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Image quality evaluation methods for printed matter —

Part 11: Colour gamut analysis

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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 ISO documents 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 of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 130, *Graphic technology*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

The colour gamut that can be achieved by a reproduction system is an important attribute. It enables users to compare the colour reproduction capabilities of different printing systems and to determine whether one system can simulate all the colours available in another. This document describes procedures to define and compare colour gamuts.

Given a set of coordinates known to lie on the surface of a colour gamut, the volume of the gamut can be determined by segmenting the gamut into a series of tetrahedra, computing the volume of each tetrahedron and summing the results. For a reproduction process with three colour components, a colour will lie on the surface if it satisfies the condition that at least one component has a value of 0 or 1, where 1 represents the maximum amount of the colour component. However, printing processes usually have four or more colour components (e.g. Cyan, Magenta, Yellow and Black in four-colour process printing), and determining which coordinates lie on the gamut boundary cannot be done solely from the relative amounts of the colour components. For CMYK processes, in almost all cases, the Black colorant extends the gamut below the gamut vertex at each hue angle. This makes it possible to identify a set of coordinates which are expected to lie on the gamut surface from the relative colorant amounts. For processes with more than four colour components, some knowledge of the colorimetry of a sample of colours from the colour data encoding is needed in order to determine which colours lie on the boundary.

For these reasons, coordinates on the surface of the gamut of RGB and CMYK printing processes can be determined by printing a test chart with suitable colorant combinations, and measuring the colours; while for other printing processes, it is necessary to model the colorant-to-colorimetry relationship in order to identify colours on the gamut boundary.

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Part 11:
Colour gamut analysis

1 Scope

This document defines procedures to measure and compare the colour gamuts of RGB and CMYK printing processes.

It is not applicable to other printing processes.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 15076-1, *Image technology colour management — Architecture, profile format and data structure — Part 1: Based on ICC.1:2010*

ISO 12642-1, *Graphic technology — Input data for characterization of four-colour process printing — Part 1: Initial data set*

ISO 13655, *Graphic technology — Spectral measurement and colorimetric computation for graphic arts images*

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
colour gamut
range of colours that can be reproduced by an output device on a given medium, represented in a CIE-based colour space

Note 1 to entry: The CIE colour space for representation of colour gamuts is normally CIELAB.

3.2
gamut vertex
coordinate in a CIE-based colour space which represents a point on a colour gamut surface and which is used in defining the surface of the gamut