ColorPursuit™ 1.0

ALWAN COLORPURSUIT METRICS
Version 1.0 r.2

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1. Profile Quality Index 1.0

1.1 Colorimetric Intent roundtrip ∆E

- Colorimetric DEV2PCS (Device to PCS) Table is scanned using 11 different input values per channel (a total of 1 331 values for RGB profiles and 14 641 values for CMYK profiles).
The corresponding CIELAB (1) values are calculated.
- The calculated CIELAB values are then used as input values in the Colorimetric PCS2DEV Table. The corresponding Device values are calculated.
- The calculated Device values are then used as input values in the Colorimetric DEV2PCS.
The corresponding CIELAB (2) values are calculated.
- The first and second set of calculated CIELAB (1) and (2) values are compared and the corresponding (1 331 or 14 641) ΔE values are calculated.
Colorimetric Intent ΔE (roundtrip error) max is calculated and displayed.
Colorimetric Intent ΔE (roundtrip error) average is calculated and displayed.

1.2 Perceptual Intent roundtrip ∆E

- Perceptual DEV2PCS (Device to PCS) Table is scanned using 11 different input values per channel (a total of 1 331 values for RGB profiles and 14 641 values for CMYK profiles).
The corresponding CIELAB (1) values are calculated.
- The calculated CIELAB values are then used as input values in the Perceptual PCS2DEV Table. The corresponding Device values are calculated.
- The calculated Device values are then used as input values in the Perceptual Colorimetric DEV2PCS.
The corresponding CIELAB (2) values are calculated.
- The first and second set of calculated CIELAB (1) and (2) values are compared and the corresponding (1 331 or 14 641) ΔE values are calculated.
Perceptual Intent ΔE (roundtrip error) max is calculated and displayed.
Perceptual Intent ΔE Intent ΔE (roundtrip error) average is calculated and displayed.

1.3 Colorimetric tables unbalance

If ΔE average for Colorimetric tables is higher than 5, Profile and Device calculated parameters are displayed in red signifying a profile unbalance problem.

1.4 Perceptual tables unbalance

If ΔE average for Perceptual tables is higher than 5 x C1, Profile and Device calculated parameters are displayed in red signifying a profile unbalance problem.
C1 = Perceptual gamut / Colorimetric gamut ; C1 ≤ 2

1.5 Colorimetric tables Quality Index

QI_1(colorimetric) = 10 - ΔEav (colorimetric intent) ; $QI_1 \geq 0$
QI_2(colorimetric) = QI_1(colorimetric) / (10 – C2)
C2 = 1.3

1.6 Perceptual tables Quality Index

QI_3(perceptual)= (10 x C1) - ΔEav (perceptual intent) ; $QI_3 \geq 0$
QI_4(perceptual)= QI_3 (perceptual) / ((10 - C2) x C1)

1.7 Profile Quality Index

Profile QI 1.0 = (QI_2(colorimetric) + QI_4(perceptual)) x 10/ 2

2. Device Quality Index 1.0

Gamut volumes are evaluated using only ICC PCS CIELAB (v) values that correspond to “visible” colors i.e. to CIE XYZ Standard Observer colors.
CIELAB (v) used “visible” colors represent approximately 65% of ICC PCS CIELAB color space.
The calculated gamuts can hence be said to represent or reproduce x% of CIELAB (v) visible colors.

2.1 Physical Gamut (volume %)

- Absolute Colorimetric PCS2DEV Table is scanned using 51 different input values of CIEL,A and B. A total of 132 651 CIELAB (1) values is used.
The corresponding device values are calculated.
- The calculated device values are used as input values in the Absolute Colorimetric DEV2PCS Table.
The corresponding CIELAB (2) values are calculated.
- The first and second set of CIELAB (1) and (2) values are compared and the corresponding (132 651) ΔE values are calculated.
If ΔE for a color is lower than the Colorimetric Gamut test value ΔE(tc), it is considered to be in the device colorimetric gamut
If ΔE for a color is higher than the Gamut test value ΔE(tc), it is considered to be out of the device colorimetric gamut.
ΔE(tc) = ΔEav (colorimetric intent) x C3 ; $\Delta E(tc) \geq 5$
C3 = 1.1 (experimental coefficient)
The number of in-gamut colors PG is calculated.
Physical Gamut PG% = PG / 132 651 x 100

2.2 Perceptual Gamut (volume %)

- Perceptual PCS2DEV Table is scanned using 51 different input values of CIEL,A and B. A total of 132 651 CIELAB (1) values is used.
The corresponding device values are calculated.
- The calculated device values are used as input values in the Perceptual DEV2PCS Table.
The corresponding CIELAB (2) values are calculated.
- The first and second set of CIELAB (1) and (2) values are compared and the corresponding (132 651) ΔE values are calculated.
If ΔE for a color is lower than the Gamut test value ΔE(tp), it is considered to be in the device colorimetric gamut
If ΔE for a color is higher than the Gamut test value ΔE(tp), it is considered to be out of the device colorimetric gamut.
ΔE(tp) = ΔEav (perceptual intent) x C3 ; ΔE(tp) ≥ 5
C3 = 1.1 (experimental coefficient)
The number of in-gamut colors EG is calculated.
Expanded Gamut EG% = EG / 132 651 x 100

2.3 Device Quality Index

$QI_5 = PG\% / C4$; $QI_5 < 1$
$QI = (QI_5)^{C5} \times 10$
C4 = 60 (experimental coefficient)
C5 = 0.35 (experimental coefficient)

Note: All experimental coefficients are defined by experience and correlations between metrics predictions and visual assessments of actual reproductions.

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