TECHNICAL REPORT

ISO/TR 17321-3

First edition
2017-04

Graphic technology and photography — Colour characterization of digital still cameras (DSCs) —

Part 3: User controls and readouts for scene-referred imaging applications

Technologie graphique et photographie — Caractérisation de la couleur des appareils photonumériques —

Partie 3: Contrôles utilisateur et lectures pour les applications d'imagerie par scène

Reference number
ISO/TR 17321-3:2017(E)

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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.

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. www.iso.org/directives

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This document was prepared by Technical committee ISO/TC 42, *Photography*.

A list of all the parts in the ISO 17321 series can be found on the ISO website.

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Introduction

Pictorial photography by and large produces images that convey the specific artistic intent of the photographer. The intent might convey a complex artistic vision, or it might simply attempt to create images that are generally pleasing to viewers. Other types of photography, such as the reproduction of images of artworks and other objects for archival purposes and the reproduction of images for scientific measurement and analysis, reproduce images that require an accurate representation of the scene captured, where accuracy is measured in terms of relative colourimetry or adapted relative colourimetry (for cases where viewer adaptation differs when looking at the correctly reproduced image and when looking at the actual scene).

Images for pictorial photography are typically processed with an *output-referred representation* on some medium. In the case of film, the medium is often a photographic print or transparency. In the case of digital capture, the output characteristics are specified and communicated either by the identification of a standard reference medium, such as sRGB or ROMM RGB, or by the inclusion of an output-intent ICC profile.

Output-referred images are often not colourimetrically accurate photographic reproductions of the actual scene or object because

— scenes vary widely in their highlight-to-midtone and midtone-to-shadow luminance rations, in their colour gamuts, and in other characteristics,

— output media vary widely in their colour gamuts and their luminance range capabilities, and

— pictorial photographers choose output media whose characteristics complement their artistic intent.

While *scene-referred (SR) images*, that is, colourimetrically accurate images of scenes and objects, are required, it is difficult to obtain colourimetrically accurate images of scenes and objects.

Digital archiving facilities sometimes use targets to create ICC profiles to invert the colour processing from output-referred images to scene-referred images. This approach is commonly used, but it has significant drawbacks:

a) characterization charts do not always represent the actual spectra to be captured;

b) the camera colour processing and chart used can limit the colour gamut and dynamic range of the resulting scene-referred images;

c) precise exposure control is difficult because the camera and image readouts typically reflect the state of the image prior to application of the ICC profile;

d) some cameras employ colour processing that is image dependent when producing output-referred images.

In this last case the ICC profile determined with the chart is only likely to be accurate when photographing the chart itself.

It is also possible to obtain scene-referred images by converting camera raw images using camera raw processing software. This approach is technically more sound than creating scene-referred images from output-referred images, but there are still issues:

— commercial camera raw processing tends to be focused on creating output-referred images;

— open-source software tends to be complex;

— additional software is often needed to convert the scene-referred image data to standard scene-referred colour encodings.

Users need simple and clear camera and camera raw processing controls and readouts that allow them to easily produce quality scene-referred images in appropriate encodings.

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This document describes a scene-referred (SR) capture-processing mode that could be added to digital still cameras for use by those photographers interested in colourimetrically accurate images of scenes and objects.

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Graphic technology and photography — Colour characterization of digital still cameras (DSCs) —

Part 3: User controls and readouts for scene-referred imaging applications

1 Scope

This document provides guidelines for user controls and readouts employed in scene-referred capture processing modes implemented in digital cameras and camera raw processing software.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

No terms and definitions are listed in this document.

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

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

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

4 Design of scene-referred (SR) capture processing mode

4.1 General

The SR capture processing mode is intended for applications where the objective is to produce images that represent colourimetrically accurate colours of the scene captured. When using the SR mode it is best if the capture conditions such as the scene illumination geometry and spectral characteristics of the illumination are controlled by the user, such as in a studio or reprographic setup. The SR mode is not specifically intended for general pictorial photography. See Annex A for additional information.

4.2 Processing aims

The aim of the colour processing applied is to produce accurate scene colourimetry, with the scene adopted white adapted to the image encoding adopted white as described in ISO/TR 17321-2. ISO 17321-1 specifies camera characterization metrology. ISO/TR 17321-2 provides considerations for determining scene analysis transforms.

4.3 Colour encoding and file format

In the SR capture processing mode, the colour encoding used for the images is a scene-referred encoding, such as the scRGB colour encoding specified in IEC 61966-2-2, or the RIMM RGB encoding specified in ISO/TS 22028-3. It is important that most colours of interest in the scene are within the colour gamut and dynamic range of the encoding selected. The encoding selected is communicated by the file format used, for example by embedding an ICC profile.

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