colour valence metric (color data: linear relation to CIE 1931 data)

linear color terms	name and relationship to CIE tristimulus or chromaticity values	notes
tristimulus values	X, Y, Z	
chromatic value	*linear chromatic value diagram (A_1, B_1)*	For grey Z of D65
red−green	$A_1 = n_{1A}[X / X_Z - Y / Y_Z] = n_{1A}[a_1 - a_{Z1}]\ Y$	X_Z = 95,05 · 0,18
	If contrast = 25:1 = 90:3,6, then −125 <= A_1 <= 125	Y_Z = 100,00 · 0,18
yellow−blue	$B_1 = n_{1B}\,[Z / Z_Z - Y / Y_Z] = n_{1B}\,[b_1 - b_{Z1}]\ Y$	Z_Z = 108,90 · 0,18
	If contrast 25:1 = 90:3,6, then −50 <= B_1 <= 50	n_{1A} = 25, n_{1B} = −10
radial	$C_{AB,1} = [\ A_1^{\,2} + B_1^{\,2}\ ]^{1/2}$	(background)
chromaticity	*linear chromaticity diagram (a_1, b_1)*	
red−green	$a_1 = [X / Y] / X_Z = [x / y] / X_Z$	
yellow−blue	$b_1 = [Z / Y] / Z_Z = [z / y] / Z_Z$	
radial	$c_{AB,1} = [\ (\ a_1 - a_{Z1}\ )^2 + (\ b_1 - b_{Z1}\ )^2\ ]^{1/2}$	

AES00−3N

higher colour metric (color data: nonlinear relation to CIE 1931 data)

nonlinear color terms	name and relationship with tristimulues or chromaticity values	notes
lightness	$L^*_1 = k \log [Y / Y_Z]$ (L^*_1= 0 for $Y = Y_Z$)	LABJND 2019
	If contrast = 25:1 = 90:3,6, then −40 <= L^*_1 <= 40	k = 40 / log (5) = 57
chroma	*logarithmic transform of tristimulues values XYZ.*	For grey Z of D65
red−green	$A^*_1 = n_{A^*}\,[\ \log (\ X / X_Z) - \log (\ Y / Y_Z)\ ]$	X_Z = 95,05 · 0,18
	If contrast 25:1 = 90:3,6, then −70 <= A^*_1 <= 70	Y_Z = 100,00 · 0,18
yellow−blue	$B^*_1 = n_{B^*}\,[\ \log (\ Y / Y_Z) - \log (\ Z / Z_Z)\ ]$	Z_Z = 108,90 · 0,18
	If contrast = 25:1 = 90:3,6, then −28 <= B^*_1 <= 28	n_{A^*} = 100, n_{B^*} = −40
radial	$C^*_{AB,1} = [\ A^{*\,2}_1 + B^{*\,2}_1\ ]^{1/2}$	(background)
chromaticity	*nonlinear chromaticities, if XYZ are normalized to 100.*	*compare to log cone excitation*
red−green	$a^*_1 = \log [\ X / Y\ ] = \log [\ x / y\ ]$	log [L / L_Z)]
yellow−blue	$b^*_1 = \log [Z / Y\ ] = \log [z / y\ ]$	log [M / (M_Z)]
		log [S / (S_Z)]
radial	$c^*_{AB,1} = [\ (\ a^*_1 - a^*_{Z1}\ )^2 + (\ b^*_1 - b^*_{Z1}\ )^2\ ]^{1/2}$	

AES01−3N

colour valence metric (color data: linear relation to CIE 1931 data)

linear color terms	name and relationship to CIE tristimulus or chromaticity values	notes
tristimulus values	X, Y, Z	
chromatic value	*linear chromatic value diagram (A, B)*	for n=D65
red−green	$A = n_A\,[\ X / Y - X_n / Y_n\ ]\ Y = n_A\,[\ a - a_n\ ]\ Y$	X_n = 95,05
	$= n_A\,[\ x / y - x_n / y_n\ ]\ Y$	Y_n = 100,00
yellow−blue	$B = -0{,}4\ n_B\,[\ Z/Y - Z_n/Y_n\ ]\ Y = n_B\,[\ b - b_n\ ]\ Y$	X_n = 108,90
	$= -0{,}4\ n_B\,[\ z / y - z_n / y_n\ ]\ Y$	$n_A = n_B$ = 2,5
radial	$C_{AB} = [\ A^2 + B^2\ ]^{1/2}$	(background)
chromaticity	*linear chromaticity diagram (a, b)*	***compare to linear cone excitation***
red−green	$a = X / Y = x / y$	
yellow−blue	$b = -\ 0{,}4\ [Z / Y\ ] = -\ 0{,}4\ [z / y\ ]$	$L/(L+M)$
radial	$c_{ab} = [\ (\ a - a_n\ )^2 + (\ b - b_n\ )^2\ ]^{1/2}$	$S/(L+M)$

AES00−7N

higher colour metric (color data: nonlinear relation to CIE 1931 data)

nonlinear color terms	name and relationship with tristimulues or chromaticity values	notes
lightness	$L^* = 116\ (\ Y / 100\ )^{1/3} - 16$ $(Y > 0{,}8)$	CIELAB 1976
	approximation: $L^*=100\ (Y/100)^{1/2{,}4}$ $(Y>0)$	
chroma	*nonlinear transform chromatic values A, B*	
red−green	$a^* = 500\ [\ (\ X / X_n)^{1/3} - (\ Y / Y_n)^{1/3}\ ]$	CIELAB 1976
	$= 500\ (\ a' - a'_n\ )\ Y^{1/3}$	
yellow−blue	$b^* = 200\ [\ (\ Y / Y_n)^{1/3} - (\ Z / Z_n)^{1/3}\ ]$	**CIELAB 1976**
	$= 500\ (\ b' - b'_n\ )\ Y^{1/3}$	*n=D65*
radial	$C^*_{ab} = [\ a^{*2} + b^{*2}\ ]^{1/2}$	*(background)*
chromaticity	*nonlinear transform chromaticities x/y, z/y*	*compare to log cone excitation*
red−green	$a' = (\ 1 / X_n\ )^{1/3}\ (\ x / y\ )^{1/3}$	
	$= 0{,}2191\ (\ x / y\ )^{1/3}$ for D65	log[L / (L+M)]
yellow−blue	$b' = -\ 0{,}4\ (\ 1 / Z_n\ )^{1/3}\ (\ z / y\ )^{1/3}$	log[S / (L+M)]
	$= -\ 0{,}08376\ (\ z / y\ )^{1/3}$ for D65	
radial	$c'_{ab} = [\ (\ a' - a'_n\ )^2 + (\ b' - b'_n\ )^2\ ]^{1/2}$	

AES01−7N