

## Line-element equations for thresholds and scaling

Colour-discrimination function  $f(y) = \Delta Y = \Delta y Y_u$  [0]

$$\Delta Y = 1/[y(1+y)] = 1/y - 1/(1+y) \quad y = 1 + \sqrt{2} e^{k(u_r)}, \quad u_r = \ln Y_r$$

$$f_u(y) = \frac{\Delta Y}{\Delta Y_u} = \frac{y}{2} - \frac{1+y}{3} \quad y = 1 + Y/Y_u, \quad dy = dx \quad [1]$$

$$F_u(y) = \int \frac{f'_u(y)}{f_u(y)} dy = \int \frac{1}{y} dy - \int \frac{1}{1+y} dy \quad [2]$$

Example for  $L^*(y)$  &  $\Delta Y$  with  $y = 1 + Y/Y_u$ ,  $y_u = 2$ :

$$L^*_u(y) = \frac{L^*(y)}{L^*(y_u)} = \frac{\ln(y)}{\ln(2)} - \frac{\ln(1+y)}{\ln(3)} \quad [3]$$

$$f_u(y) = \frac{\Delta Y}{\Delta Y_u} = \frac{1+Y_r}{2} - \frac{1+0,5 Y_r}{1,5} \quad [4]$$

see K. Richter (1996), Computer Graphic and Colorimetry, p. 113–127

<http://color.li.tu-berlin.de/BUA4BF.PDF>