line element of *Stiles* (1946) with „color values" *P*, *D*, *T*

three separate color signal functions

$F(P) = c\,i \log(1+9P)$
$F(D) = c\,j \log(1+9D)$
$F(T) = c\,k \log(1+9T)$

***Taylor*-derivations (*c*=1/(ln 10)):**

$\Delta F(P, D, T) = \frac{dF}{dP}\Delta P + \frac{dF}{dD}\Delta D + \frac{dF}{dT}\Delta T$

$= \frac{9ci}{1+9P}\Delta P + \frac{9cj}{1+9D}\Delta D + \frac{9ck}{1+9T}\Delta T$

VE170−1

line element of *Vos&Walraven* (1972) with „color values" *P*, *D*, *T*

three separate color signal functions

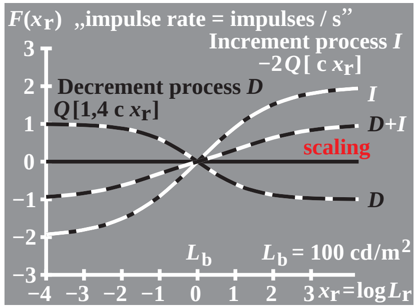
$F(P) = -2i\sqrt{P}$
$F(D) = -2j\sqrt{D}$
$F(T) = -2k\sqrt{T}$

***Taylor*-derivations:**

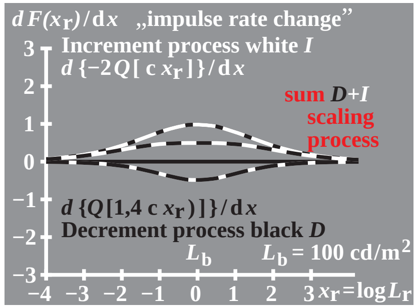
$\Delta F(P, D, T) = \frac{dF}{dP}\Delta P + \frac{dF}{dD}\Delta D + \frac{dF}{dT}\Delta T$

$\Delta F(P, D, T) = \frac{i}{\sqrt{P}}\Delta P + \frac{j}{\sqrt{D}}\Delta D + \frac{k}{\sqrt{T}}\Delta T$

VE170−2



VE171−1



VE171−2

functions $q[n x_r]$ for „achromatic signal"-description

with $x_r = \log L_r = \log L / L_b$
(L_b = background lumininance)

$q[nx_r]=1+1/[1+\sqrt{2}\ 10^{nx_r}]$

function values (with $n = k \log e$):

$q[nx_r \to +\infty] = 1$
$q[nx_r = 0] = \sqrt{2}$
$q[nx_r \to -\infty] = 2$

VE170−3

„achromatic signal"-description functions $Q_{lm}[n\,x_r]$

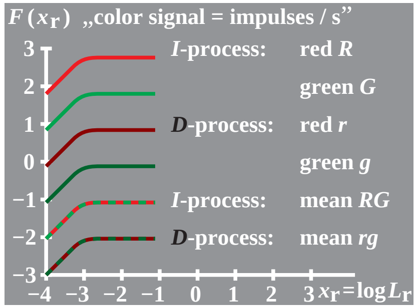
with $x_r = \log L_r$
(L_r = relative luminance)

$Q_{lm}[n\,x_r] = \frac{l}{\log\sqrt{2}} \log q[n\,x_r] - m$

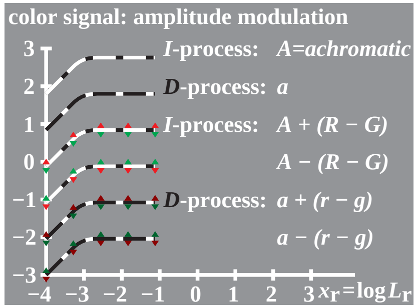
function values with $l = m = 1$:

$Q[n\,x_r \to +\infty] = 1$
$Q[n\,x_r = 0] = 0$
$Q[n\,x_r \to -\infty] = -1$

VE170−4



VE171−3



VE171−4

„achromatic signal" sensitivity as function of relative luminance
$g = \log H = n\,x_r$

$Q' = \frac{d}{dH}[\log\{1+1/(1+\sqrt{2}H)\}]/\log\sqrt{2}$
$= -\sqrt{2}/[\log\sqrt{2}(1+\sqrt{2}H)(2+\sqrt{2}H)]$

function values:

$Q'[n\,x_r \to +\infty] = 0$
$Q'[n\,x_r = 0] = -0{,}5$
$Q'[n\,x_r \to -\infty] = 0$

VE170−5

relative luminance sensitivity $L_r / \Delta L_r$ as function of H

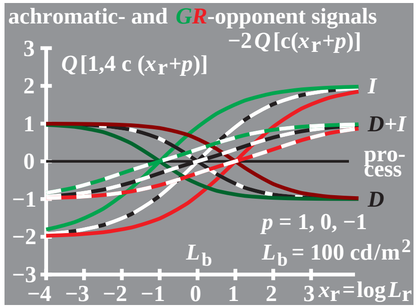
$L_r = 10^{x_r}$ $H = 10^{n\,x_r}$ c = ln 10
$dL_r/dx = c\,L_r$ $dH/dx = c\,n\,H$

it follows: $L_r / \Delta L_r = [n H / (dH\,c)]$

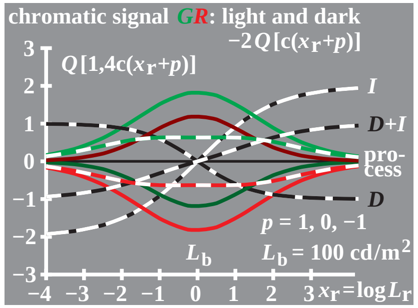
$L_r/dL_r = \mathrm{const}H/[(1+\sqrt{2}H)(2+\sqrt{2}H)]$

$Q'[n\,x_r \to +\infty] = 0$
$Q'[n\,x_r = 0]$ = maximum
$Q'[n\,x_r \to -\infty] = 0$

VE170−6



VE171−5



VE171−6

double line element of *Richter* (2006) for the lighting technic with relative luminance $L_r = F(L, M, S)$

luminance signal function $F(L_r)$

$F(L_r) = iQ(H) = \begin{cases} \underline{i}\ Q(\underline{H})\ (x_r<0) \\ \bar{i}\ Q(\bar{H})\ (x_r \geq 0) \end{cases}$

with: $\underline{n}$= 1,4 c $\bar{n}$= c $\underline{i}$=1 $\bar{i}$=−2
$x_r = \log L_r$
$H=10^{nx_r}$ $\underline{H}=10^{\underline{n}x_r}$ $\bar{H}=10^{\bar{n}x_r}$

VE170−7

double line element of *Richter* (2006) for the lighting technic with relative luminance $L_r = F(L, M, S)$

luminance signal function $F(L_r)$

$F(L_r) = iQ(H)$ $H = 10^{nx_r}$

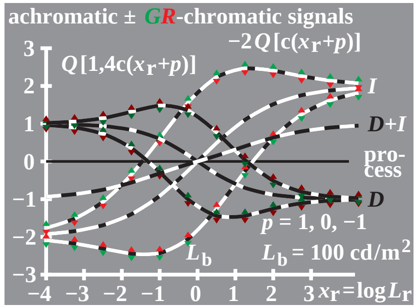
$Q[\log\{1+1/(1+\sqrt{2}H)\}]/\log\sqrt{2} - 1$

Taylor-derivations:

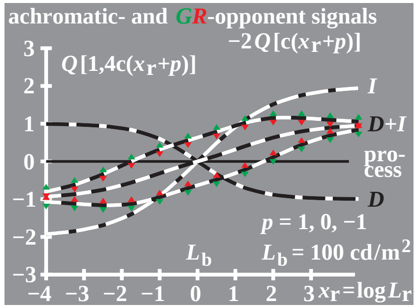
$\Delta F(L_r) = \frac{dF}{dL_r}\Delta L_r = i\,\frac{dQ}{dH}\Delta H$

$= -i\sqrt{2}\Delta H/[\log\sqrt{2}(1+\sqrt{2}H)(2+\sqrt{2}H)]$

VE170−8



VE171−7



VE171−8

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