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Graphic technology — Standard object colour spectra database for colour reproduction evaluation (SOCS)

Technologie graphique — Base de données de spectres de couleurs d'objets normalisée pour l'évaluation de la reproduction des couleurs (SOCS)

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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

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

In exceptional circumstances, when a 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), it may decide by a simple majority vote of its participating members to publish a Technical Report. A Technical Report is entirely informative in nature and does not have to be reviewed until the data it provides are considered to be no longer valid or useful.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 shall not be held responsible for identifying any or all such patent rights.

ISO/TR 16066 was prepared by Technical Committee ISO/TC 130, *Graphic technology*.

The TC 130 Japanese National Committee prepared this database, and their efforts have made this Technical Report possible. The original form of this report was published as a technical report TR X 0012 by the Japanese Standards Association in Japanese in December 1998.

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Introduction

The simplest way to evaluate the colour reproduction of colour image input devices is to input images of objects whose colours are exactly known and then to compare the pixel values to exact ones. For that purpose, input colour target standards have been already established in ISO 12641:1997, *Graphic technology — Prepress digital data exchange — Colour targets for input scanner calibration*. Evaluation becomes more complicated, however, when we consider metamers.

The perceived colours of a pair of objects are referred to as metamers if, under a particular illumination, they have the same tristimulus values even though they are spectrally different. The spectral pairs of such objects may be used to advantage in the assessment of differences among lighting conditions. If, for instance, a pair of spectra yield the same tristimulus values *X, Y, Z* under CIE illuminant D50, the difference between the two perceived colours of the pair of spectra as measured in the field under a different illumination is referred to as a metameric index, which can be used as a measure of the non-conformance of that illumination to D50.

While it may be sometimes preferable, e.g. for standards purposes, to use artificial pairs of perceived colours, i.e. those not coming from natural objects, natural metameric pairs have the advantage that one can assess the effect of non-standard lighting for a particular lighting condition. One may find, for instance, that a particular light source leads to unacceptably large deviations in skin tones, whereas the same source is quite acceptable for furniture colours.

Definitions with respect to metameric indices and the procedures for their evaluation are described in the following CIE publications:

CIE 15.2, *Colorimetry*, 2nd ed. (1986) (Contains Special Metamerism Index: Change in Illuminant)

CIE 51.2, *A method for assessing the quality of daylight simulators for colorimetry* (1999)

CIE 80, *Special metamerism index: Change in observer* (1989)

It can also be useful to consider metamers in the evaluation of such colour image input devices as colour scanners and digital cameras, which, though designed to capture images in a way similar to that of the human visual system (HVS), nonetheless deviate enough from HVS sensitivity so that colour reproduction of sensed colours in display devices or print outputs are significantly different from that desired, even when the illumination conditions of the original human observation of an object have been recreated for the observation of the output image.

To evaluate deviations due to variations in light sources and/or sensor sensitivities under actual conditions, it is useful to know the range of spectral differences in existing objects. Committee members have created an exhaustive collection of colours of existing objects, a database containing more than 50 000 items. This report details the extraction from the data of 365 colour samples and their classification into sets, of which there are two types, “typical sets” and “difference sets”. “Typical sets” refers to sets of typical spectral reflectances and transmittances of objects as classified into a number of different categories. “Difference sets” refers to sets of metamers whose tristimulus values are roughly typical but whose spectral values are significantly non-typical.

The entire original collection of more than 50 000 spectral data items is included, in electronic form, as part of this Technical Report in the data directory SourceData as described in Annex A.

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Graphic technology — Standard object colour spectra database for colour reproduction evaluation (SOCS)

1 Scope

This Technical Report provides a database of typical and difference sets of existing object colour spectral data that are suitable for evaluating the colour reproduction of image input devices. It also includes the spectral reflectance and transmittance source data from which these data sets have been derived.

2 Standard object colour spectra

2.1 Object categories and sample selection

2.1.1 Categories and groups

The following categories and subcategories were first established:

(1) Photographic materials

   a. Transparencies

   b. Reflection prints

(2) Offset prints

(3) Computer colour prints

   a. Dye sublimation printer

   b. Electrostatic printer

   c. Ink-jet printer

(4) Paint (not for art)

(5) Paints (for art)

   a. Oil paints

   b. Water colours

(6) Textiles

   a. Synthetic dyes

   b. Plant dyes

(7) Flowers and leaves

(8) Outdoor scenes (Krinov data except for flowers and leaves)

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