

Derivation of achromatic receptor response

$$F'_{ab}[x_r/a] \quad x_r = \log(\text{relative luminance})$$

with $x_r = \log [L/L_u]$ (L = test luminance)

L_u = surround luminance

$$F'_{ab}[x_r/a] = \frac{4b}{a' \{10^{x_r/a'} + 10^{-x_r/a'}\}^2} = \frac{b}{a' \sinh^2[x_r/a']}$$

function values for $b=1$ and $a' = a \ln(10) > 0$:

$$F'_{a1}[x_r/a' \rightarrow -\infty] = 0 \quad x = \log L, \quad u = \log L_u$$

$$F'_{a1}[x_r/a' = 1] = 1 \quad x_r = \log [L/L_u]$$

$$F'_{a1}[x_r/a' \rightarrow +\infty] = 0 \quad = x - u$$