Hyperbolic response function of achromatic vision space T^*_{HYP3}

nonlinear color terms	name and relationship with test field luminance L	notes
threshold sum T^*_{HYP3}	$T^*_{HYP3} = A_1 \cdot L^t / (L^t + A_2)$; $X = L^t$ $= A_1 \cdot X / (X + A_2)$; $dX/dL = t \cdot X^{t-1}$ alternative: $A_2 = A_{2x}^t$	*T. Seim* 2014: exponent: t = 0,8 for presentation time: t_p = 0,1s of *Avramopoulos* experiments 1989 Hyperbolic function: $T^*_{max} = A_1$ $T^*_{average} = 0,5 \cdot A_1$ $A_{2x} = A_2^{1/t}$
CIE luminance contrast sensitivity threshold L / dL	$dT^*_{HYP3} / dX = A_1 \cdot A_2 / (X + A_2)^2$ $dT^*_{HYP3} / dL = dT^*_{HYP3} / dX \cdot dX / dL$ $dT^*_{HYP3} / dL = A_1 \cdot A_2 \cdot t \cdot X^{t-1} / (X + A_2)^2$ *for* dT^*_{HYP3}=1, and multiplication with L: $L / dL = A_1 \cdot A_2 \cdot t \cdot X / (X + A_2)^2$ $= A_1 \cdot A_2 \cdot t \cdot L^t / (L^t + A_2)^2$	
CIE luminance difference threshold dL	$dL = L \cdot (L^t + A_2)^2 / (A_1 \cdot A_2 \cdot t \cdot L^t)$ $= (L^t + A_2)^2 / (A_1 \cdot A_2 \cdot t \cdot L^{t-1})$	

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Potential response function of achromatic vision space T^*_{POT3}

nonlinear color terms	name and relationship with test field luminance L	notes
threshold sum T^*_{POT3}	$T^*_{POT3} = A_1 \cdot [(1+A_3 \cdot L)^t - 1]$; $X = 1 + A_3 \cdot L$ $= A_1 \cdot [X^t - 1]$; $dX/dL = A_3$ = ??	*K. Richter* 1988: exponent: t = −0,25 for presentation time: t_p = 0,1s (*Lingelbach* experiments 1977)
CIE luminance contrast sensitivity threshold L / dL	$dT^*_{POT3} / dX = A_1 \cdot t \cdot X^{t-1}$ $dT^*_{POT3} / dL = dT^*_{POT3} / dX \cdot dX / dL$ $dT^*_{POT3} / dL = A_1 \cdot t \cdot X^{t-1} \cdot A_3$ *for* dT^*_{POT3}=1, and multiplication with L: $L / dL = A_1 \cdot L \cdot t \cdot A_3 \cdot X^{t-1}$ $= A_1 \cdot L \cdot t \cdot A_3 \cdot [1 + A_3 L]^{t-1}$	for large L: $T^*_{POT3} = A_1 \cdot A_3 \cdot L^t$
CIE luminance difference threshold dL	$dL = 1 / (A_1 \cdot t \cdot A_3 \cdot X^{t-1})$ $= 1 / (A_1 \cdot t \cdot A_3 \cdot [1 + A_3 \cdot L]^{t-1})$	for least square fit: $dX/dA3$ = 1 dX/dL = A_3

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Potential response function of achromatic vision space T^*_{POT4}

nonlinear color terms	name and relationship with test field luminance L	notes
threshold sum T^*_{POT4}	$T^*_{POT4} = A_0 \cdot [(A_1+A_3 \cdot L)^n - 1]$; $X = A_1 + A_3 \cdot L$ $= A_0 \cdot [X^n - 1]$; $dX/dL = A_3$ $= V \cdot (L_s/s)^n \cdot [(1 - s + s \cdot L / L_s)^n - 1]$	*K. Richter* 1988: exponent: n = −0,25 or: $t = 1 - n$ = 1,25 for presentation time: t_p = 0,4s (*Lingelbach* experiments 1977) threshold data s, L_s: $s = 1 - A_1$ $L_s = (1 - A_1) / A_3$ $V = A_0 \cdot (L_s / s)^{-n}$ $s = 1/[1+(n \, V \, L^n)^{1/(1-n)}]$
CIE luminance contrast sensitivity threshold L / dL	$dT^*_{POT4} / dX = A_0 \cdot n \cdot X^{n-1}$ $dT^*_{POT4} / dL = dT^*_{POT4} / dX \cdot dX / dL$ $dT^*_{POT4} / dL = A_0 \cdot n \cdot X^{n-1} \cdot A_3$ *for* dT^*_{POT4}=1, and multiplication with L: $L / dL = A_0 \cdot L \cdot n \cdot A_3 \cdot X^{n-1}$ $= A_0 \cdot L \cdot n \cdot A_3 \cdot [A_1+A_3 L]^{n-1}$	for large L: $T^*_{POT4} = V \cdot L^n$
CIE luminance difference threshold dL	$dL = 1 / (A_0 \cdot n \cdot A_3 \cdot X^{n-1})$ $= A_4 \cdot (A_1+A_3 L)^t$; $A_4 = 1/(A_0 \cdot n \cdot A_3)$	for least square fit: $dX/dA1$ = 1 $dX/dA3$ = L dX/dL = A_3

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Potential response function of achromatic vision space T^*_{POT4}

nonlinear color terms	name and relationship with test field luminance L	notes
threshold sum T^*_{POT4}	$T^*_{POT4} = A_4 \cdot [(A_1+A_3 \cdot L)^t - 1]$; $X = A_1 + A_3 \cdot L$ $= A_4 \cdot [X^t - 1]$; $dX/dL = A_3$ $= V \cdot (L_s/s)^t \cdot [(1 - s + s \cdot L / L_s)^t - 1]$	*K. Richter* 1988: exponent: t = −0,25 or: $n = 1 - t$ = 1,25 for presentation time: t_p = 0,4s (*Lingelbach* experiments 1977) threshold data s, L_s: $s = 1 - A_1$ $L_s = (1 - A_1) / A_3$ $V = A_4 \cdot (L_s / s)^{-t}$ $s = 1/[1+(t \, V \, L^t)^{1/(1-n)}]$
CIE luminance contrast sensitivity threshold L / dL	$dT^*_{POT4} / dX = A_4 \cdot t \cdot X^{t-1}$ $dT^*_{POT4} / dL = dT^*_{POT4} / dX \cdot dX / dL$ $dT^*_{POT4} / dL = A_4 \cdot t \cdot X^{t-1} \cdot A_3$ *for* dT^*_{POT4}=1, and multiplication with L: $L / dL = A_4 \cdot L \cdot t \cdot A_3 \cdot X^{t-1}$ $= A_4 \cdot L \cdot t \cdot A_3 \cdot [A_1+A_3 L]^{t-1}$	for large L: $T^*_{POT4} = V \cdot L^t$
CIE luminance difference threshold dL	$dL = 1 / (A_4 \cdot t \cdot A_3 \cdot X^{t-1})$ $= (A_1+A_3 L)^n / (A_4 \cdot t \cdot A_3)$	for least square fit: $dX/dA1$ = 1 $dX/dA3$ = L dX/dL = A_3

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