

Equations: colorimetric data transfer from LCH^* (CIELAB) to nce^* and rgb^*_{33}

Given: CIELAB data of any colour L^* , C^*_{ab} , h_{ab} = LCH^* = LAB^*LCH^* or L^* , a^* , b^*

CIELAB data L^*_{33} , $C^*_{ab,33}$, $h_{ab,33}$; a^*_{33} , b^*_{33} of eight basic colours $X = RJGC^*BM^*NW$

Aim: nce^* and rgb^*_{33} elementary colour data of the given colour (in example M located between R and J)

CIELAB hue angle of maximum colour M	$h_{ab,M} = h_{ab}$	(1)
Relative device hue angle ratio of M	$\alpha_M = [h_{ab,M} - h_{ab,R}] / [h_{ab,J} - h_{ab,R}]$	(2)
CIELAB data $L^*_{33,M}$, $a^*_{33,M}$, $b^*_{33,M}$, $C^*_{ab,33,M}$ of M	$L^*_{33,M} = \alpha_M L^*_{33} + (1 - \alpha_M) L^*_{33,R}$	(3)
	$a^*_{33,M} = \alpha_M a^*_{33} + (1 - \alpha_M) a^*_{33,R}$	(4)
	$b^*_{33,M} = \alpha_M b^*_{33} + (1 - \alpha_M) b^*_{33,R}$	(5)
	$C^*_{ab,33,M} = [(\alpha_M^2 L^*_{33} + b^*_{33,M})^2]^{1/2}$	(6)
relative lightness of the given colour	$L^* = [L^*_{33} - L^*_{33,N}] / [L^*_{33,W} - L^*_{33,N}]$	(7)
relative chroma of the given colour	$c^* = C^*_{ab,33} / C^*_{ab,M}$	(8)
relative triangle lightness of the given colour	$r^* = L^* - [L^*_{33,M} - L^*_{33,N}] / [L^*_{33,W} - L^*_{33,N}] c^* + 0.5 c^*$	(9)
relative blackness of the given colour	$n^* = 1 - r^* - 0.5 c^*$	(10)
relative whiteness of the given colour	$w^* = 1 - n^* - c^*$	(11)
elementary hue angle of the given colour	$e^* = \text{function} [h_{ab}]$	(12)
relative $rgb^*_{33,M}$ data of M	$r^*_{33,M} = \alpha_M r^*_{33} + (1 - \alpha_M) r^*_{33,R}$	(13)
	$g^*_{33,M} = \alpha_M g^*_{33} + (1 - \alpha_M) g^*_{33,R}$	(14)
	$b^*_{33,M} = \alpha_M b^*_{33} + (1 - \alpha_M) b^*_{33,R}$	(15)
relative rgb^*_{33} data of the given colour	$r^*_{33} = w^* + c^* r^*_{33,M}$	(16)
	$g^*_{33} = w^* + c^* g^*_{33,M}$	(17)
	$b^*_{33} = w^* + c^* b^*_{33,M}$	(18)

ZE180-3

Equations: colorimetric data transfer from nce^* to elementary colour data rgb^*_{33} and LCH^*

Given: nce^* data (similar NCS) of any colour $nce^* = lab^*nce^*$ ($0 < n^* < 1$, $c^* < 1$)

CIELAB data L^*_{33} , $C^*_{ab,33}$, $h_{ab,33}$; a^*_{33} , b^*_{33} of eight basic colours $X = RJGC^*BM^*NW$

Aim: Elementary colour data rgb^*_{33} and LCH^* of the given colour

Elementary hue number of a colour	e^*	(1)
CIELAB hue angle of colour and maximum colour M	$h_{ab} = \text{function} [e^*]$	(2)
relative whiteness of the given colour	$w^* = 1 - n^* - c^*$	(3)
relative triangle lightness of the given colour	$r^* = 1 - n^* - 0.5 c^*$	(4)
$rgb^*_{33,M}$ data of maximum colour M	$r^*_{33,M} = \text{function} [h_{ab,33}]$	(5)
	$g^*_{33,M} = \text{function} [h_{ab,33}]$	(6)
	$b^*_{33,M} = \text{function} [h_{ab,33}]$	(7)
relative rgb^*_{33} elementary colour data of the given colour	$r^*_{33} = w^* + c^* r^*_{33,M}$	(8)
	$g^*_{33} = w^* + c^* g^*_{33,M}$	(9)
	$b^*_{33} = w^* + c^* b^*_{33,M}$	(10)
$LCH^*_{33,M}$ data of maximum colour M	$L^*_{33,M} = \text{function} [h_{ab}]$	(11)
	$C^*_{ab,33,M} = \text{function} [h_{ab}]$	(12)
	$H^*_{33,M} = h_{ab}$	(13)
relative lightness of M	$L^*_M = [L^*_{33,M} - L^*_{33,N}] / [L^*_{33,W} - L^*_{33,N}]$	(14)
relative lightness of the given colour	$L^* = r^* + L^*_M c^* + 0.5 c^*$	(15)
LCH^* data of the given colour	$L^* = L^* [L^*_{33,W} - L^*_{33,N}] + L^*_{33,N}$	(16)
	$C^*_{ab} = c^* C^*_{ab,33,M}$	(17)
	$H^* = H^*_{33,M}$	(18)

ZE181-3

Equations: colorimetric data transfer from LCH^* (CIELAB) to nce^* and rgb^*_{33}

Given: CIELAB data of any colour L^* , C^*_{ab} , h_{ab} = LCH^* = LAB^*LCH^* or L^* , a^* , b^*

CIELAB data L^*_{33} , $C^*_{ab,33}$, $h_{ab,33}$; a^*_{33} , b^*_{33} of eight basic colours $X = RJGC^*BM^*NW$

Aim: nce^* and rgb^*_{33} elementary colour data of the given colour

hue angle of the given colour and of M	$h_{ab} = H^*$	(1)
$LCH^*_{33,M}$ data of maximum colour M	$L^*_{33,M} = \text{function} [h_{ab}]$	(2)
	$C^*_{ab,33,M} = \text{function} [h_{ab}]$	(3)
	$H^*_{33,M} = h_{ab}$	(4)
relative CIELAB lightness of the given colour	$L^* = [L^*_{33} - L^*_{33,N}] / [L^*_{33,W} - L^*_{33,N}]$	(5)
relative chroma of the given colour	$c^* = C^*_{ab,33} / C^*_{ab,M}$	(6)
relative triangle lightness of the given colour	$r^* = L^* - [L^*_{33,M} - L^*_{33,N}] / [L^*_{33,W} - L^*_{33,N}] c^* + 0.5 c^*$	(7)
relative blackness of the given colour	$n^* = 1 - r^* - 0.5 c^*$	(8)
relative whiteness of the given colour	$w^* = 1 - n^* - c^*$	(9)
elementary hue angle of the given colour	$e^* = \text{function} [h_{ab}]$	(10)
$rgb^*_{33,M}$ data of maximum colour M	$r^*_{33,M} = \text{function} [h_{ab}]$	(11)
	$g^*_{33,M} = \text{function} [h_{ab}]$	(12)
	$b^*_{33,M} = \text{function} [h_{ab}]$	(13)
relative rgb^*_{33} data of the given colour	$r^*_{33} = w^* + c^* r^*_{33,M}$	(14)
	$g^*_{33} = w^* + c^* g^*_{33,M}$	(15)
	$b^*_{33} = w^* + c^* b^*_{33,M}$	(16)

ZE180-7

Equations: colorimetric data transfer from rgb^*_{33} to nce^* data and LCH^* data

Given: Elementary colour data of any colour $rgb^*_{33} = lab^*rgb^*_{33}$

CIELAB data L^*_{33} , $C^*_{ab,33}$, $h_{ab,33}$; a^*_{33} , b^*_{33} of eight basic colours $X = RJGC^*BM^*NW$

Aim: nce^* = lab^*nce^* (similar to NCS data) and LCH^* data of the given colour ($0 < e^* < 1$)

relative chroma of the given colour	$c^* = \max [rgb^*_{33}] - \min [rgb^*_{33}]$	(1)
relative blackness of the given colour	$n^* = 1 - \max [rgb^*_{33}]$	(2)
relative triangle lightness of the given colour	$r^* = 1 - n^* - 0.5 c^*$	(3)
relative red-green chroma in 60 degree system s	$a^*_{TS} = r^*_{33} \cos(30) + g^*_{33} \cos(150)$	(4)
relative yellow-blue chroma in 60 degree system s	$b^*_{TS} = r^*_{33} \sin(30) + g^*_{33} \sin(150) + b^*_{33} \sin(270)$	(5)
hue angle in 60 degree system s	$h_{ab,33} = \arctan [a^*_{TS} / b^*_{TS}]$ ($0 < h_{ab,33} < 360$)	(6)
CIELAB hue angle in 60 degree system s	$h_{ab,33} = h_{ab}$	(7)
elementary hue number of the given colour	$e^* = \text{function} [h_{ab}]$	(8)
CIELAB $LCH^*_{33,M}$ data of maximum colour M	$L^*_{33,M} = \text{function} [h_{ab}]$	(9)
	$C^*_{ab,33,M} = \text{function} [h_{ab}]$	(10)
	$H^*_{33,M} = h_{ab}$	(11)
relative lightness of maximum colour M	$L^*_M = [L^*_{33,M} - L^*_{33,N}] / [L^*_{33,W} - L^*_{33,N}]$	(12)
relative lightness of the given colour	$L^* = r^* + L^*_M c^* + 0.5 c^*$	(13)
CIELAB LCH^* data of the given colour	$L^* = L^* [L^*_{33,W} - L^*_{33,N}] + L^*_{33,N}$	(14)
	$C^*_{ab} = c^* C^*_{ab,33,M}$	(15)
	$h_{ab} = h_{ab,M}$	(16)

ZE181-7

BAM-test chart ZE18; colorimetric coordinate transfer
Equations for the transfer between oly^*_{33} , LCH^* and nce^*

input: rgb ($\rightarrow oly^*_{33}$) $setrgbcolor$
output: no change compared to input