Hand detection

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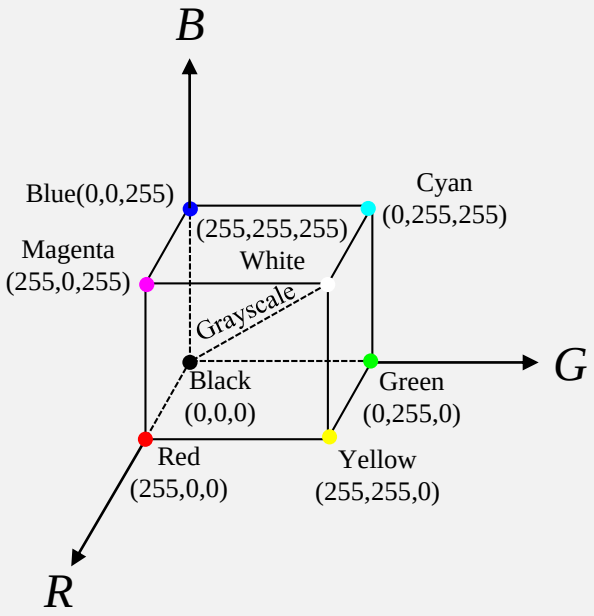
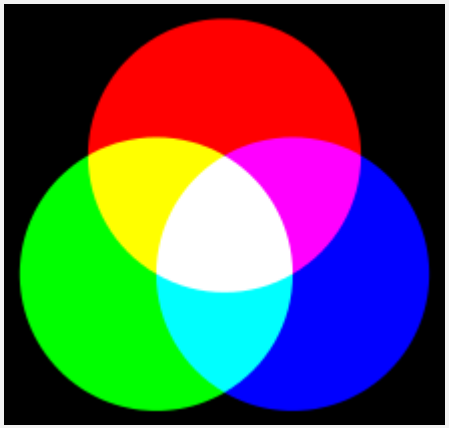
Color Space

- RGB





Color Space

- Normalized RGB color model

  I=R+G+B

  r=R/I, g=G/I, b=B/I

- Gaussian Distribution

$$G(m, \sigma^2)$$

$$m = (m_r, m_g) \qquad \sigma^2 = \begin{bmatrix} {\sigma_r}^2 & 0 \\ 0 & {\sigma_g}^2 \end{bmatrix}$$

cf.

$$G(m, \sigma^2) = \frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{(x-m)^2}{2\sigma^2}}$$

$$m_r = \frac{1}{N}\sum_{i=1}^{N} r_i,\ m_g = \frac{1}{N}\sum_{i=1}^{N} g_i$$

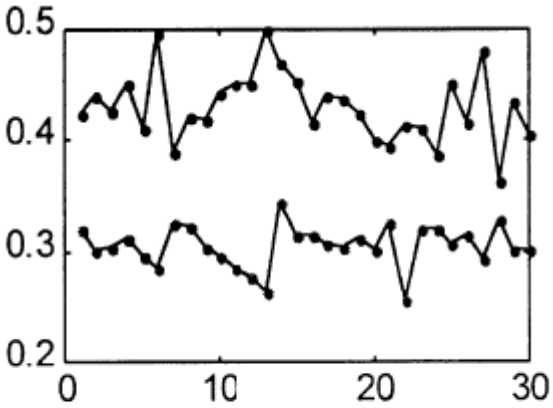
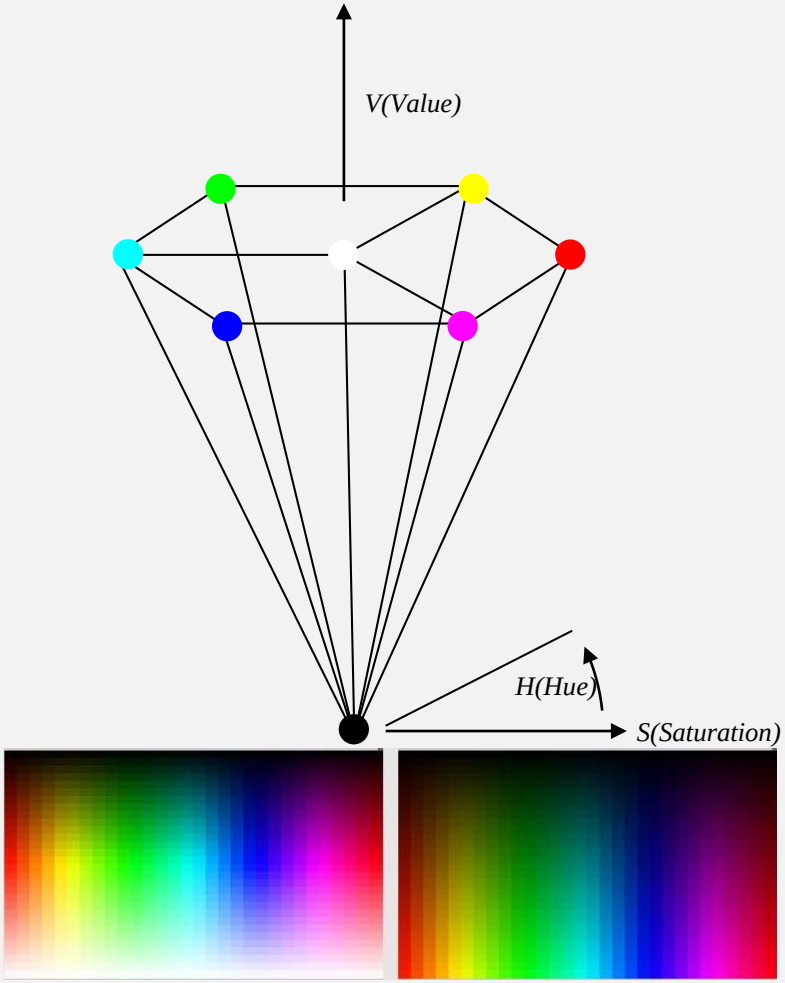


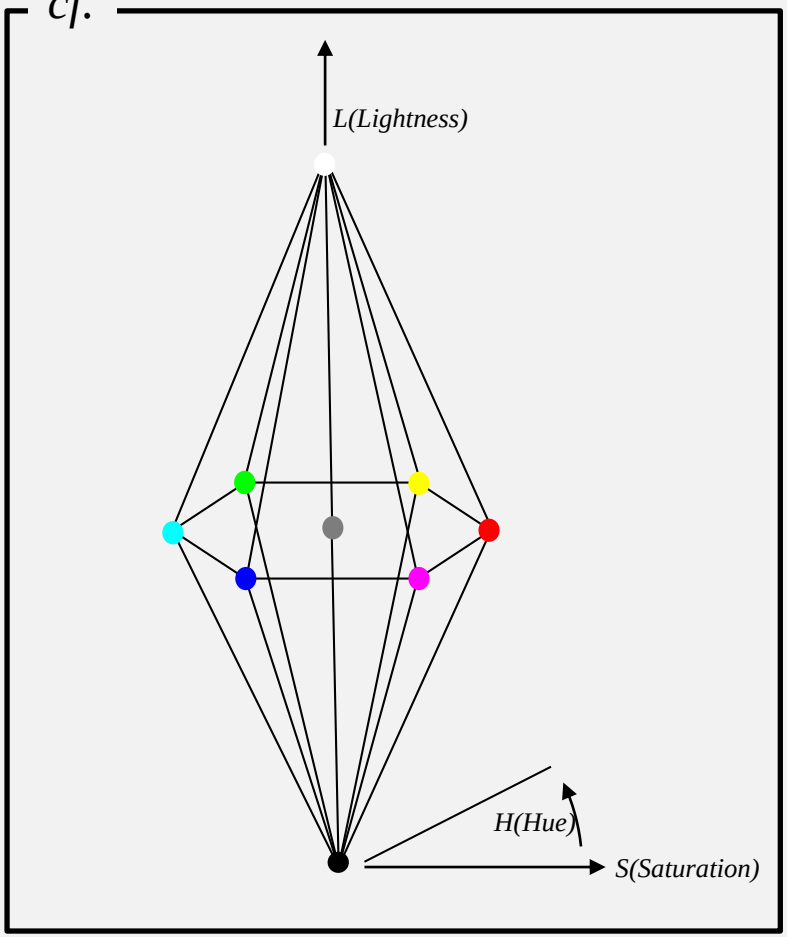
Fig. 2. Experimental values for normalized *R* (the upper drawing) and *G* (the lower drawing) on 30 face images.

Color Space

- HSV



cf.



Color Space

- HSV Conversion

$$H = \begin{Bmatrix} H1 & if\ B \le G \\ 360° - H1 & if\ B > G \end{Bmatrix}$$

$$H1 = cos^{-1}\{\frac{0.5[(R-G)+(R-B)]}{\sqrt{(R-G)^2+(R-B)(G-B)}}$$

$$S = \frac{Max(R,G,B) - Min(R,G,B)}{Max(R,G,B)}$$

$$V = \frac{Max(R,G,B)}{255}$$

Color Space

- Experimental results -HSV

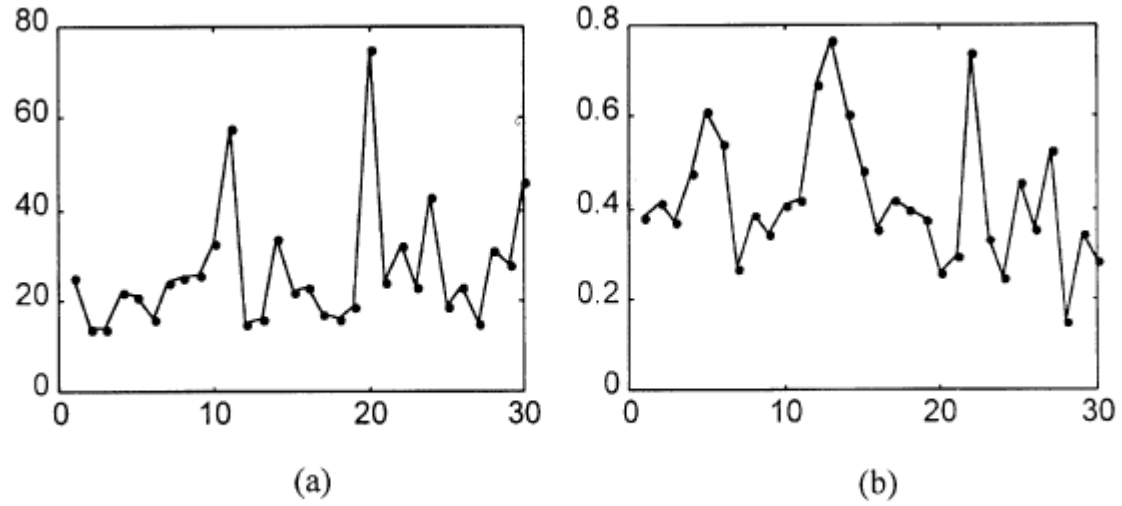


Fig. 3. Experimental values for hue and saturation on 30 face images: (a) hue values and (b) saturation values.

Color Space

- Color model selection

<Normalized RGB>

$0.36 \leq r \leq 0.465, 0.28 \leq g \leq 0.363$

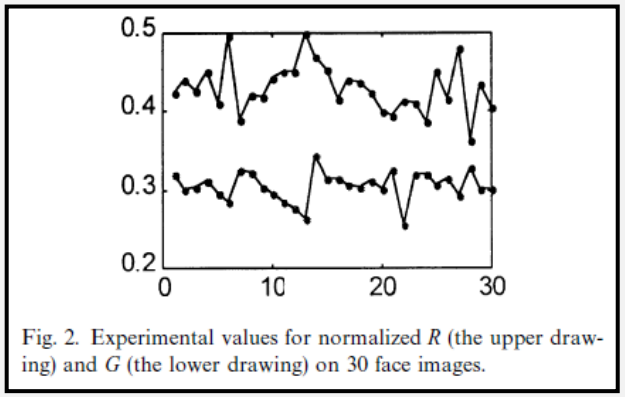


Fig. 2. Experimental values for normalized *R* (the upper drawing) and *G* (the lower drawing) on 30 face images.

<HSV>

$0 \leq H \leq 50, 0.20 \leq S \leq 0.68, 0.35 \leq V \leq 1.0$

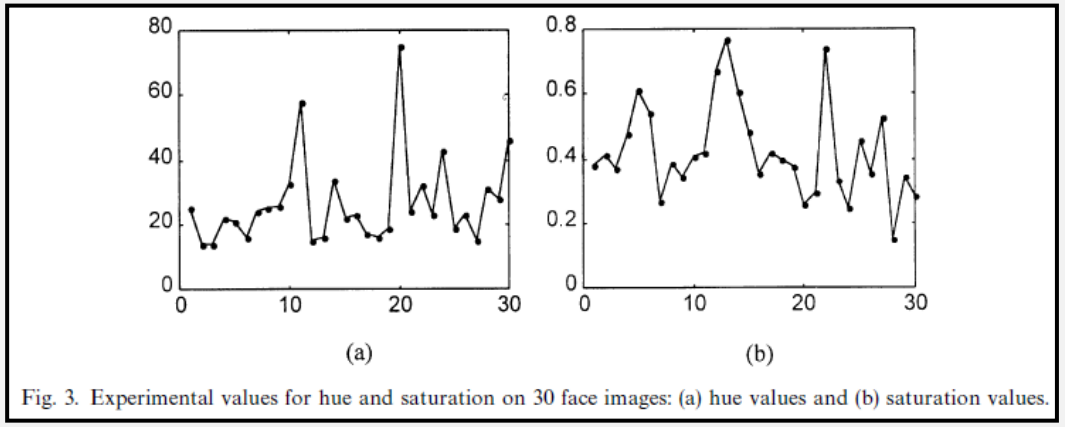
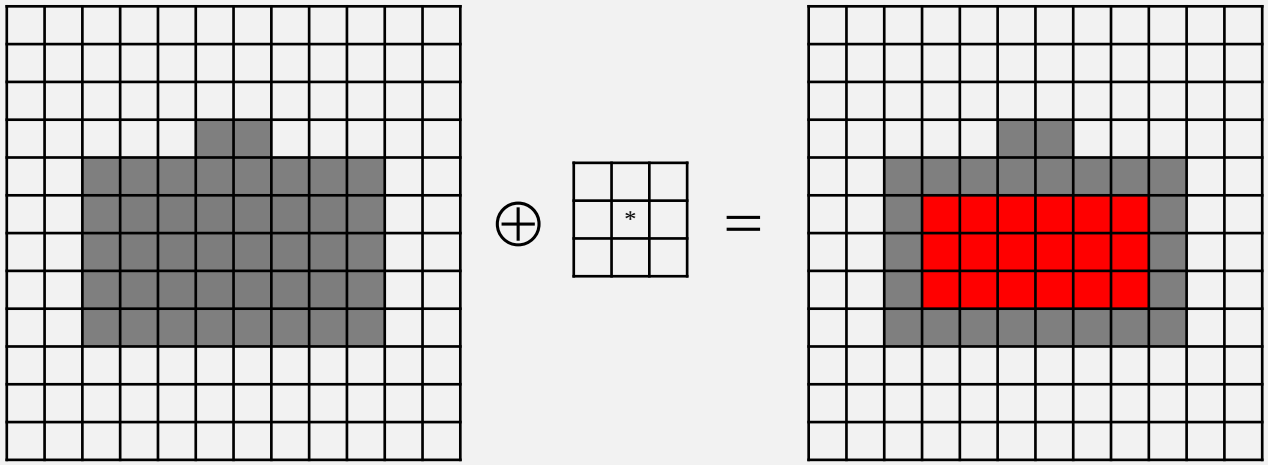


Fig. 3. Experimental values for hue and saturation on 30 face images: (a) hue values and (b) saturation values.

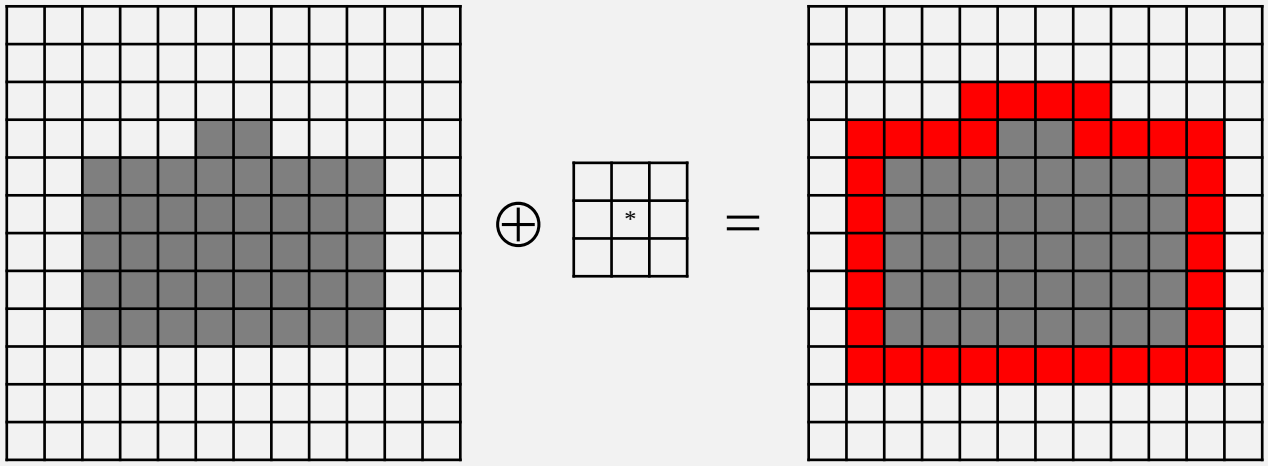
Morphological Operation

- Erode



Morphological Operation

- Dilate



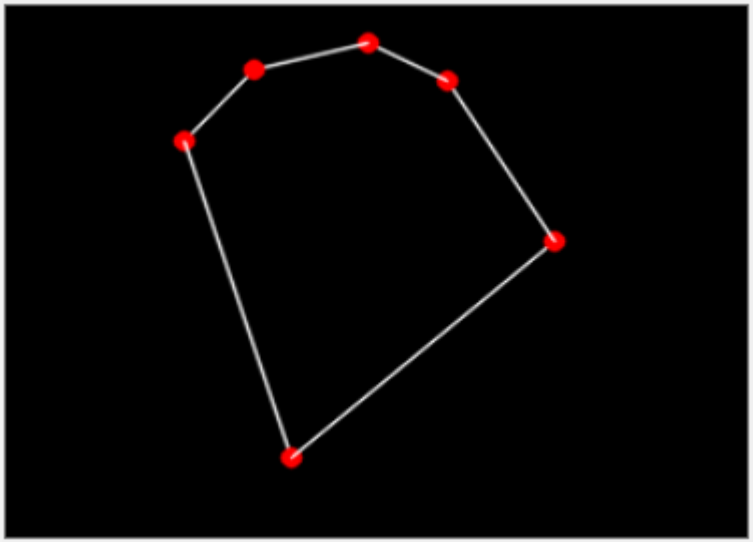
Morphological Operation

- Opening & Closing

Opening : Erode → Dilate

Closing : Dilate→ Erode

Results



Q & A