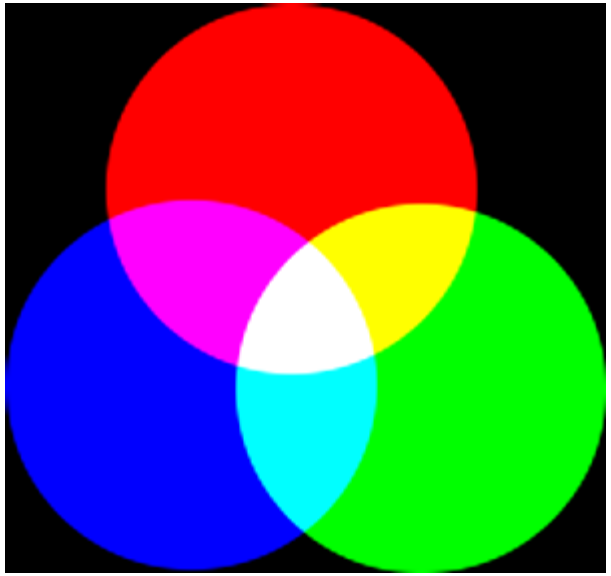
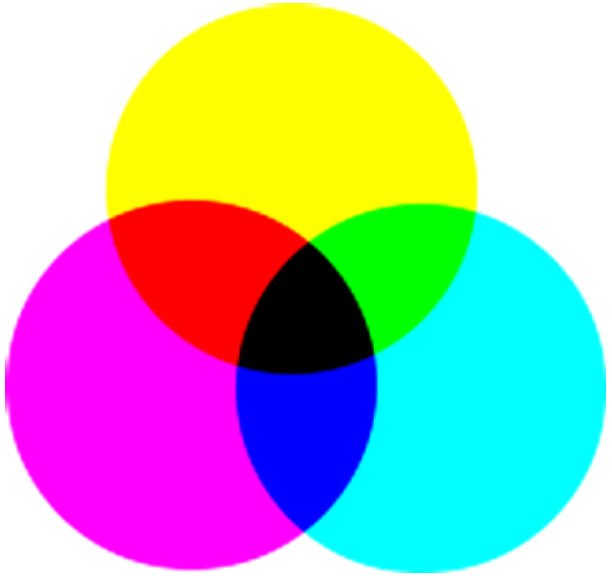
彩色图像处理
Color Image Processing

加色vs减色系统

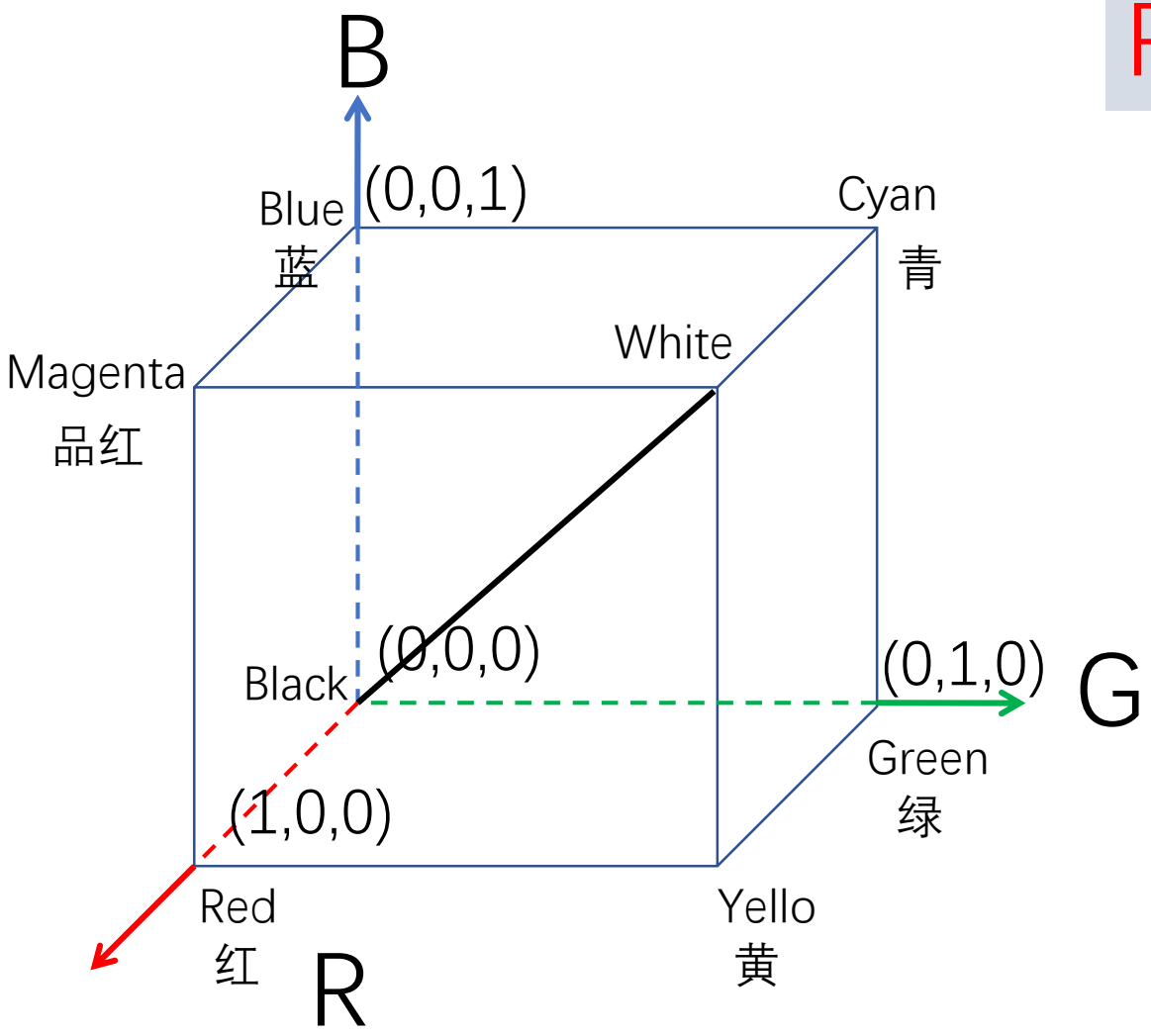


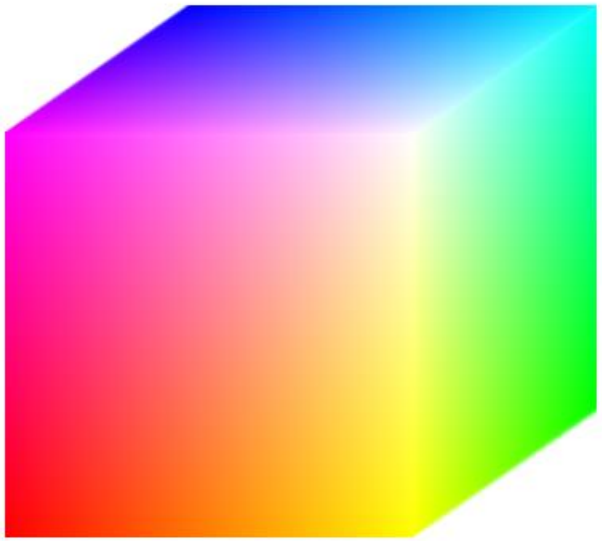
加色系统

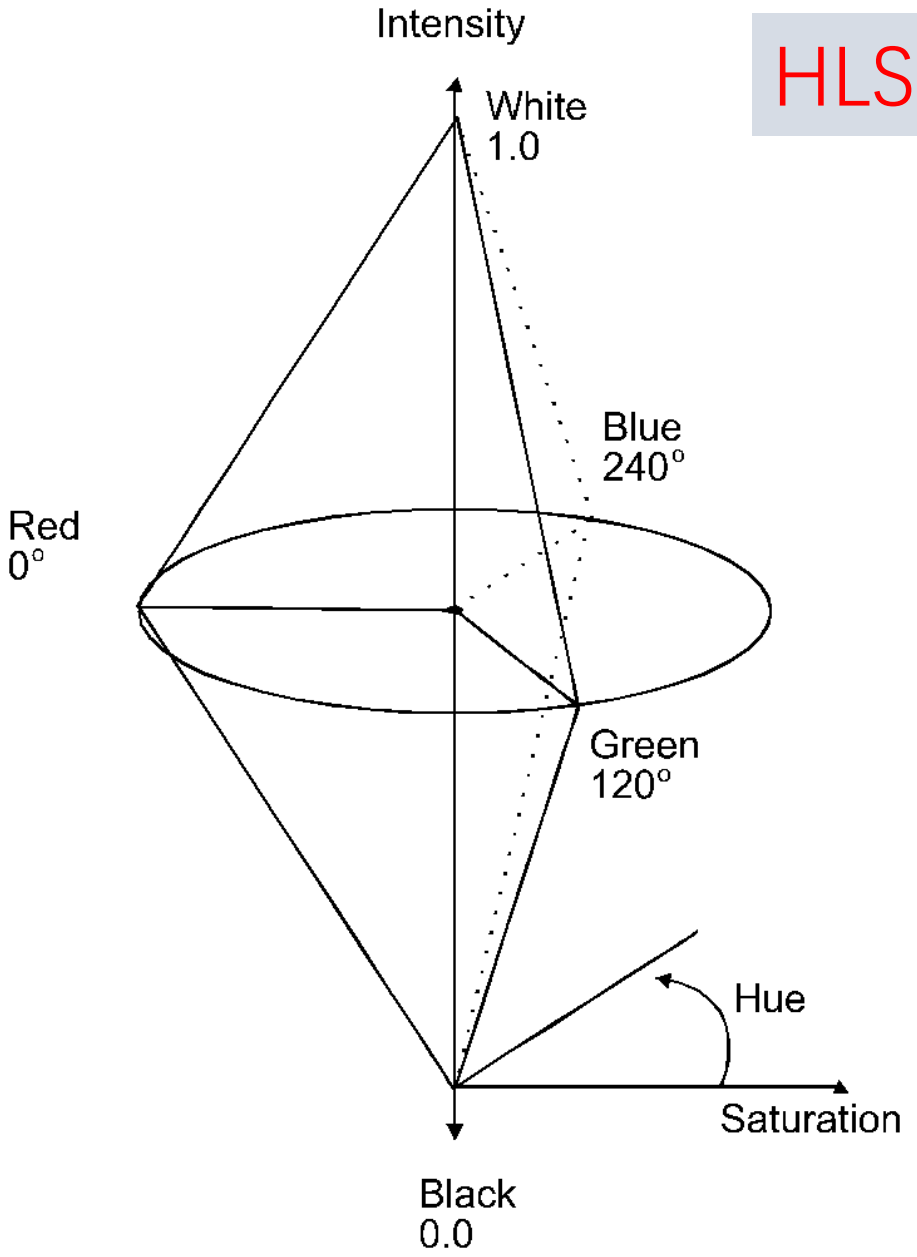


减色系统

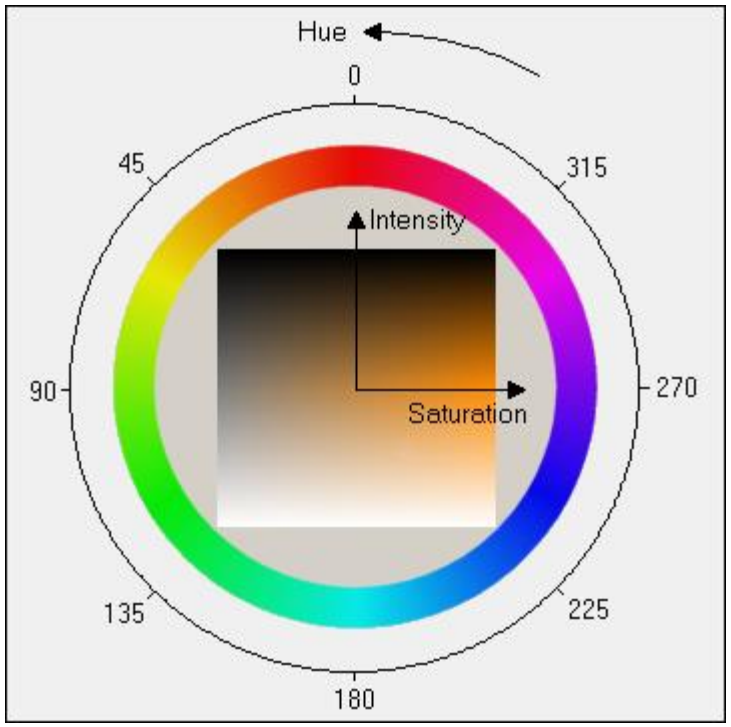
RGB

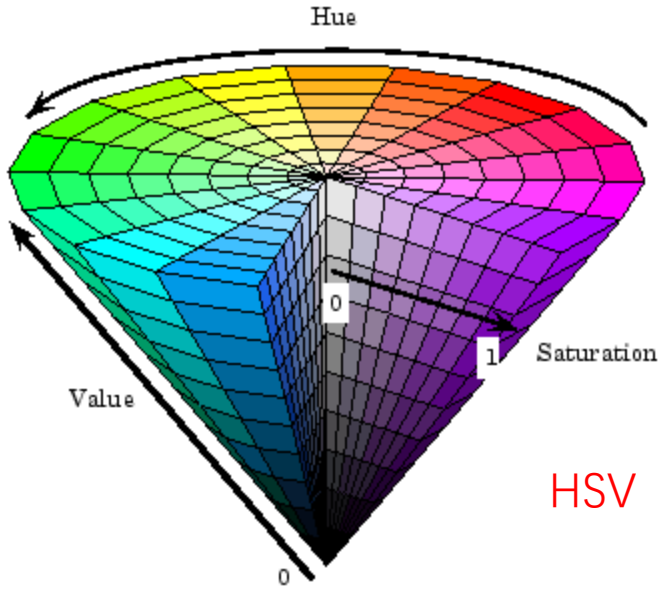

B
Blue
蓝
(0,0,1)
Cyan
青
White
Magenta
品红
Black
(0,0,0)
(0,1,0)
G
Green
绿
(1,0,0)
Red
红
R
Yello
黄




Intensity
White
1.0
Blue
240°
Red
0°
Green
120°
Hue
Saturation
Black
0.0

HLS


Hue
0
45
315
Intensity
90
270
Saturation
135
225
180


Hue
0
1
Saturation
Value
0

HSV

RGB → HSV

- $max = \sup(R, G, B)$ $\quad min = \inf(R, G, B)$
- $V = max$
- $$S = \begin{cases} \dfrac{max - min}{max} & \text{if } max \neq 0 \\ 0 & \text{otherwise} \end{cases}$$
- $$H_t = \begin{cases} \frac{G-B}{max-min} & \text{if} \quad R = max \\ \frac{B-R}{max-min} + 2 & \text{if} \quad G = max \\ \frac{R-G}{max-min} + 4 & \text{if} \quad B = max \end{cases}$$
- If $H_t < 0, \quad H_t = H_t + 6$
- $H = H_t \times 60°$

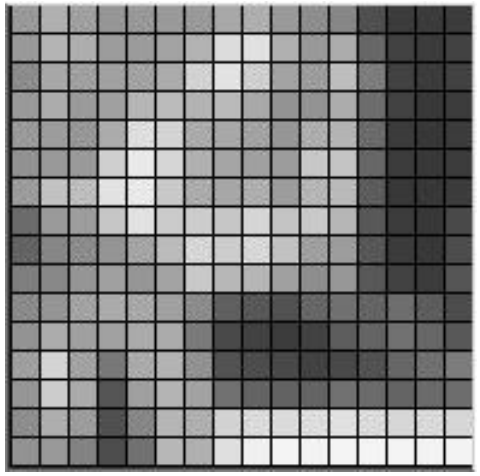
RGB → HLS

- $max = \sup(R, G, B)$ $\quad min = \inf(R, G, B)$

R, G and B are between 0 and 1.

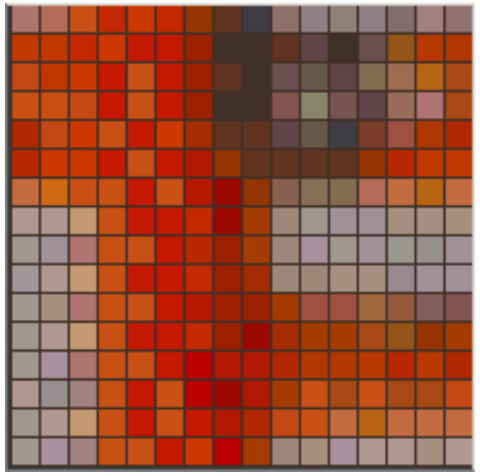
- $$L = \frac{max+min}{2}$$
- $$S_c = \begin{cases} \frac{max-min}{max+min} & \text{if} \quad L \le \frac{1}{2} \\ \frac{max-min}{2-max-min} & \text{if} \quad L > \frac{1}{2} \end{cases}$$
- $$H_t = \begin{cases} \frac{G-B}{max-min} & \text{if} \quad R = max \\ \frac{B-R}{max-min} + 2 & \text{if} \quad G = max \\ \frac{R-G}{max-min} + 4 & \text{if} \quad B = max \end{cases}$$
- If $H_t < 0, \quad H_t := H_t + 6$
- $H = H_t \times 60°$

灰度图像（标量值）



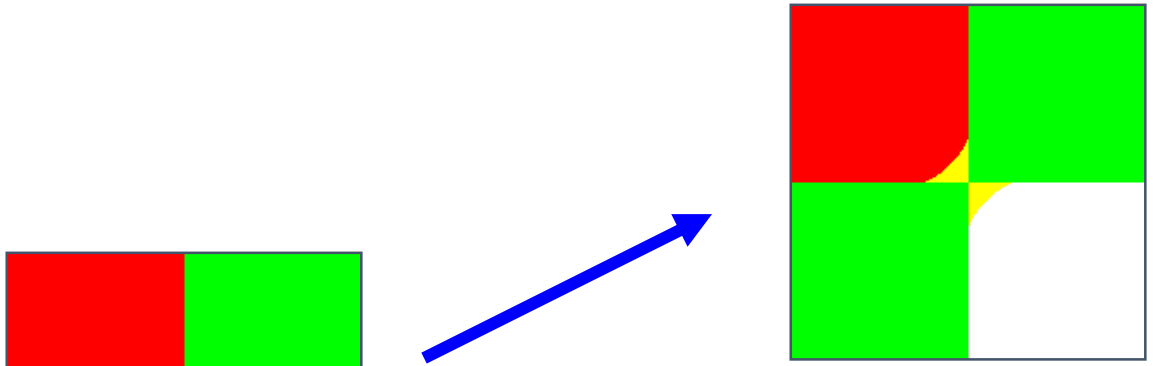
$f(x, y) \rightarrow \{0,1,\ldots, N\}$

彩色图像（向量值）

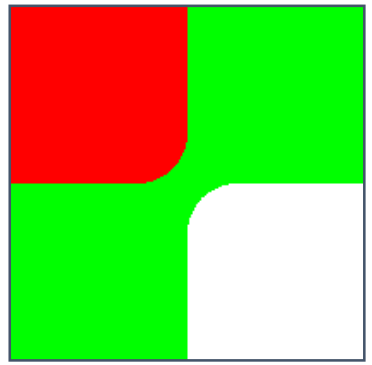


$f(x, y) \rightarrow [\ \{0,\ldots,N\},\ \{0,\ldots,N\},\ \{0,\ldots,N\}\ ]$

各通道单独均值滤波



向量均值滤波



灰度图像增强算法 → 彩色图像