

Equations: colorimetric data transfer from rgb_d to nce^*_d data and LCH^*_d data

Given: rgb_d device colour data of any colour $rgb_d = lab^*rgb_d$ and of 48 step colour circle $j=0$ to 47

$rgb_{Md,j}$ and CIELAB data $L^*_{Md,j}$, $C^*_{ab,Md,j}$, $h_{ab,Md,j} = LCH^*_{Md,j}$

Aim: calculate nce^*_d with $(0 \leq n^*_d, c^*_d, e^*_d \leq 1)$ (similar to NCS data) and $LCH^*_{a,d}$ data of the device colour
Data of a given device (d) colour

$$\begin{aligned} \text{relative chroma of the device colour} & c^*_d = \max [rgb_d] - \min [rgb_d] & (1) \\ \text{relative blackness of the device colour} & n^*_d = 1 - \max [rgb_d] & (2) \\ \text{relative triangle lightness of the device colour} & t^*_d = 1 - n^*_d - 0,5 c^*_d & (3) \\ \text{relative red-green chroma in 6x60 degree system s} & a^*_{rs,d} = r_d \cos(30) + g_d \cos(150) & (4) \\ \text{relative yellow-blue chroma in 6x60 degree system s} & b^*_{rs,d} = r_d \sin(30) + g_d \sin(150) + b_d \sin(270) & (5) \\ \text{hue angle in 6x60 degree system s} & h_{ab,s,d} = \arctan[b^*_{rs,d} / a^*_{rs,d}] \quad (0 \leq h_{ab,s,d} \leq 360) & (6) \\ \text{hue number in 6x60 degree system s} & e^*_d = h_{ab,s,d} / 360 \quad (0 \leq e^*_d \leq 1) & (7) \\ \text{CIELAB hue angle in device system} & h_{ab,d} = \text{function} [h_{ab,s,d}] \quad (\text{with table/equations}) & (8) \\ \text{adapted CIELAB } LCH^*_d \text{ data of maximum colour } M_d & L^*_{Md} = \text{function} [h_{ab,d}] \quad (\text{with table/equations}) & (9) \\ & C^*_{ab,Md} = \text{function} [h_{ab,d}] \quad (\text{with table/equations}) & (10) \\ & h_{ab,Md} = h_{ab,d} & (11) \\ \text{relative lightness of maximum colour } M_d & l^*_{Md} = [L^*_{Md} - L^*_{Nd}] / [L^*_{Wd} - L^*_{Nd}] & (12) \\ \text{relative lightness of the device colour} & l^*_d = t^*_d + l^*_{Md} c^*_d + 0,5 c^*_d & (13) \\ \text{CIELAB } LCH^*_d \text{ data of the device colour} & L^*_d = l^*_d [L^*_{Wd} - L^*_{Nd}] + L^*_{Nd} & (14) \\ & C^*_{ab,d} = c^*_d C^*_{ab,Md} & (15) \end{aligned}$$

SN870-3N

Equations: colorimetric data transfer from rgb_d to nce^*_d data and $LCH^*_{a,d}$ data

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$rgb_{Md,j}$ and adapted CIELAB data $L^*_{Md,j}$, $C^*_{ab,a,Md,j}$, $h_{ab,a,Md,j} = LCH^*_{a,Md,j}$

Aim: calculate nce^*_d with $(0 \leq n^*_d, c^*_d, e^*_d \leq 1)$ (similar to NCS data) and $LCH^*_{a,d}$ data of the device colour
Data of a given device (d) colour

$$\begin{aligned} \text{relative chroma of the device colour} & c^*_d = \max [rgb_d] - \min [rgb_d] & (1) \\ \text{relative blackness of the device colour} & n^*_d = 1 - \max [rgb_d] & (2) \\ \text{relative triangle lightness of the device colour} & t^*_d = 1 - n^*_d - 0,5 c^*_d & (3) \\ \text{relative red-green chroma in 6x60 degree system s} & a^*_{rs,d} = r_d \cos(30) + g_d \cos(150) & (4) \\ \text{relative yellow-blue chroma in 6x60 degree system s} & b^*_{rs,d} = r_d \sin(30) + g_d \sin(150) + b_d \sin(270) & (5) \\ \text{hue angle in 6x60 degree system s} & h_{ab,s,d} = \arctan[b^*_{rs,d} / a^*_{rs,d}] \quad (0 \leq h_{ab,s,d} \leq 360) & (6) \\ \text{hue number in 6x60 degree system s} & e^*_d = h_{ab,s,d} / 360 \quad (0 \leq e^*_d \leq 1) & (7) \\ \text{CIELAB hue angle in device system} & h_{ab,a,d} = \text{function} [h_{ab,s,d}] \quad (\text{with table/equations}) & (8) \\ \text{adapted CIELAB } LCH^*_{a,d} \text{ data of maximum colour } M_d & L^*_{Md} = \text{function} [h_{ab,a,d}] \quad (\text{with table/equations}) & (9) \\ & C^*_{ab,a,Md} = \text{function} [h_{ab,a,d}] \quad (\text{with table/equations}) & (10) \\ & h_{ab,a,Md} = h_{ab,a,d} & (11) \\ \text{relative lightness of maximum colour } M_d & l^*_{Md} = [L^*_{Md} - L^*_{Nd}] / [L^*_{Wd} - L^*_{Nd}] & (12) \\ \text{relative lightness of the device colour} & l^*_d = t^*_d + l^*_{Md} c^*_d + 0,5 c^*_d & (13) \\ \text{adapted CIELAB } LCH^*_{a,d} \text{ data of the device colour} & L^*_d = l^*_d [L^*_{Wd} - L^*_{Nd}] + L^*_{Nd} & (14) \\ & C^*_{ab,a,d} = c^*_d C^*_{ab,a,Md} & (15) \end{aligned}$$

SN870-7N

Equations: colorimetric data transfer from rgb_e to nce^*_e data and LCH^*_e data

Given: rgb_e elementary colour data of any colour $rgb_e = lab^*rgb_e$ and of 48 step colour circle $j=0$ to 47

$rgb_{Me,j}$ and CIELAB data $L^*_{Me,j}$, $C^*_{ab,Me,j}$, $h_{ab,Me,j} = LCH^*_{Me,j}$

Aim: calculate nce^*_e with $(0 \leq n^*_e, c^*_e, e^*_e \leq 1)$ (similar to NCS data) and LCH^*_e data of elementary colour
Data of a give elementary (e) colour

$$\begin{aligned} \text{relative chroma of the elementary colour} & c^*_e = \max [rgb_e] - \min [rgb_e] & (1) \\ \text{relative blackness of the elementary colour} & n^*_e = 1 - \max [rgb_e] & (2) \\ \text{relative triangle lightness of the elementary colour} & t^*_e = 1 - n^*_e - 0,5 c^*_e & (3) \\ \text{relative red-green chroma in 4x90 degree system s} & a^*_{rs,e} = r_e \cos(0) + g_e \cos(180) & (4) \\ \text{relative yellow-blue chroma in 4x90 degree system s} & b^*_{rs,e} = r_e \sin(0) + g_e \sin(180) + b_e \sin(270) & (5) \\ \text{hue angle in 4x90 degree system s} & h_{ab,s,e} = \arctan[b^*_{rs,e} / a^*_{rs,e}] \quad (0 \leq h_{ab,s,e} \leq 360) & (6) \\ \text{hue number in 4x90 degree system s} & e^*_e = h_{ab,s,d} / 360 \quad (0 \leq e^*_e \leq 1) & (7) \\ \text{CIELAB hue angle in elementary system} & h_{ab,a,e} = \text{function} [h_{ab,s,e}] \quad (\text{with table/equations}) & (8) \\ \text{CIELAB } LCH^*_e \text{ data of maximum colour } M_e & L^*_{Me} = \text{function} [h_{ab,e}] \quad (\text{with table/equations}) & (9) \\ & C^*_{ab,Me} = \text{function} [h_{ab,e}] \quad (\text{with table/equations}) & (10) \\ & h_{ab,Me} = h_{ab,e} & (11) \\ \text{relative lightness of maximum colour } M_e & l^*_{Me} = [L^*_{Me} - L^*_{Ne}] / [L^*_{We} - L^*_{Ne}] & (12) \\ \text{relative lightness of the elementary colour} & l^*_e = t^*_e + l^*_{Me} c^*_e + 0,5 c^*_e & (13) \\ \text{CIELAB } LCH^*_e \text{ data of the elementary colour} & L^*_e = l^*_e [L^*_{We} - L^*_{Ne}] + L^*_{Ne} & (14) \\ & C^*_{ab,e} = c^*_e C^*_{ab,Me} & (15) \end{aligned}$$

SN871-3N

Equations: colorimetric data transfer from rgb_e to nce^*_e data and $LCH^*_{a,e}$ data

Given: rgb_e elementary colour data of any colour $rgb_e = lab^*rgb_e$ and of 48 step colour circle $j=0$ to 47

$rgb_{Me,j}$ and adapted CIELAB data $L^*_{Me,j}$, $C^*_{ab,a,Me,j}$, $h_{ab,a,Me,j} = LCH^*_{a,Me,j}$

Aim: calculate nce^*_e with $(0 \leq n^*_e, c^*_e, e^*_e \leq 1)$ (similar to NCS data) and $LCH^*_{a,e}$ data of elementary colour
Data of a given elementary (e) colour

$$\begin{aligned} \text{relative chroma of the elementary colour} & c^*_e = \max [rgb_e] - \min [rgb_e] & (1) \\ \text{relative blackness of the elementary colour} & n^*_e = 1 - \max [rgb_e] & (2) \\ \text{relative triangle lightness of the elementary colour} & t^*_e = 1 - n^*_e - 0,5 c^*_e & (3) \\ \text{relative red-green chroma in 4x90 degree system s} & a^*_{rs,e} = r_e \cos(0) + g_e \cos(180) & (4) \\ \text{relative yellow-blue chroma in 4x90 degree system s} & b^*_{rs,e} = r_e \sin(0) + g_e \sin(180) + b_e \sin(270) & (5) \\ \text{hue angle in 4x90 degree system s} & h_{ab,s,e} = \arctan[b^*_{rs,e} / a^*_{rs,e}] \quad (0 \leq h_{ab,s,e} \leq 360) & (6) \\ \text{hue number in 4x90 degree system s} & e^*_e = h_{ab,s,e} / 360 \quad (0 \leq e^*_e \leq 1) & (7) \\ \text{CIELAB hue angle in elementary system} & h_{ab,a,e} = \text{function} [h_{ab,s,e}] \quad (\text{with table/equations}) & (8) \\ \text{adapted CIELAB } LCH^*_{a,e} \text{ data of maximum colour } M_e & L^*_{Me} = \text{function} [h_{ab,a,e}] \quad (\text{with table/equations}) & (9) \\ & C^*_{ab,a,Me} = \text{function} [h_{ab,a,e}] \quad (\text{with table/equations}) & (10) \\ & h_{ab,a,Me} = h_{ab,a,e} & (11) \\ \text{relative lightness of maximum colour } M_e & l^*_{Me} = [L^*_{Me} - L^*_{Ne}] / [L^*_{We} - L^*_{Ne}] & (12) \\ \text{relative lightness of the elementary colour} & l^*_e = t^*_e + l^*_{Me} c^*_e + 0,5 c^*_e & (13) \\ \text{adapted CIELAB } LCH^*_{a,e} \text{ data of the elementary colour} & L^*_e = l^*_e [L^*_{We} - L^*_{Ne}] + L^*_{Ne} & (14) \\ & C^*_{ab,a,d} = c^*_e C^*_{ab,a,Me} & (15) \end{aligned}$$

SN871-7N

TUB-test chart SN87; Colorimetric coordinate transfer
Equations for the transfer between rgb , LCH^*nce^*

input: $w/rgb/cmyk \rightarrow w/rgb/cmyk$
output: no change compared