

Colorimetric data for system lines TLS18 -> ORS18, TLS00, NRS18, SRS18

For input LCH^*_{a0} (TLS18) and output LCH^*_{am} for 4 systems ($m = 0$ to 4)
Six CIELAB hue angles of device ORS18: (37.7 96.4 150.9 236.0 305.0 353.7);
Six CIELAB hue angles of device TLS00: (40.0 102.8 136.0 196.4 306.3 328.2);
Six CIELAB hue angles of device NRS18: (25.5 92.3 162.2 217.0 271.7 328.6);
Six CIELAB hue angles of device SRS18: (30.0 90.0 150.0 210.0 270.0 330.0);

no. Colour	->TLS18 LCH^*_{a0}	->TLS18 n^*, c^*, H^*_{ai0}	ORS18 LCH^*_{a1}	TLS00 LCH^*_{a2}	NRS18 LCH^*_{a3}	SRS18 LCH^*_{a4}
01 O=000y	50.9 43.6 35	0.3 0.5 35	48.5 37.2 35	44.6 52.4 35	52.8 35.3 35	52.8 37.0 35
02 o10y	53.0 40.5 42	0.3 0.5 42	50.0 39.7 42	45.0 49.2 42	52.8 33.8 42	52.8 35.2 42
03 o20y	55.0 38.4 49	0.3 0.5 49	52.5 37.9 49	47.4 46.3 49	52.8 32.8 49	52.8 34.1 49
04 o30y	56.8 37.2 55	0.3 0.5 55	54.7 36.8 55	49.4 44.7 55	52.8 32.4 55	52.8 33.6 55
05 o40y	58.8 36.4 62	0.3 0.5 62	57.2 36.2 62	51.7 43.4 62	52.8 32.3 62	52.8 33.5 62
06 o50y	60.8 36.1 69	0.3 0.5 69	59.8 36.0 69	54.1 42.9 69	52.8 32.8 69	52.8 33.9 69
07 o60y	62.9 36.4 76	0.3 0.5 76	62.3 36.5 76	56.4 43.0 76	52.8 33.8 76	52.8 34.9 76
08 o70y	64.9 37.2 83	0.3 0.5 83	64.8 37.5 83	58.8 43.7 83	52.8 35.4 83	52.8 36.4 83
09 o80y	67.0 38.6 90	0.3 0.5 90	67.4 39.1 90	61.1 45.2 90	52.8 37.7 90	52.8 38.7 90
10 o90y	68.7 40.5 96	0.3 0.5 96	69.5 41.2 96	63.1 47.1 96	52.8 37.1 96	52.8 36.7 96
11 Y=y00l	70.8 43.5 103	0.3 0.5 103	67.3 43.9 103	65.4 46.5 103	52.8 34.8 103	52.8 35.0 103

Goal: Transfer coordinates LCH^*_{a0} (system m=0) to LCH^*_{am} (system m=1 to 4)

The given data LCH^*_{a0} include the device hue H^*_{a0}

Integer (i) device hue: $H^*_{ai0} = \text{round} (H^*_{a0})$ (1)

Fetch device data $LCH^*_{a,M0}$ from table with 361 entries for H^*_{ai0} from 0 to 360 degrees
Lightness, chroma, hue: $LCH^*_{a,M0} = LCH^*_{a,M0} [H^*_{ai0}]$ (2)

Calculate lcw^* data from LC^*_{a0} and $LC^*_{a,M0}$:

Relative lightness: $l^* = [L^*_{a0} - L^*_{N0}] / [L^*_{W0} - L^*_{N0}]$ (3)

Relative chroma: $c^* = C^*_{a0} / C^*_{a,M0}$ (4)

Relative Blackness: $n^* = 1 - l^* + c^* [L^*_{M0} - L^*_{N0}] / [L^*_{W0} - L^*_{N0}]$ (5)

Fetch device data $LCH^*_{a,Mm}$ from table with 361 entries for H^*_{ai0} from 0 to 360 degrees
lightness, chroma, hue: $LCH^*_{a,Mm} = LCH^*_{a,Mm} [H^*_{ai0}]$ (6)

For any input or output device (m=0 to 4) it is valid for constant $n^*, c^*, l^*, H^*_{a:}$:

CIELAB lightness: $L^*_m = L^*_{am} = L^*_{Nm} + l^* [L^*_{Wm} - L^*_{Nm}]$ (7)

Adated CIELAB chroma: $C^*_{am} = c^* C^*_{a,Mm}$ (8)

Adated CIELAB hue: $H^*_{am} = H^*_{a0}$ (9)

Result: device dependent adapted CIELAB data of 4 systems m=1 to 4:

lightness, chroma, hue: LCH^*_{am} (10)

Colorimetric data for system lines TLS18 -> ORS18, TLS00, NRS18, SRS18

For input olv^*_{30} (TLS18) and output LCH^*_{am} for 4 systems ($m = 0$ to 4)
Six CIELAB hue angles of device ORS18: (37.7 96.4 150.9 236.0 305.0 353.7);
Six CIELAB hue angles of device TLS00: (40.0 102.8 136.0 196.4 306.3 328.2);
Six CIELAB hue angles of device NRS18: (25.5 92.3 162.2 217.0 271.7 328.6);
Six CIELAB hue angles of device SRS18: (30.0 90.0 150.0 210.0 270.0 330.0);

	->TLS18						->TLS18			ORS18			TLS00			NRS18			SRS18				
no.	Colour	olv* ₃₀					n*, c*, H* _{si0}					LCH* _{a1}			LCH* _{a2}			LCH* _{a3}			LCH* _{a4}		
01	O=000y	0.7	0.2	0.2	0.3	0.5	30	48.5	37.2	35	44.6	52.4	35	52.8	35.3	35	52.8	37.0	35				
02	o10y	0.7	0.25	0.2	0.3	0.5	35	50.0	39.7	42	45.0	49.2	42	52.8	33.8	42	52.8	35.2	42				
03	o20y	0.7	0.3	0.2	0.3	0.5	41	52.5	37.9	49	47.4	46.3	49	52.8	32.8	49	52.8	34.1	49				
04	o30y	0.7	0.35	0.2	0.3	0.5	47	54.7	36.8	55	49.4	44.7	55	52.8	32.4	55	52.8	33.6	55				
05	o40y	0.7	0.4	0.2	0.3	0.5	53	57.2	36.2	62	51.7	43.4	62	52.8	32.3	62	52.8	33.5	62				
06	o50y	0.7	0.45	0.2	0.3	0.5	60	59.8	36.0	69	54.1	42.9	69	52.8	32.8	69	52.8	33.9	69				
07	o60y	0.7	0.5	0.2	0.3	0.5	67	62.3	36.5	76	56.4	43.0	76	52.8	33.8	76	52.8	34.9	76				
08	o70y	0.7	0.55	0.2	0.3	0.5	73	64.8	37.5	83	58.8	43.7	83	52.8	35.4	83	52.8	36.4	83				
09	o80y	0.7	0.6	0.2	0.3	0.5	79	67.4	39.1	90	61.1	45.2	90	52.8	37.7	90	52.8	38.7	90				
10	o90y	0.7	0.65	0.2	0.3	0.5	84	69.5	41.2	96	63.1	47.1	96	52.8	37.1	96	52.8	36.7	96				
11	Y=y00l	0.7	0.7	0.2	0.3	0.5	90	67.3	43.9	103	65.4	46.5	103	52.8	34.8	103	52.8	35.0	103				

Goal: Transfer coordinates olv^*_{30} (system m=0) to LCH^*_{am} (system m=1 to 4)

The following equations for relative blackness and chroma are valid for any device:

$$n^* = 1 - \max (o^*_{30}, l^*_{30}, v^*_{30}) \quad (1)$$

$$c^* = \max (o^*_{30}, l^*_{30}, v^*_{30}) - \min (o^*_{30}, l^*_{30}, v^*_{30}) \quad (2)$$

For the calculation of the missing relative device hue assume

as a starting point that the three values olv^*_{30} belong to the standard (s) device SRS18:

relative red-green chroma: $a^*_{r0} = o^*_{30} \cos(30) + l^*_{30} \cos(150)$ (3)

relative yellow-blue chroma: $b^*_{r0} = o^*_{30} \sin(30) + l^*_{30} \sin(150) - v^*_{30} \sin(270)$ (4)

Standard integer hue: $H^*_{si0} = \text{round} [\text{atan} (b^*_{r0} / a^*_{r0})]$ (5)

Fetch device integer hue: $H^*_{ai0} = H^*_{si-ai} [H^*_{si0}]$ (6)

Fetch device data $LCH^*_{a,M0}$ from table with 361 entries for H^*_{ai0} from 0 to 360 degrees

Lightness, chroma, hue: $LCH^*_{a,M0} = LCH^*_{a,M0} [H^*_{ai0}]$ (7)

Fetch device data $LCH^*_{a,Mm}$ from table with 361 entries for H^*_{ai0} from 0 to 360 degrees

lightness, chroma, hue: $LCH^*_{a,Mm} = LCH^*_{a,Mm} [H^*_{ai0}]$ (8)

For any input or output device (m=0 to 4) it is valid for constant $n^*, c^*, l^*, H^*_{a:}$:

CIELAB lightness: $L^*_m = L^*_{am} = L^*_{Nm} + l^* [L^*_{Wm} - L^*_{Nm}]$ (9)

Adated CIELAB chroma: $C^*_{am} = c^* C^*_{a,Mm}$ (10)

Adated CIELAB hue: $H^*_{am} = H^*_{a,M0} = H^*_{a,Mm}$ (11)

Result: device dependent adapted CIELAB data of 4 systems m=1 to 4:

lightness, chroma, hue: LCH^*_{am} (12)