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Digital cameras - Chromatic displacement measurements

数码照相机 色位移的测量

(English Translation)

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Foreword

This document is in accordance with the provisions of GB/T 1.1-2020 "Guidelines for standardization work Part 1: Structure and drafting rules for standardization documents" Drafting.

This document is equivalent to ISO 19084:2015 "Measurement of chromatic aberration of photographic digital cameras".

The following minimal editorial changes were made to this document.

--- The name of the standard was changed to "Measurement of color shift of digital cameras";

--- Added the list of normative references (see Chapter 2).

Introduction

Digital camera images sometimes exhibit artifacts called color shifts, which usually appear at the boundaries that separate light and dark features.

This document defines this type of artifact as color shift, regardless of the source.

Cameras, color shift may be caused by optical, mechanical and electrical factors. However, for digital cameras with monocular sensors, there are almost no mechanical and electrical factors.

The color shift is mainly caused by optical factors and artifacts caused by the mosaic color filter array. Optical factors include lateral color aberration, longitudinal chromatic aberration and coma, etc.

Lateral chromatic aberration occurs when the size of an image changes with the wavelength of light. Because of this, lateral chromatic aberration is more pronounced in the periphery of the image.

Ideally, lateral chromatic aberration is rotationally symmetric, however this may not be the case due to manufacturing tolerances.

Longitudinal chromatic aberration occurs when the back focus changes with the wavelength of light. Unlike lateral chromatic aberration, longitudinal chromatic aberration occurs not only in the periphery of the image, but also in the it is quite obvious and may be more obvious in the center of the image.

Chromatic aberration caused by coma occurs when the properties of coma vary with the wavelength of light. This phenomenon is called purple fringing or color fringing Like lateral dispersion, chromatic aberration is particularly noticeable in the peripheral portions of the image. In many cases, a larger lens F number (smaller aperture) can be used.

circle) to reduce coma.

Color shift can be enhanced or reduced through image processing.

To measure color shift, the International Electrotechnical Commission (IEC) has developed IEC 61146-2, and the Camera and Imaging Products Association (CIPA) has also developed in addition, the Institute of Electrical and Electronics Engineers (IEEE) has also developed the CIPADCG-002-2012 standard based on IEC 61146-2.

P1858 - Camera Phone Image Quality Standard (CPIQ).

This document describes two measurement methods. the color shift measurement method and the radial color shift measurement method. The color shift measurement includes the total color shift caused by all factors specified in IEC 61146-2 and CIPADCG-002-2012. The radial color shift is the monocular sensor number.

The main factor of the color shift of the code camera is the radial color shift. The method for measuring optical aberration is based on a method developed by CPIQ.

Measurement of color shift in digital cameras

1 Scope

This document defines the terms and definitions of color shift in digital cameras and describes the test modes, measurement conditions and methods for color shift in order to Ability to compare measurement results.

The measurement method is designed to be able to evaluate the performance of a digital camera by using image data output by the digital camera.

This document does not specify the allowable amount of color shift.

2 Normative references

This document has no normative references.

3 Terms and definitions

The following terms and definitions apply to this document.

The shift in the position of different color features in the output image caused by optical, mechanical, electrical, and image processing factors.

Note 1: Optical factors include lateral chromatic aberration, longitudinal chromatic aberration, characteristic coma, etc.

Note 2: Color shift is the shift of the red (R) and blue (B) channels relative to the green (G) channel in the output image.

NOTE 3 Chromatic shift is assessed by measuring the lateral color shift in the image.

The radial shift in the positions of different colors in the output image caused by the optical factor of lateral chromatic aberration.

NOTE: This offset may be affected by mechanical, electrical, and image processing factors.

4.1 General

The measurement shall be made using a digital signal from a digital camera output image that captures the test target.

When measuring the color shift of a digital camera, the following measurement conditions should be used as nominal conditions.

If some nominal operating conditions are specified, the actual operating conditions should

be listed together with the reported results.

4.2 Equipment and Hardware

Each test target plate should describe the lighting conditions in detail, including parameters such as illumination, brightness and color temperature.

4.2.1 Lighting

The lighting color temperature should be $5700\text{K} \pm 1000\text{K}$. This document does not specify a specific lighting level, the recommended level is $1000\text{lx} \sim 2000\text{lx}$ (for transmissive targets, between 318cd/m^2 and 637cd/m^2). Special measurement purposes may require other levels. Test