TECHNICAL REPORT

ISO/IEC TR 19797

First edition
2004-09-01

Information technology — Office machines — Device output of 16 colour scales, output linearization method (LM) and specification of the reproduction properties

Technologies de l'information — Machines de bureau — Sortie de dispositif des échelles 16 couleurs, méthode linéaire de sortie (LM) et spécification des propriétés de reproduction

Reference number
ISO/IEC TR 19797:2004(E)

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

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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.

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.

In exceptional circumstances, the joint technical committee may propose the publication of a Technical Report of one of the following types:

— type 1, when the required support cannot be obtained for the publication of an International Standard, despite repeated efforts;

— type 2, when the subject is still under technical development or where for any other reason there is the future but not immediate possibility of an agreement on an International Standard;

— type 3, when the joint technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example).

Technical Reports of types 1 and 2 are subject to review within three years of publication, to decide whether they can be transformed into International Standards. Technical Reports of type 3 do not necessarily have to be reviewed until the data they provide are considered to be no longer valid or useful.

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 TR 19797, was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 28, *Office equipment.*

Introduction

Purpose and justification

The method in this Technical Report produces a linear relationship between the linear digital input data and the output data produced for a visual relative CIELAB scale. Using this method for a digital input value of 0.5 a mean grey of 0.5 on a visual scale is produced. On the visual scale the values for white and black are 0 and 1 in relative CIELAB space. The method has been already developed (there was a SC28 study period of one year, Project 18 of the SC28 Berlin 2000 Plenary). Example files are on the Internet in various file formats (see SC28 Document j28N493). The output will be within a visual tolerance of 6 CIELAB units independent of the file format used (see graphs on page 13–15 and on BAM-Internet addresses listed in Annex B). For a given file format the CIELAB values of the first output must be measured. The measured CIELAB data are included in a modified output file which produces the linearized output which will be equally spaced in CIELAB. Various cases are given below:

1. PS (PostScript) file on a PS printer then the new PS output file on the PS printer produces the 16 step equally spaced output.

2. PDF file on any printer then the new PDF output file is produced by the software *Adobe Acrobat Distiller or equivalent* from a PS file. The PDF output file produces the 16 step equally spaced output.

3. GIF file on any printer then the new GIF output file is produced by the software *Adobe Illustrator or equivalent* from a PS file. The GIF output file produces the 16 step equally spaced output.

The method is similar for other file formats and the output result is within a visual tolerance of 6 CIELAB units independent of the file format used.

Advantages: If the CIELAB data of the first output are used then the linearization method (LM) leads to the same relative CIELAB output within visual tolerances of 6 CIELAB values (1 step of 16 steps, see graphs on pages 13–15) independent of e. g. application software, file format, printer driver and paper.

Remark: If the intended output is linearly spaced in relative CIELAB space (see ISO/IEC 15 775) then in most cases the colour differences between the first and the linearized output and the intended output are reduced by a factor 3 to 6.

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1. Scope

A digital file is used to produce 16 step colour scales on a colour printer between the white paper and the 6 chromatic colours and black. The intended 16 step colour scales are defined in figures B4 and D4 of the ISO/IEC-test charts for colour copiers according to ISO/IEC 15775. The digital file format may be PostScript (PS), Portable document (PDF), GIF, HTM or equivalent. Within the different file formats the 16 step colour scales are defined by 16 digital values between 0 and 1, e. g. by 0, 1/15, 2/15 to 15/15 in CMY coordinates. The first output is measured and by the linearization method (LM) of this Technical Report, a visually equally spaced output is produced in relative CIELAB units, e. g. between the white paper and the six device colours and black. There is a table of output values and a graph for the first and linearized output. This method produces a linear relationship between the linear digital input data and the output data on a visual relative CIELAB scale for the colour primaries. The visual uniformity of overprint scales can be improved by this method. The method is applicable for systems that do not have colour management or as a linearization method for devices that could be used as a setup_state for colour management. The aim of this method is to produce equal CIELAB spacing. The equal spacing of the steps achieved in the linearization method may be adapted to various purposes. The accuracy and repeatability of this method is expected to be within 6 CIELAB units. Other methods may be appropriate for applications requiring greater accuracy.

Note: Any first output can be used for this linearization method (LM) even though the first output depends e. g. on application software, file format, printer driver, paper and other parameters.

2. Normative References

The following referenced documents are indispensable for the application of this document, For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 15775: 1999, *Information technology – Office machines – Method of specifying image reproduction of colour copying machines by analog test charts – Realisation and application*

ISO/CIE 10526:1991, *CIE standard colorimetric illuminants*

ISO/CIE 10527:1991, *CIE standard colorimetric observers*

CIE-pub. 15.2:1986, *Colorimetry*

ITU-R BT.709-2:1995, *Parameter Values for the HDTV Standards for Production and International Program Exchange*

IEC/CIE 17.4:1987, *International lighting vocabulary, 4th edition, Joint publication IEC/CIE*

DIN 33866-1 to -5:2000, *Information technology – Office machines – Colour image reproduction devices,* Part 1: *Method of specifying image reproduction of colour devices by digital and analog test charts*