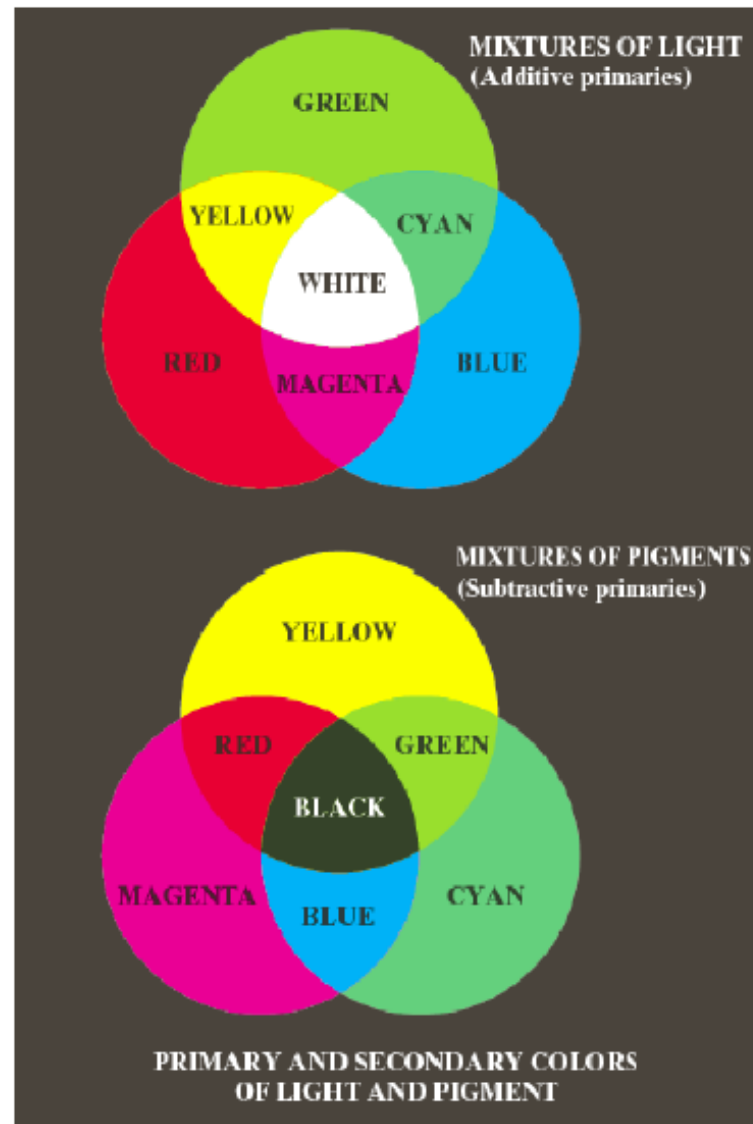

PONTIFÍCIA UNIVERSIDADE CATÓLICA DE GOIÁS
DEPARTAMENTO DE COMPUTAÇÃO
COMPUTAÇÃO GRÁFICA CMP 1170 – 2019/1
PROF. MSC. GUSTAVO SIQUEIRA VINHAL

Aula 10

Cor e Visão Humana

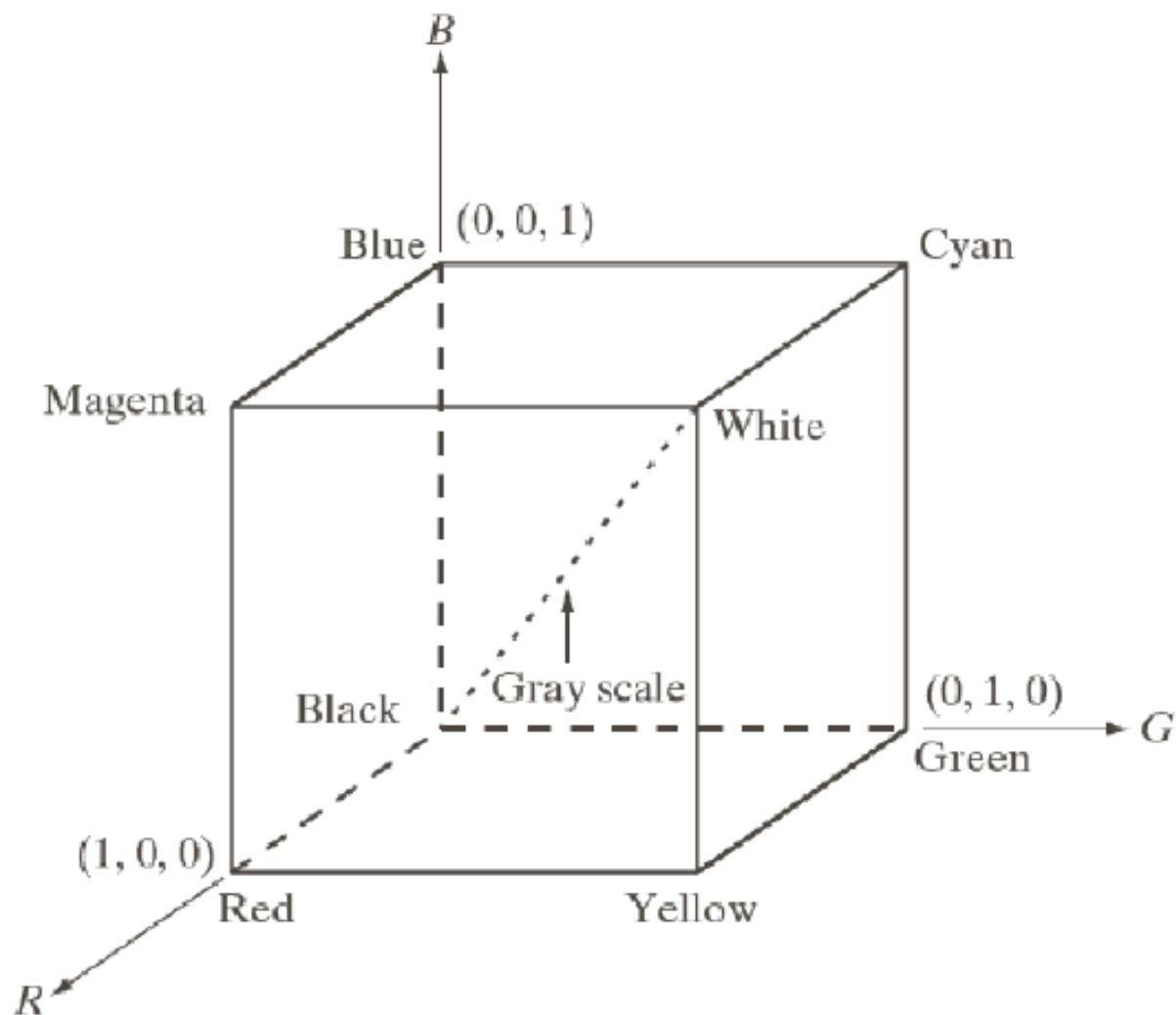
(continuação)



Espaço de Cores:

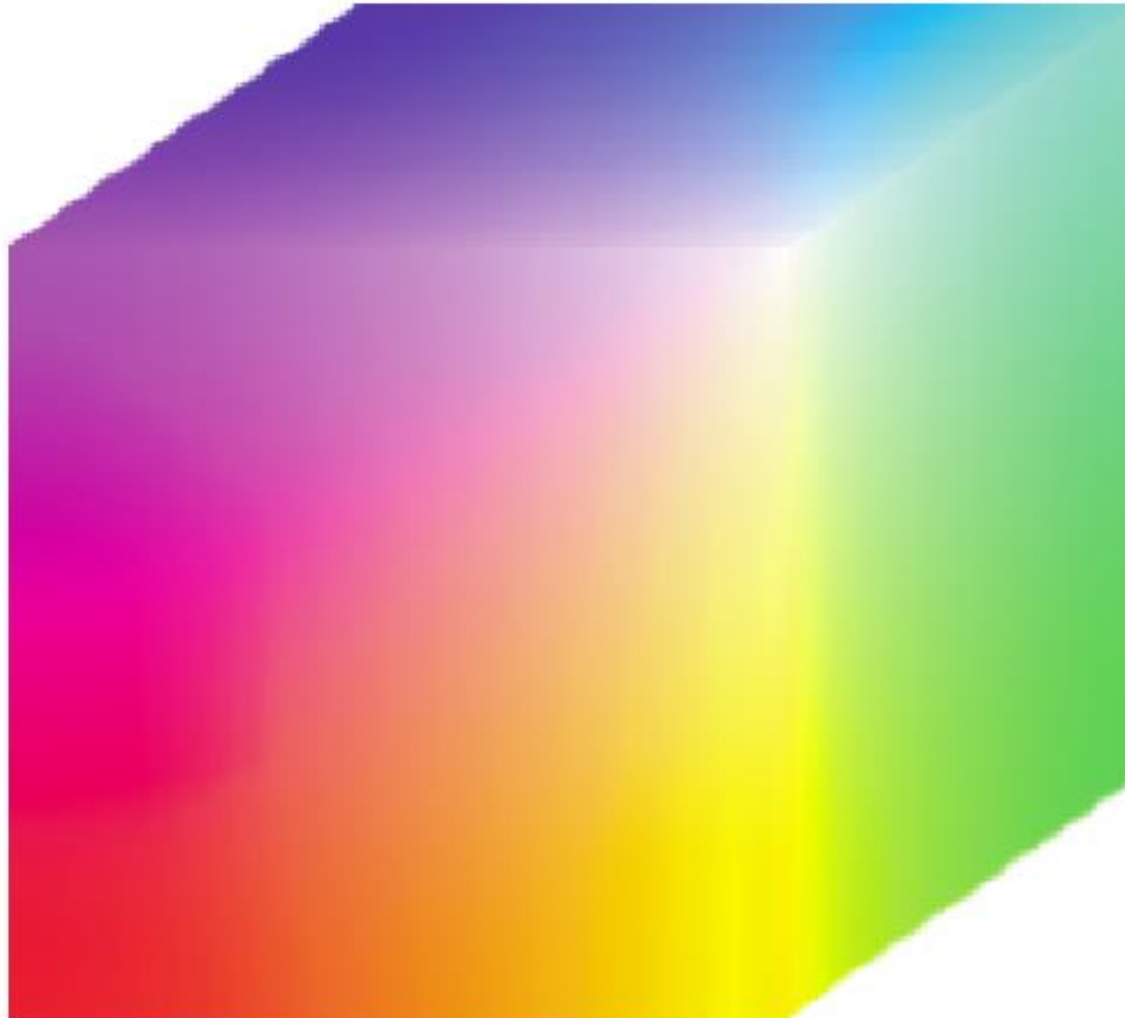
- **RGB** (red, green, blue)
 - monitores e câmeras
- **CMY** (cyan, magenta, yellow)
 - impressoras
- **CMYK** (cyan, magenta, yellow, black)
 - impressoras
- **HSO** (hue, saturation, intensity)
 - modelo perceptivo
 - separa a intensidade – usada por dispositivos em preto e branco (tons de cinza)

RGB

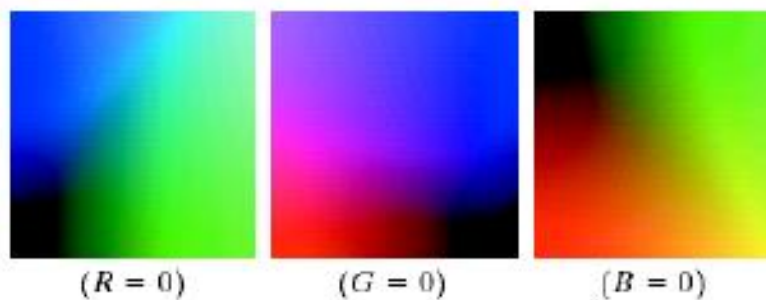
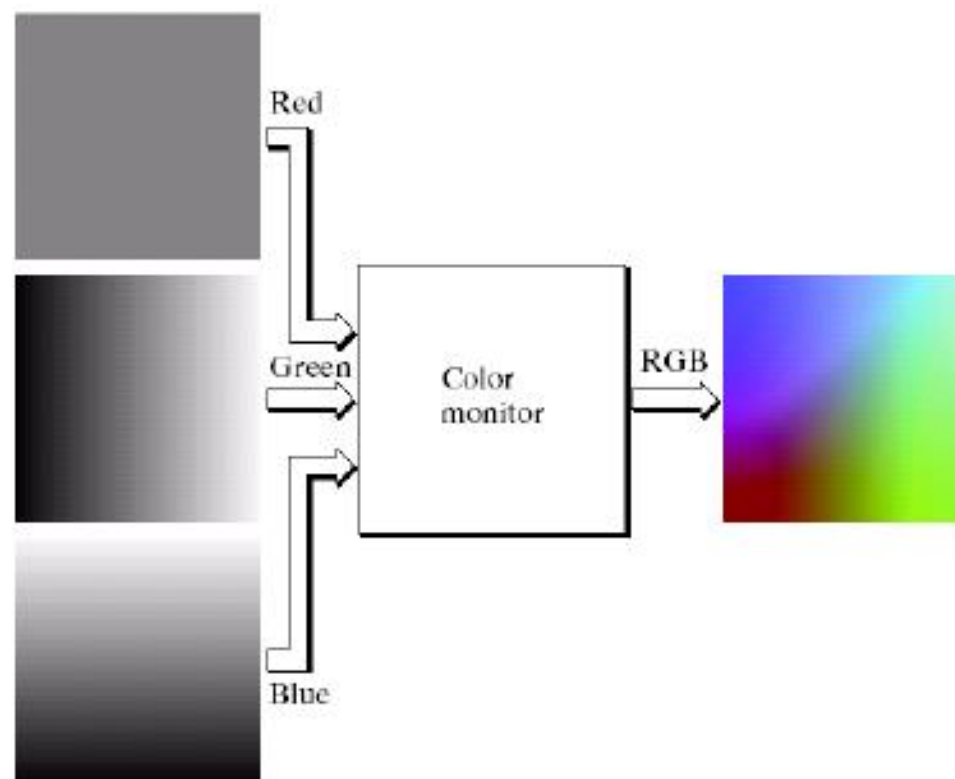


RGB

- 24 bits – 8×3 (full color) (R,G,B)
- number of colors = $(2^8)^3 = 16\,777\,216$



RGB

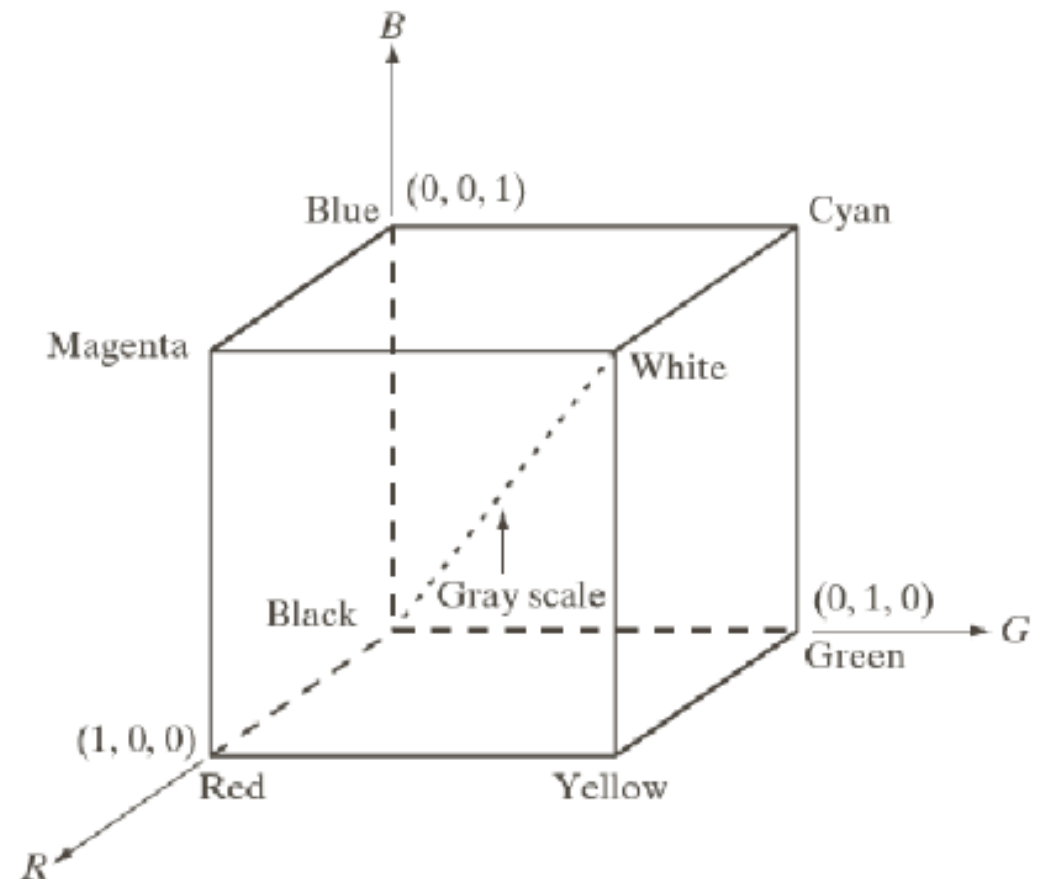


CMY e CMYK

- **CMY**: Cores primárias para pigmentos

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

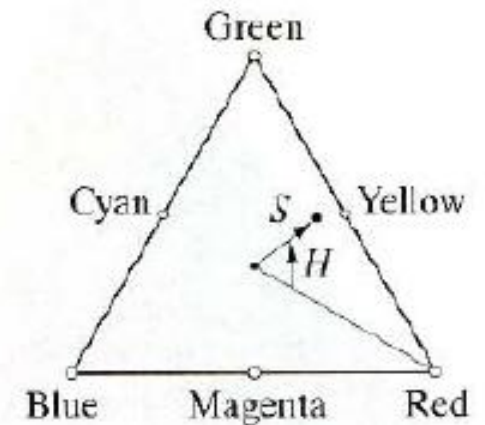
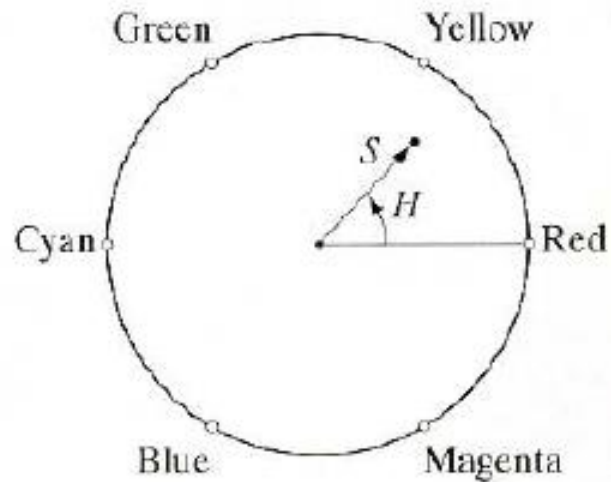
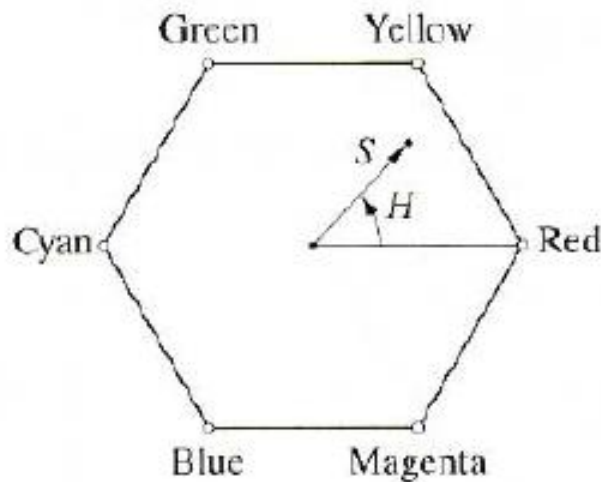
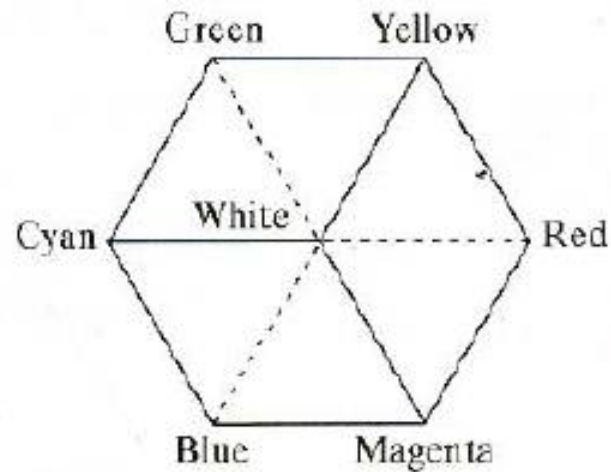
- **CMYK**: Preto é adicionado para evitar aspecto apagado do preto.



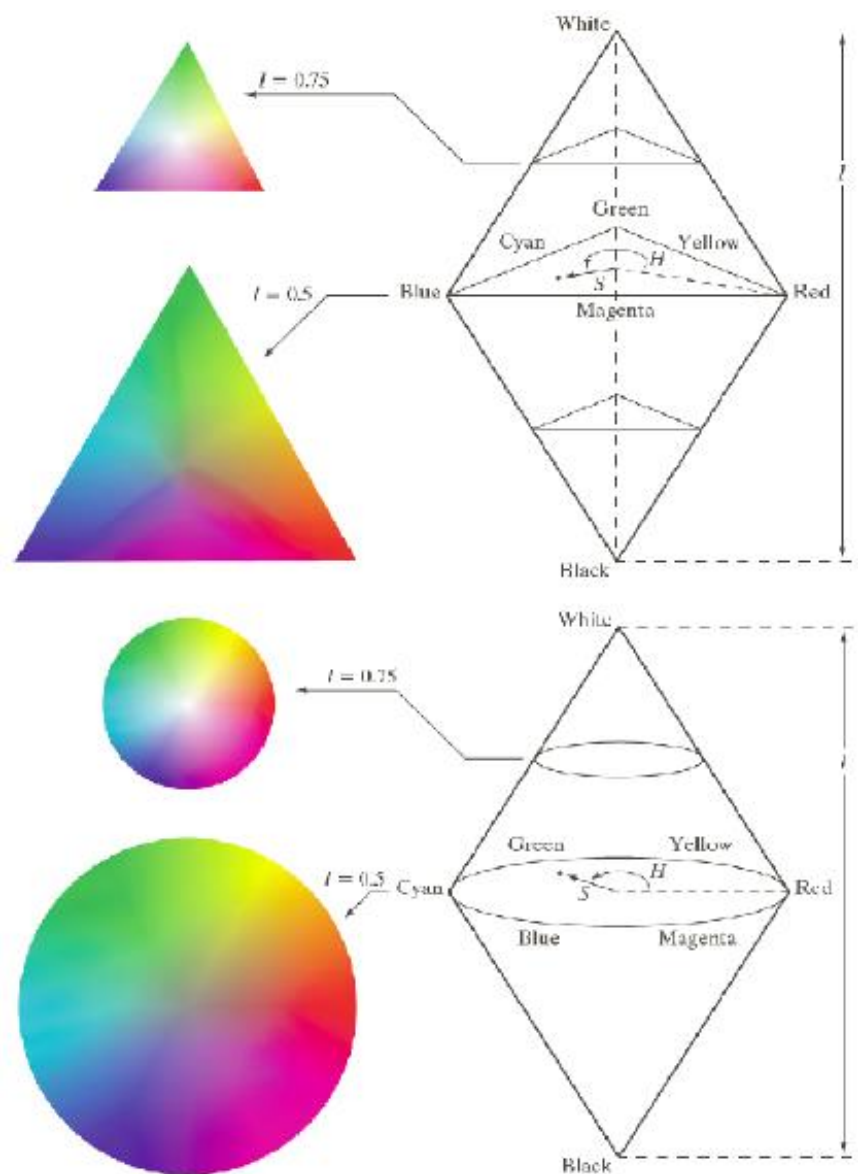
HSI

- Mais próximo da maneira como percebemos as cores:
 - Tonalidade (hue), saturação (saturation), intensidade (intensity)
- Produção e reprodução de cor
- Isolamento da componente de intensidade
 - níveis de cinza

HSI



HSI



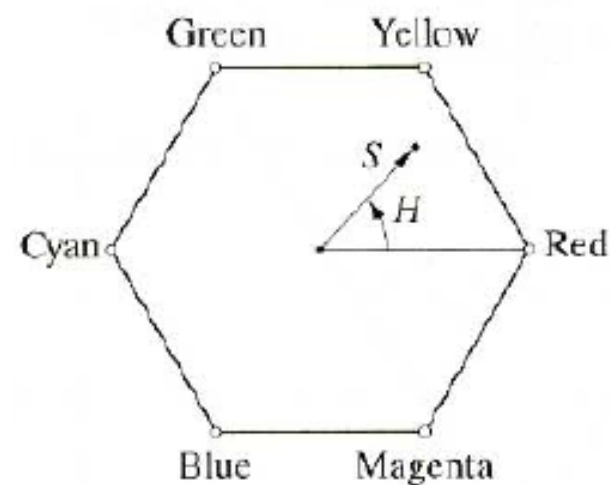
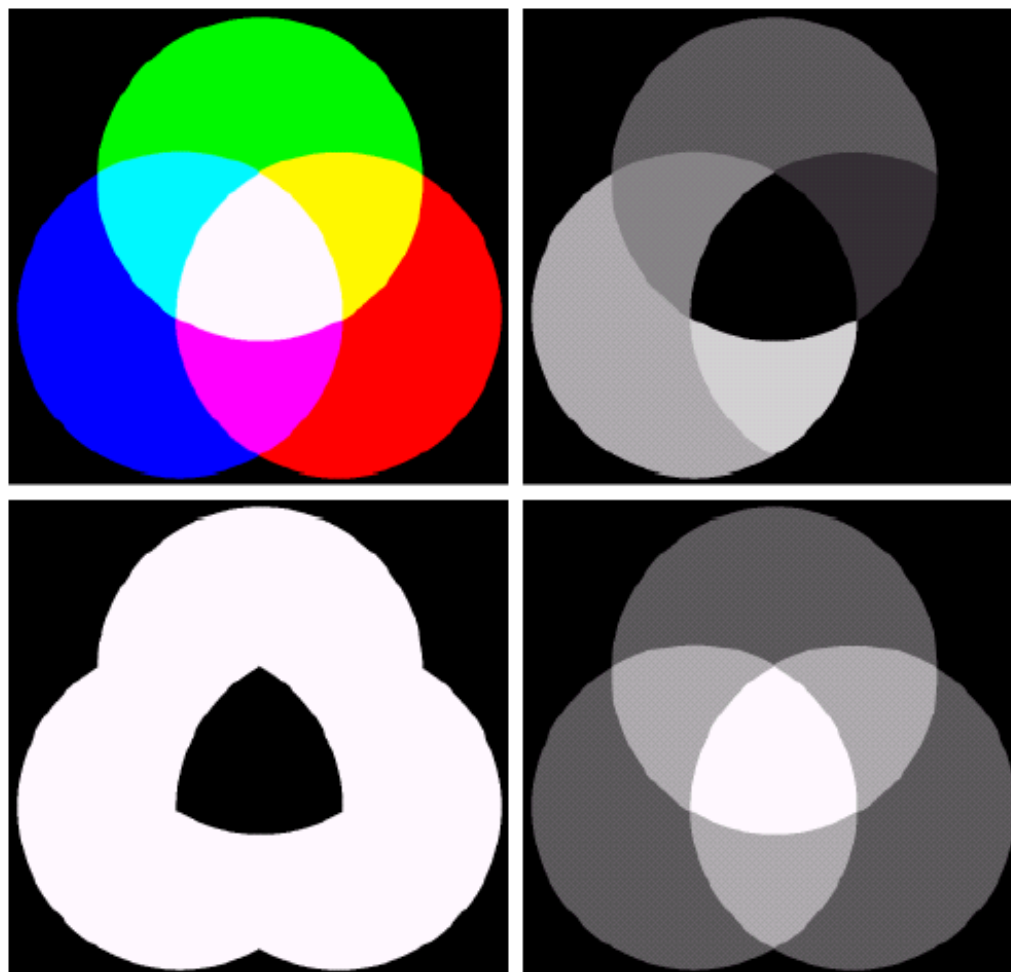
Conversão RGB para HSI

$$H = \begin{cases} 0, & \text{se } B \leq G \\ 360 - \theta, & \text{se } B > G \end{cases}$$

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

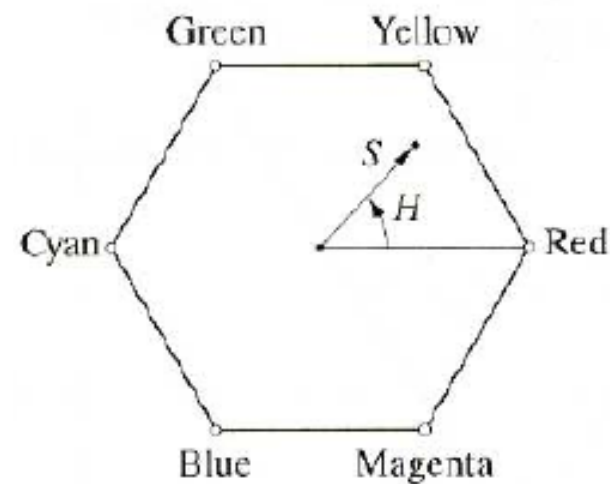
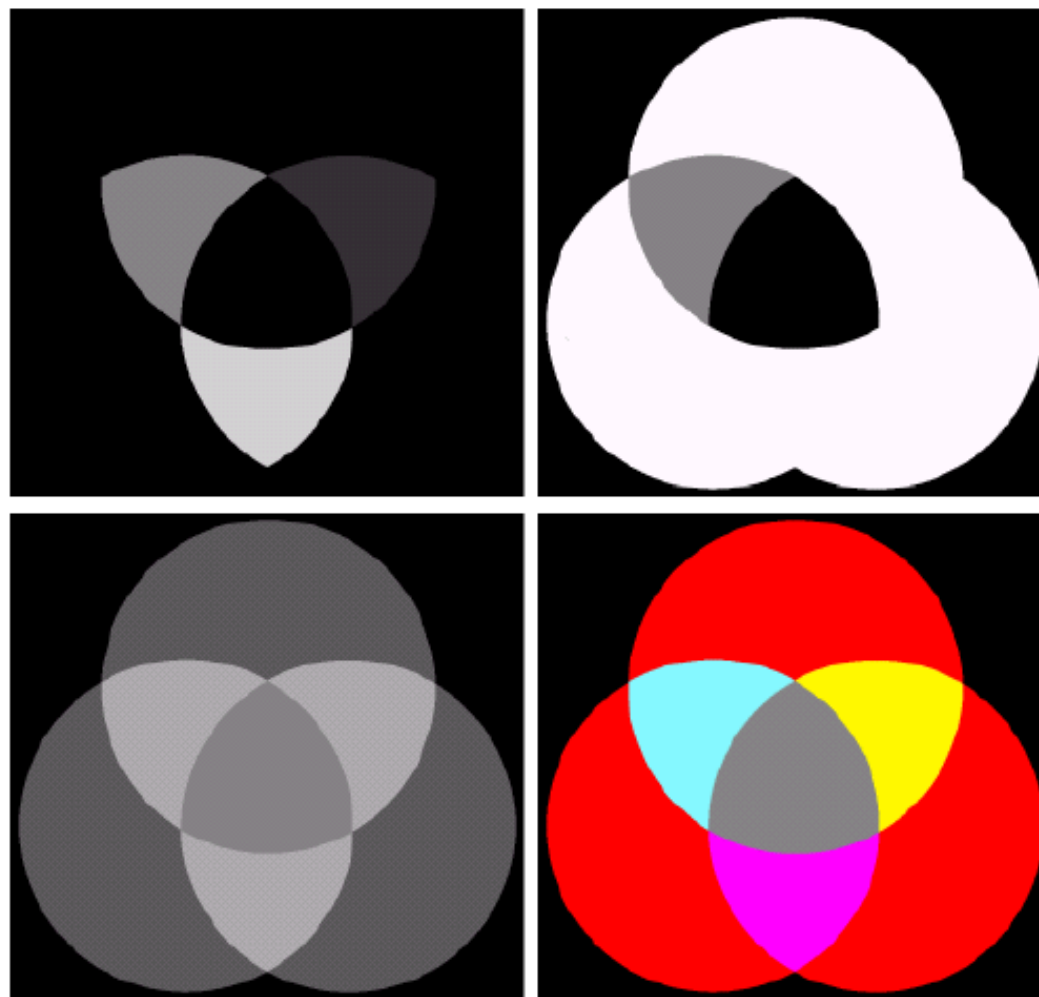
$$S = 1 - \frac{3}{(R + G + B)} \min(R, G, B)$$

$$I = \frac{1}{3}(R + G + B)$$



a b
c d

FIGURE 6.16 (a) RGB image and the components of its corresponding HSI image: (b) hue, (c) saturation, and (d) intensity.



a	b
c	d

FIGURE 6.17 (a)–(c) Modified HSI component images. (d) Resulting RGB image. (See Fig. 6.16 for the original HSI images.)

CG – Cor e Visão Humana



Full color

Imagem colorida e suas componentes em vários espaços de cores.

CMYK



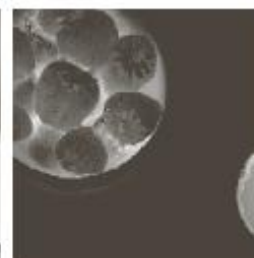
Cyan



Magenta



Yellow



Black

RGB



Red



Green



Blue

HSI



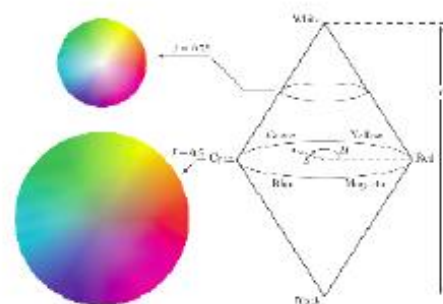
Hue



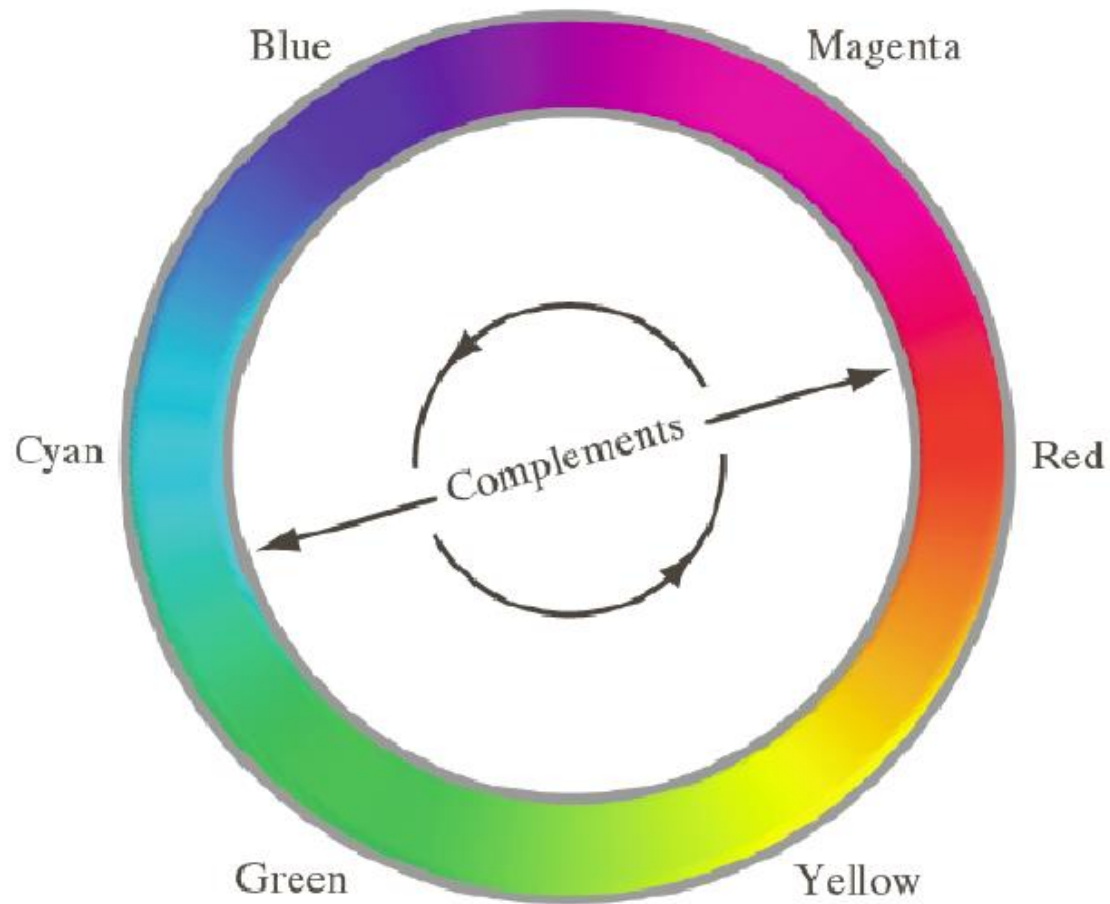
Saturation



Intensity



Círculo de cores



Balanceamento de Cores para imagens CMYK



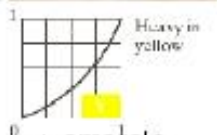
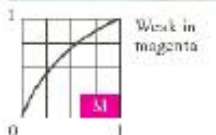
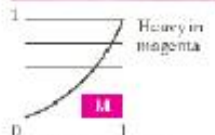
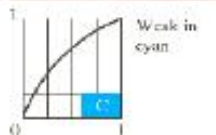
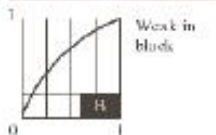
Original/Corrected

clarear

+ cyan
 $+(G+B) == -R$

-cyan
 $-(G+B) == +R$

escurecer



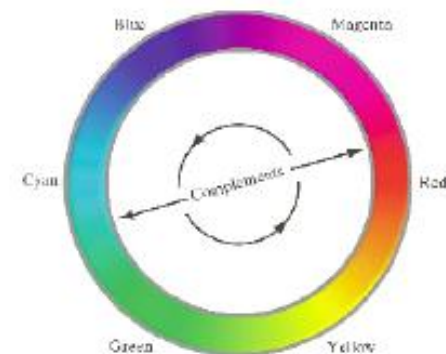
+ magenta
 $+(R+B) == -G$

- magenta
 $-(R+B) == +G$

+ amarelo
 $+(G+R) == -B$

-r amarelo
 $-(G+R) == +B$

Cyan = G+B
Magenta = R+B
Yellow = R+G



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