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<=n^*_d, c^*_d, e^*_d<=1) **(similar to NCS data) and $LCH^*_{a,d}$ data of the device colour**
Data of a given device (d) colour

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

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Equations: colorimetric data transfer from rgb_d to nce^*_d data and $LCH^*_{a,d}$ 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 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<=n^*_d, c^*_d, e^*_d<=1) **(similar to NCS data) and $LCH^*_{a,d}$ data of the device colour**
Data of a given device (d) colour

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

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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<=n^*_e, c^*_e, e^*_e<=1) **(similar to NCS data) and LCH^*_e data of elementary colour**
Data of a give elementary (e) colour

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

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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<=n^*_e, c^*_e, e^*_e<=1) **(similar to NCS data) and $LCH^*_{a,e}$ data of elementary colour**
Data of a given elementary (e) colour

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

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TUB-test chart SE87; Colorimetric coordinate transfer
Equations for the transfer between *rgb*, *LCH** and *nce**

input: *w/rgb/cmyk* –> *w/rgb/cmyk*
output: no change