Tutorials on OpenCV

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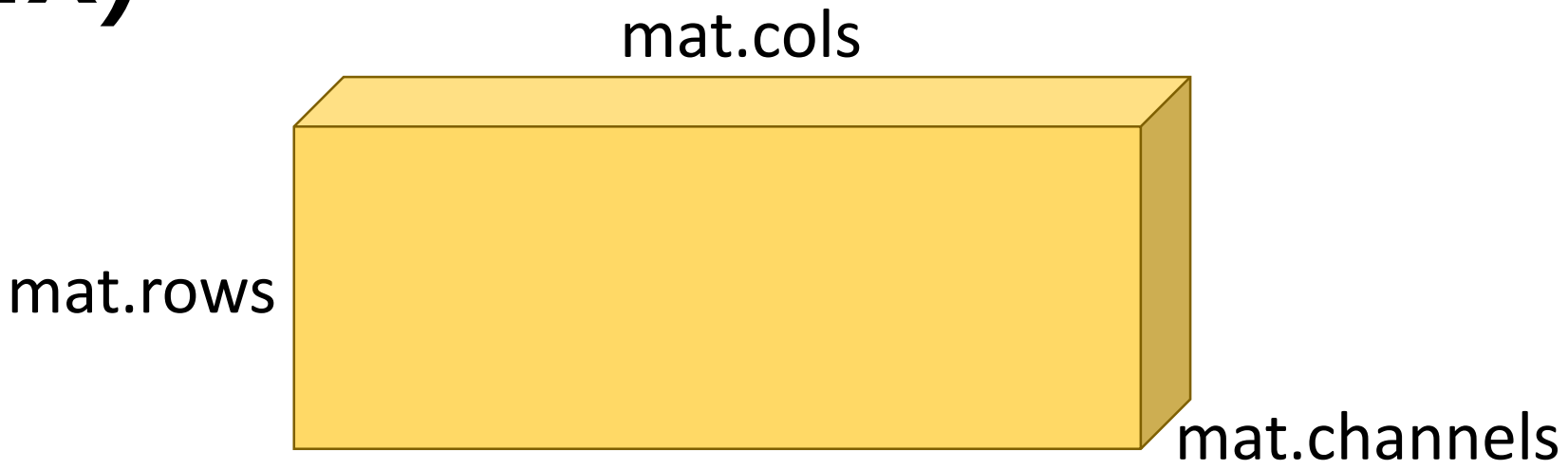
http://monkeycoding.com/?p=531

Mat (Matrix)

- rows
- cols
- channels
- type



	C1	C2	C3	C4
CV_8U	0	8	16	24
CV_8S	1	9	17	25
CV_16U	2	10	18	26
CV_16S	3	11	19	27
CV_32S	4	12	20	28
CV_32F	5	13	21	29
CV_64F	6	14	22	30

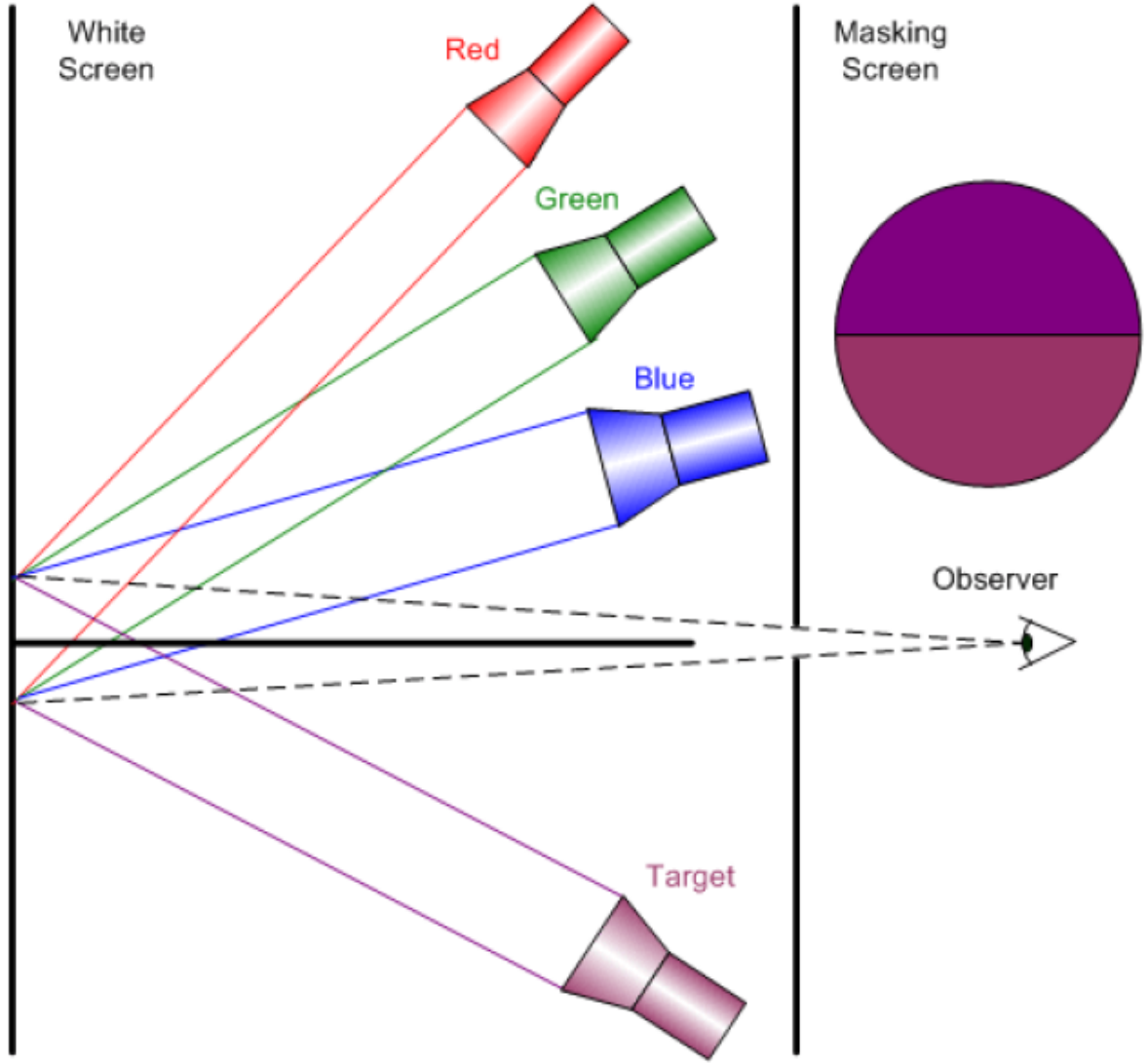
Mat creation

- **cv::Mat(int rows, int cols, int type, const cv::Scalar &s)**
- Ex.
- cv::Mat img1(240, 320, CV_8U);
- cv::Mat img2(240, 320, CV_8U, cv::Scalar(100));
- cv::Mat img3(240, 320, CV_8UC3, cv::Scalar(200, 100, 0));

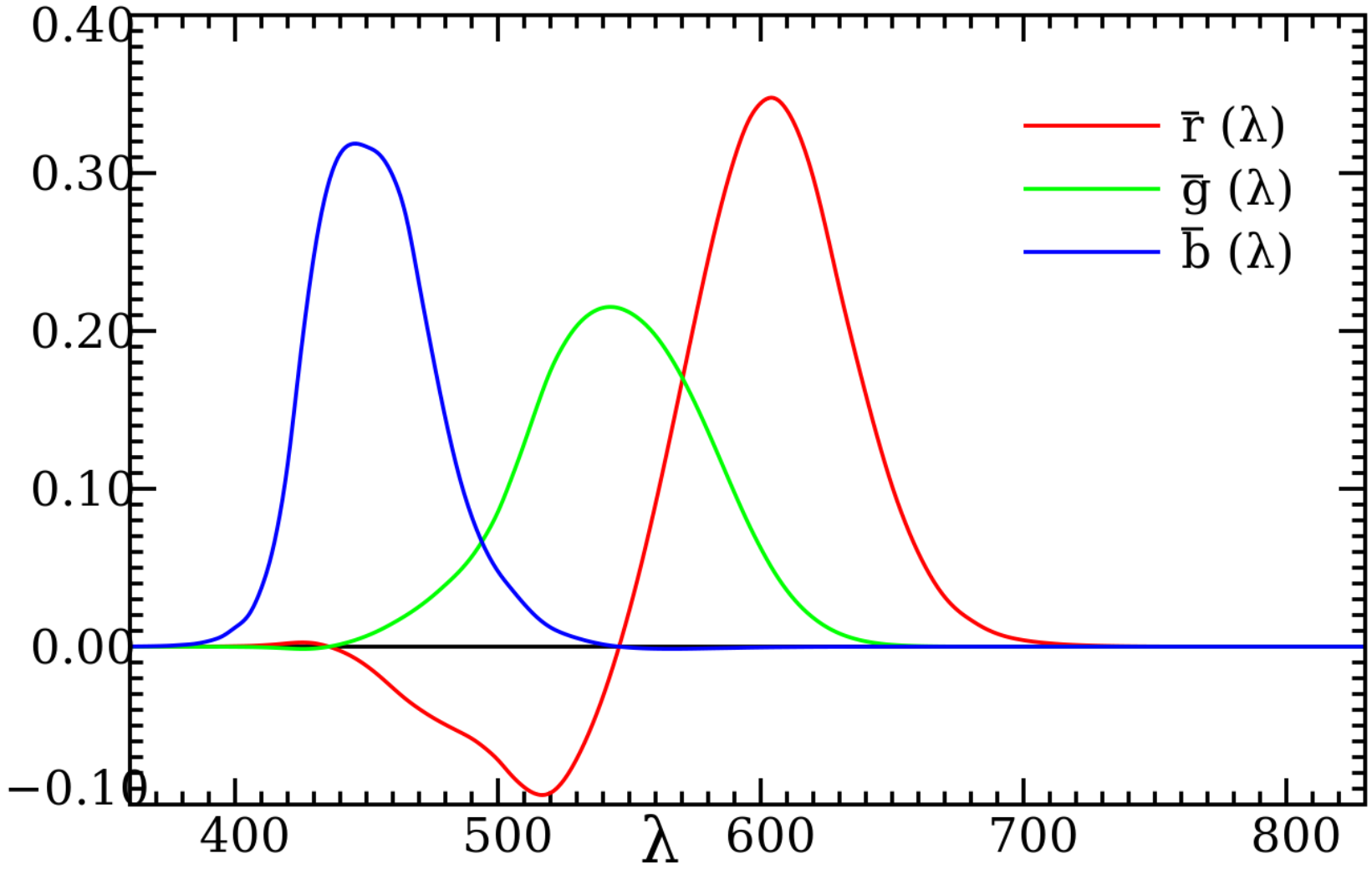
- **void cv::Mat::create(int rows, int cols, int type)**
- Ex.
- cv::Mat img;
- img.create(300, 400, CV_8U);

Color Space – CIE XYZ

- 最先採用數學方式定義



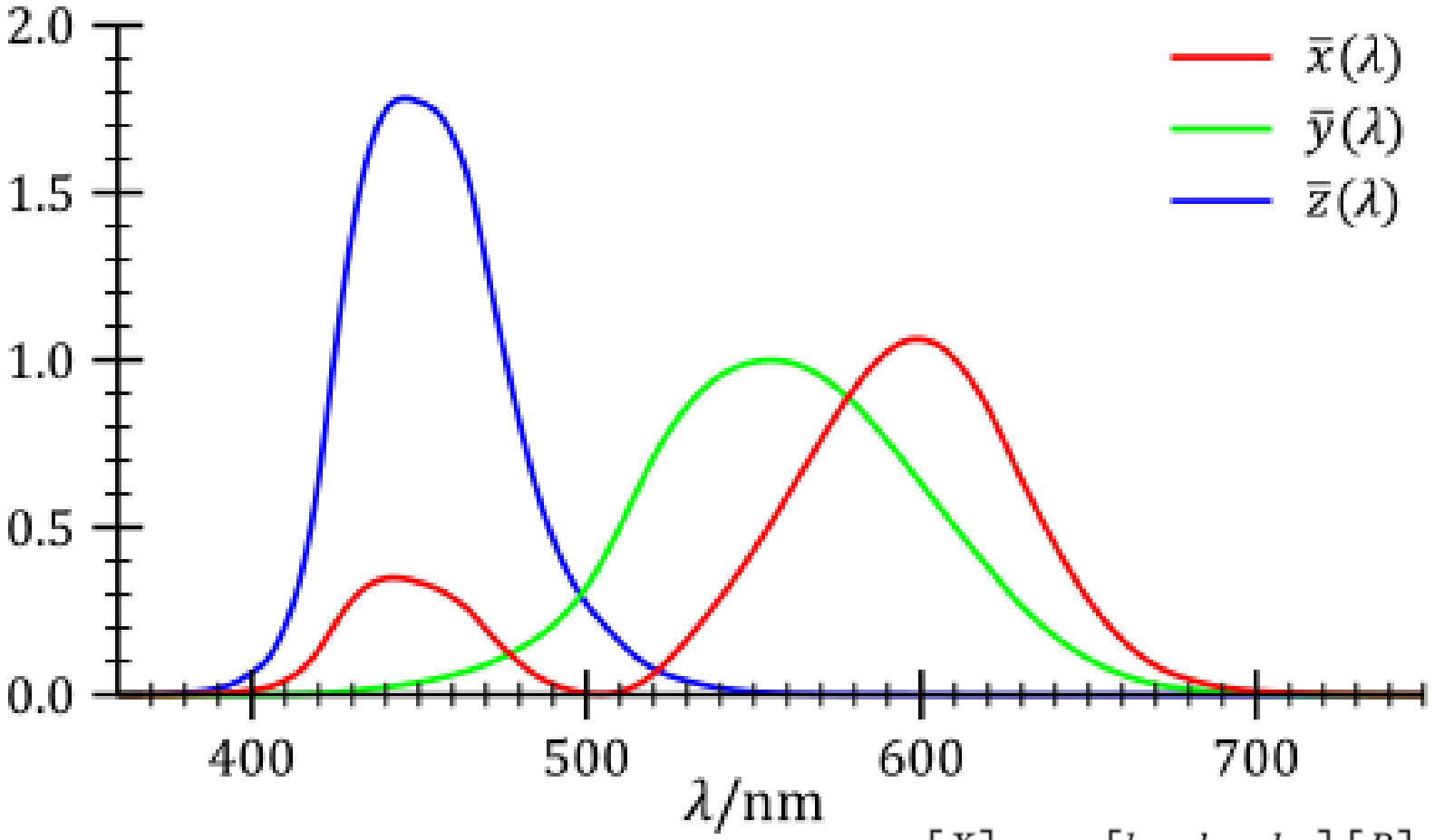
Color Space – CIE XYZ



CIE RGB 顏色匹配函數

匹配水平刻度標示的波長的單色測試顏色所需要的原色數量

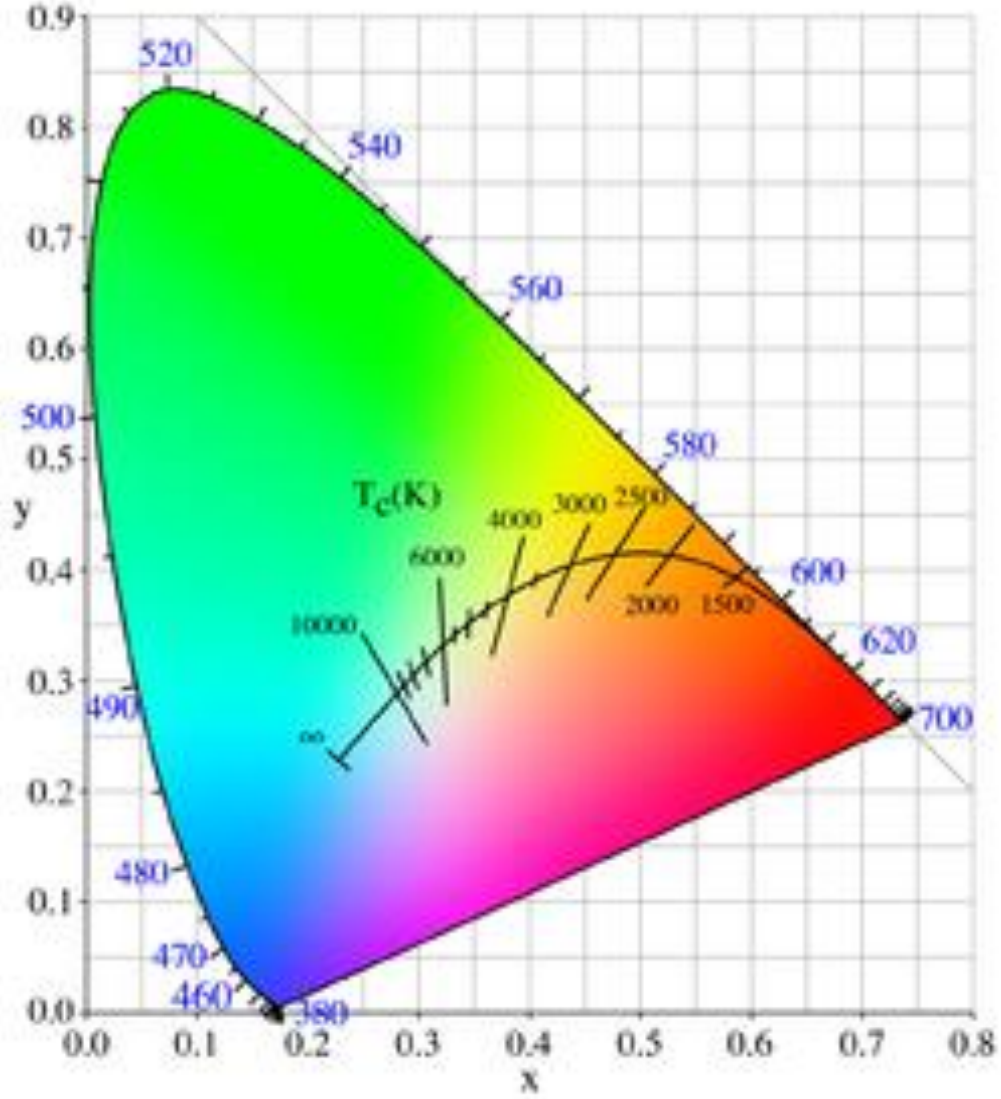
Color Space – CIE XYZ



$$\begin{bmatrix} X \\ Y \\ Z \end{bmatrix} = \frac{1}{b_{21}} \begin{bmatrix} b_{11} & b_{12} & b_{13} \\ b_{21} & b_{22} & b_{23} \\ b_{31} & b_{32} & b_{33} \end{bmatrix} \begin{bmatrix} R \\ G \\ B \end{bmatrix} = \frac{1}{0.17697} \begin{bmatrix} 0.49 & 0.31 & 0.20 \\ 0.17697 & 0.81240 & 0.01063 \\ 0.00 & 0.01 & 0.99 \end{bmatrix} \begin{bmatrix} R \\ G \\ B \end{bmatrix}$$

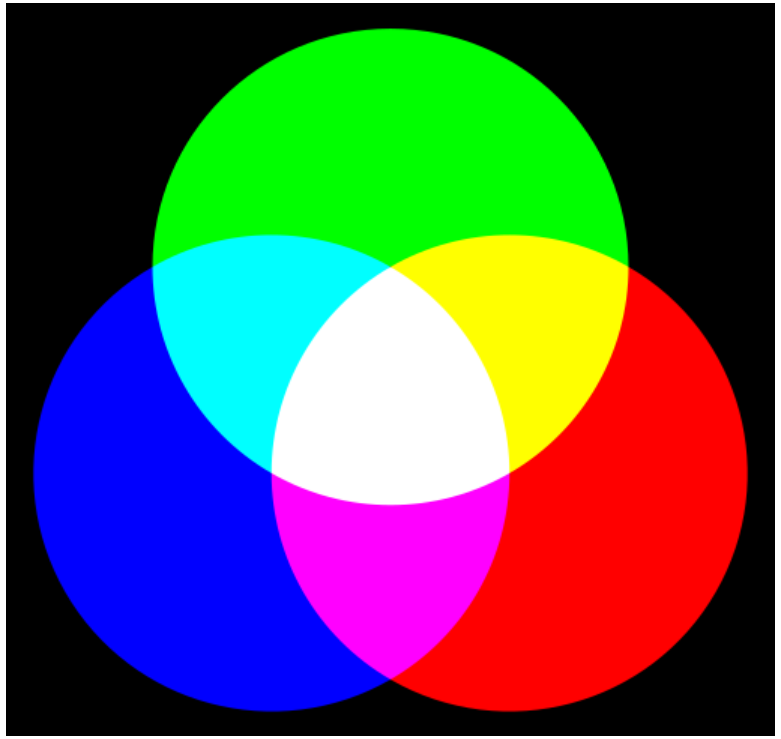
Color Space – CIE XYZ

- $x = \frac{X}{X+Y+Z}$
- $y = \frac{Y}{X+Y+Z}$
- $z = \frac{Z}{X+Y+Z}$
- $x + y + z = 1$



Color Space – RGB & CMYK

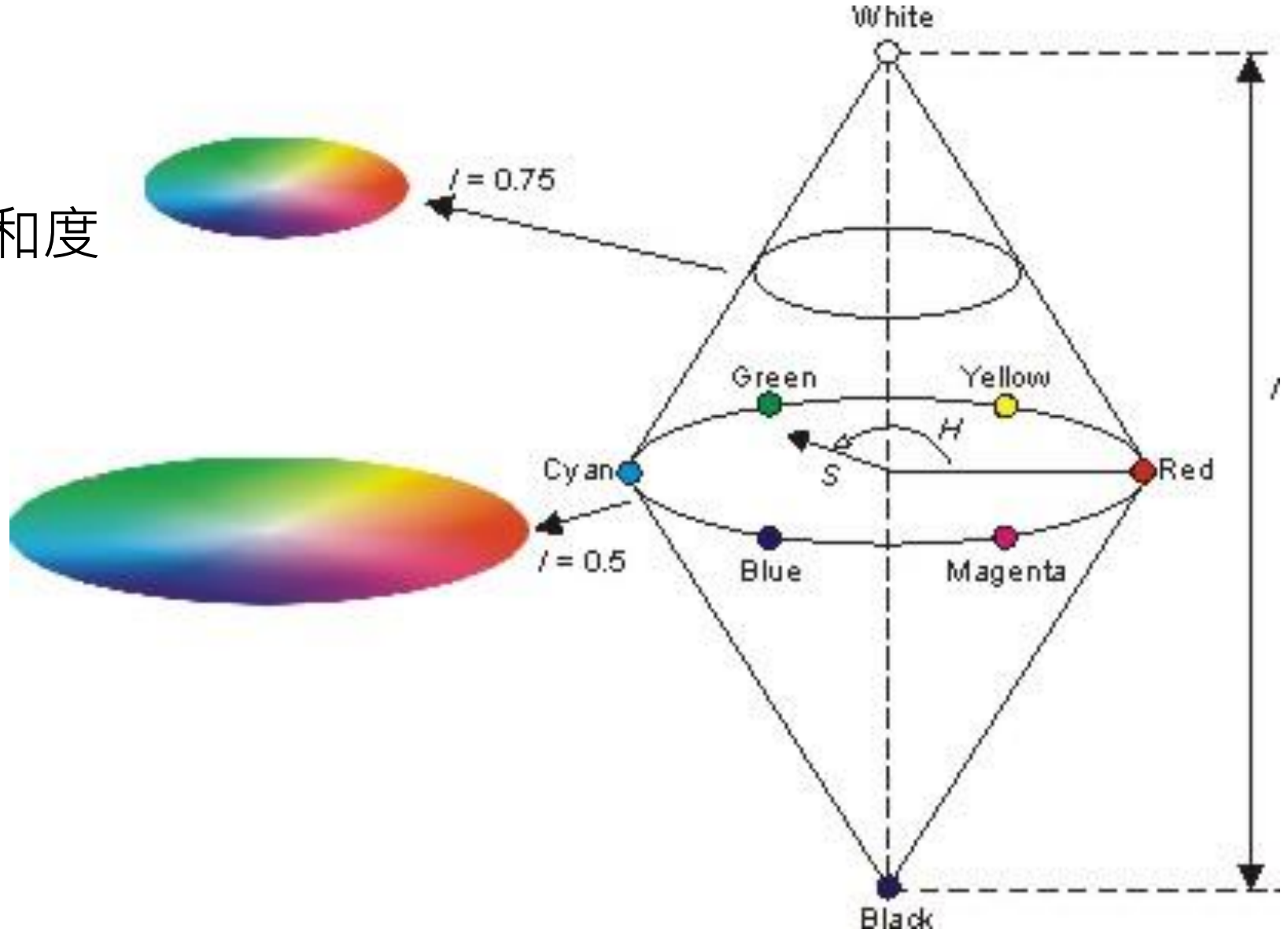
RGB - 加法混色
光通過何種比例產生顏色



CMY + K (black) - 減法混色
使用何種油墨，通過光的反射顯示出顏色

Color Space – HSI

- Hue : 色相
- Saturation : 飽和度
- Intensity : 亮度



Color Space Transform

RGB - CMY

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

RGB - GRAY

Gray = R*0.299 + G*0.587 + B*0.114

RGB - HSI

RG Sector ($0° \le H < 120°$)

$$B = I(1-S)$$

$$R = I\left[1+\frac{S\cos H}{\cos(60°-H)}\right]$$

$$G = 1-(R+B)$$

GB Sector ($120° \le H < 240°$)

$$H = H - 120°$$

$$B = I(1-S)$$

$$G = I\left[1+\frac{S\cos H}{\cos(60°-H)}\right]$$

$$B = 1-(R+G)$$

BR Sector ($240° \le H \le 360°$)

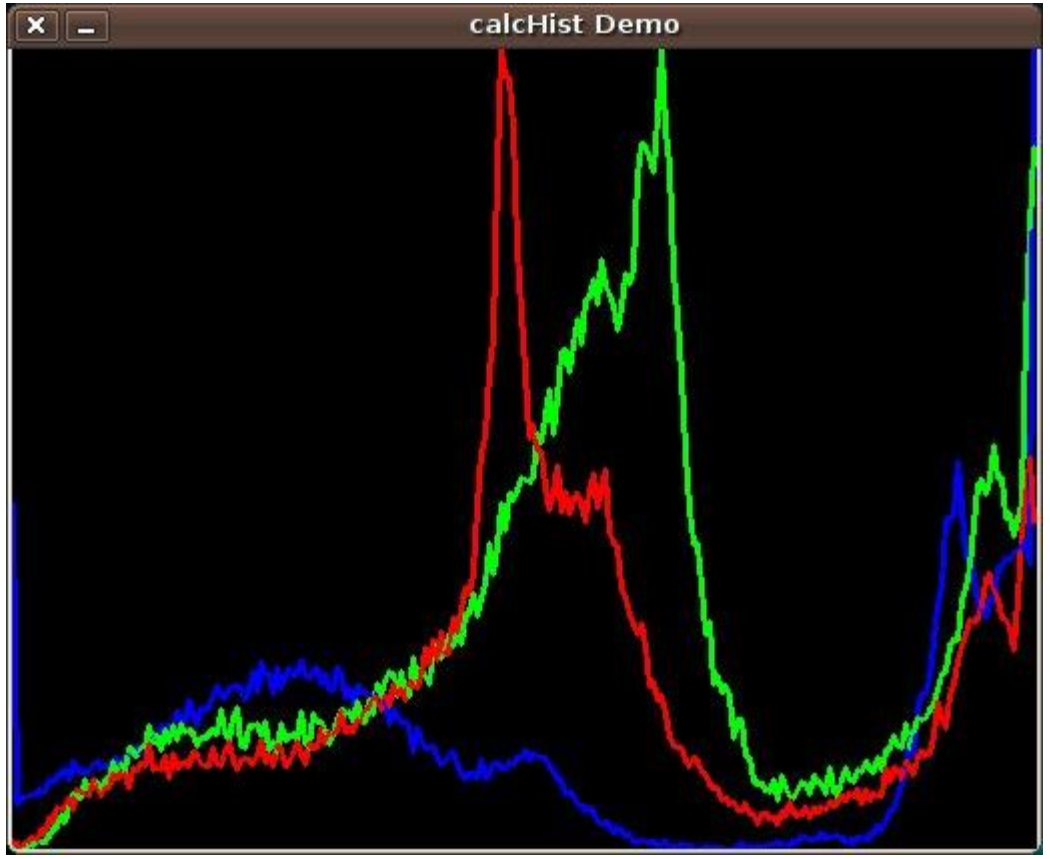
$$H = H - 240°$$

$$G = I(1-S)$$

$$B = I\left[1+\frac{S\cos H}{\cos(60°-H)}\right]$$

$$R = 1-(G+B)$$

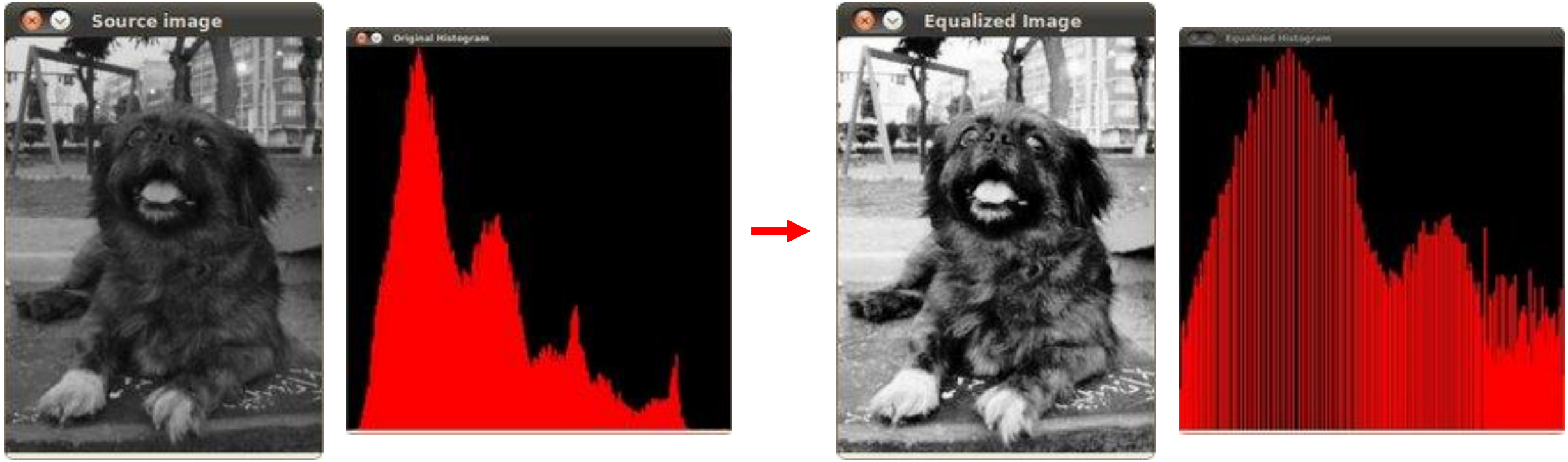
Histogram



0 255

Histogram Equalization - Gray

- It is a method that improves the contrast in an image, in order to stretch out the intensity range



Histogram Equalization - Color

- Equalize BGR image is a non-linear problem.
- Change BGR to YCrCb.
- YCrCb: Y stores the intensity information.
- Only equalize Y channel.

Histogram Equalization - Color

原圖

Y：灰階

Cr：紅色色度

Cb：藍色色度