

This is a preview - [click here to buy the full publication](#)

INTERNATIONAL STANDARD

ISO/IEC 14495-2

Second edition
2003-04-01

Information technology — Lossless and near-lossless compression of continuous-tone still images: Extensions

*Technologies de l'information — Compression sans perte et quasi sans
perte d'images fixes à modelé continu: Extensions*



Reference number
ISO/IEC 14495-2:2003(E)

© ISO/IEC 2003

PDF disclaimer

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

© ISO/IEC 2003

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

CONTENTS

	<i>Page</i>
1 Scope	1
2 Normative references	1
2.1 Identical Recommendations International Standards	1
2.2 Additional references	1
3 Definitions, abbreviations, symbols and conventions	2
3.1 Definitions.....	2
3.2 Abbreviations	2
3.3 Symbols.....	2
4 General	3
4.1 Extensions specified by this Recommendation International Standard	4
4.1.1 Encoding with arithmetic coding	4
4.1.2 Extension of near-lossless coding	4
4.1.3 Extension of prediction	5
4.1.4 Extension of Golomb coding	5
4.1.5 Fixed length coding.....	5
4.1.6 Sample transformation for inverse colour transforms	5
4.2 Descriptions of extended functions	5
5 Interchange format requirements.....	6
6 Encoder requirements.....	6
7 Decoder requirements.....	6
8 Conformance testing for extensions	7
8.1 Purpose.....	7
8.2 Encoder conformance tests.....	7
8.3 Decoder conformance tests	7
Annex A – Encoding procedures with arithmetic coding for a single component.....	10
A.1 Coding parameters and compressed image data.....	10
A.2 Initializations and conventions.....	10
A.2.1 Initializations.....	10
A.2.2 Conventions for figures.....	12
A.3 Context determination	12
A.3.1 Local gradient computation.....	12
A.3.2 Flat region detection.....	13
A.3.3 Local gradient quantization.....	13
A.3.4 Quantized gradient merging	14
A.3.5 Adjustment of error tolerance for near-lossless coding with visual quantization.....	14
A.4 Prediction	14
A.4.1 Edge-detecting predictor	14
A.4.2 Prediction correction.....	14
A.4.3 Computation of prediction error.....	15
A.4.4 Error quantization for near-lossless coding, and reconstructed value computation	16
A.4.5 Modulo reduction of the prediction error	16
A.5 Prediction error encoding	16
A.5.1 Error mapping	17
A.5.2 Binarization of MErrval with the Golomb code tree.....	17
A.5.3 Mapped-error encoding	18
A.6 Update variables.....	18
A.6.1 Update	18
A.6.2 Bias computation.....	21
A.7 Flow of encoding procedures	22

	<i>Page</i>
Annex B – Arithmetic coding.....	24
B.1 Arithmetic encoding procedures	24
B.1.1 Binary arithmetic encoding principles	24
B.1.2 Procedures of arithmetic coding.....	25
B.2 Arithmetic decoding procedures	28
B.2.1 Binary arithmetic decoding principles	28
B.2.2 Procedures of arithmetic decoding.....	28
Annex C – Encoding with arithmetic coding for multiple component images	30
C.1 Introduction.....	30
C.2 Line interleaved mode.....	30
C.2.1 Description.....	30
C.2.2 Process flow.....	30
C.3 Sample interleaved mode	30
C.3.1 Description.....	30
C.3.2 Process flow.....	31
C.4 Minimum coded unit (MCU)	31
Annex D – Extended functions for the baseline coding model.....	32
D.1 Extensions of near-lossless coding.....	32
D.1.1 Near-lossless coding with visual quantizaion	32
D.1.2 Near-lossless coding with NEAR value re-specification	32
D.2 Extensions of prediction on baseline coding model.....	33
D.2.1 Initializations.....	33
D.2.2 Prediction correction.....	33
D.2.3 Symbol packing.....	33
D.2.4 Update variables.....	34
D.2.5 Run interruption sample encoding	35
D.2.6 Flow of encoding procedures.....	35
D.3 Extension of Golomb coding.....	35
D.3.1 Golomb code completion.....	36
D.3.2 Run interruption handling for qbpp=1	36
Annex E – Fixed length coding	37
E.1 Introduction.....	37
E.2 Fixed length coding.....	37
Annex F – Sample transformation for inverse colour transform	38
F.1 Inverse colour transform	38
F.2 Example and guideline (Informative).....	39
Annex G – Compressed data format.....	41
G.1 General aspects of the compressed data format specification	41
G.1.1 Marker assignments	41
G.1.2 JPEG-LS preset parameters specification syntax.....	41
Annex H – Control procedures for extensions.....	48
H.1 Control procedure for encoding a restart interval.....	48
H.2 Control procedure for encoding a minimum coded unit (MCU) with fixed length code (FLC)	48
Annex I – Conformance tests.....	51
I.1 Test images	51
I.1.1 Source images	51
I.1.2 Compressed image data.....	51
I.1.3 Test image formats.....	51
Annex J – Patents	53
J.1 List of patents.....	53
Annex K – Bibliography.....	55

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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of the joint technical committee is to prepare International Standards. 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.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

ISO/IEC 14495-2 was prepared jointly by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 29, *Coding of audio, picture, multimedia and hypermedia information*, in collaboration with ITU-T. The identical text is published as ITU-R Recommendation T.870.

This second edition cancels and replaces the first edition (ISO/IEC 14495-2:2002), which has been technically revised.

ISO/IEC 14495 consists of the following parts, under the general title *Information technology — Lossless and near-lossless compression of continuous-tone still images*:

- *Part 1: Baseline*
- *Part 2: Extensions*

[This is a preview - click here to buy the full publication](#)

**INTERNATIONAL STANDARD
ITU-T RECOMMENDATION****Information technology – Lossless and near-lossless compression of
continuous-tone still images: Extensions****1 Scope**

This Recommendation | International Standard defines a set of lossless (bit-preserving) and nearly lossless (where the error for each reconstructed sample is bounded by a predefined value) compression methods for coding continuous-tone (including bi-level), gray-scale, or colour digital still images.

This Recommendation | International Standard:

- specifies extensions (including arithmetic coding, extension of near lossless coding, extension of prediction and extension of Golomb coding) to processes for converting source image data to compressed image data;
- specifies extensions to processes for converting compressed image data to reconstructed image data including an extension for sample transformation for inverse colour transforms;
- specifies coded representations for compressed image data;
- provides guidance on how to implement these processes in practice.

2 Normative references

The following Recommendations and International Standards contain provisions which, through references 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

- CCITT Recommendation T.81 (1992) | ISO/IEC 10918-1:1994, *Information technology – Digital compression and coding of continuous-tone still images: Requirements and guidelines.*
- ITU-T Recommendation T.83 (1994) | ISO/IEC 10918-2:1995, *Information technology – Digital compression and coding of continuous-tone still images: Compliance testing.*
- ITU-T Recommendation T.84 (1996) | ISO/IEC 10918-3:1997, *Information technology – Digital compression and coding of continuous-tone still images: Extensions.*
- ITU-T Recommendation T.87 (1998) | ISO/IEC 14495-1:2000, *Information technology – Lossless and near-lossless compression of continuous-tone still images: Baseline.*

2.2 Additional references

- ISO/IEC 646:1991, *Information technology – ISO 7-bit coded character set for information interchange.*
- ISO 5807:1985, *Information processing – Documentation symbols and conventions for data, program and system flowcharts, program network charts and system resources charts.*
- ISO/IEC 9899:1999, *Programming languages – C.*