

Red Green Blue

Cyan Magenta Yellow Black

$$\begin{pmatrix} C \\ M \\ Y \end{pmatrix} = \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix} - \begin{pmatrix} R \\ G \\ B \end{pmatrix}$$

Hue Saturation Intensity or Value

In MATLAB HSV = rgb2hsv(RGB);

Intensity is average of R,G,B

$$I = \frac{R + G + B}{3}$$

HUE: angle goes from zero to 2π with respect to the R axis

RED to YELLOW to GREEN to CYAN to BLUE to MAGENTA to RED

$$\cos(\theta) = \frac{\frac{1}{2}[(R-G) + (R-B)]}{\left[(R-G)^2 + (R-G)(G-B) \right]^{\frac{1}{2}}}$$

SATURATION goes from 0 to 1

from black to pure color

$$S = 1 - \frac{\min(R, G, B)}{I}$$

CIELAB L*a*b* device independent

$$L^* = 116h\left(\frac{Y}{Y_w}\right) - 16$$

$$a^* = 500 \left[h\left(\frac{X}{X_w}\right) - h\left(\frac{Y}{Y_w}\right) \right]$$

$$b^* = 200 \left[h\left(\frac{Y}{Y_w}\right) - h\left(\frac{Z}{Z_w}\right) \right]$$

$$h(q) = \begin{cases} \sqrt[3]{q} & q > 0.008856 \\ 7.787q + \frac{16}{116} & q \leq 0.008856 \end{cases}$$

X_w, Y_w, Z_w are reference tristimulus values – e.g. the white of a perfectly reflecting

diffuser under CIE standard D65 illumination

$x=0.3127$ $y=0.3290$ in CIE chromacity diagram

L=lightness

a= red – green

b = green - blue