreversible filter**: A particular filter pair used in the wavelet transformation. This irreversible filter pair has 9 taps in the low-pass and 7 taps in the high-pass.

3.5 **access unit**: A coded representation of one video frame.

3.6 **AND**: Bit wise AND logical operator.

3.7 **arithmetic coder**: An entropy coder that converts variable length strings to variable length codes (encoding) and vice versa (decoding).

3.8 **auxiliary channel**: A channel that is used by the application outside the scope of colourspace conversion. For example, an opacity channel or a depth channel would be an auxiliary channel.

3.9 **bit**: A contraction of the term "binary digit"; a unit of information represented by a zero or a one.

3.10 **bit-plane**: A two dimensional array of bits. In this Recommendation | International Standard a bit-plane refers to all the bits of the same magnitude in all coefficients or samples. This could refer to a bit-plane in a component, tile-component, code-block, region of interest, or other.

3.11 **bit stream**: The actual sequence of bits resulting from the coding of a sequence of symbols. It does not include the markers or marker segments in the main and tile-part headers or the EOC marker. It does include any packet headers and in-stream markers and marker segments not found within the main or tile-part headers.

3.12 **big-endian**: The bits of a value representation occur in order from the most significant to the least significant.

3.13 **box**: A portion of the file format defined by a length and unique box type. Boxes of some types may contain other boxes.

3.14 **box contents**: Refers to the data wrapped within the box structure. The contents of a particular box are stored within the DBox field within the box data structure.

3.15 **box type**: Specifies the kind of information that shall be stored with the box. The type of a particular box is stored within the TBox field within the box data structure.

3.16 **byte**: Eight bits.

3.17 **channel**: One logical component of the image. A channel may be a direct representation of one component from the codestream, or may be generated by the application of a palette to a component from the codestream.