Skin tone detection.

ISL / 안재원

목차

- Old skin tone detection method
- New skin tone detection method
- Result

01

Old skin tone detection method

WANG, Yanjiang; YUAN, Baozong. A novel approach for human face detection from color images under complex background. *Pattern Recognition*, 2001, 34.10: 1983-1992.

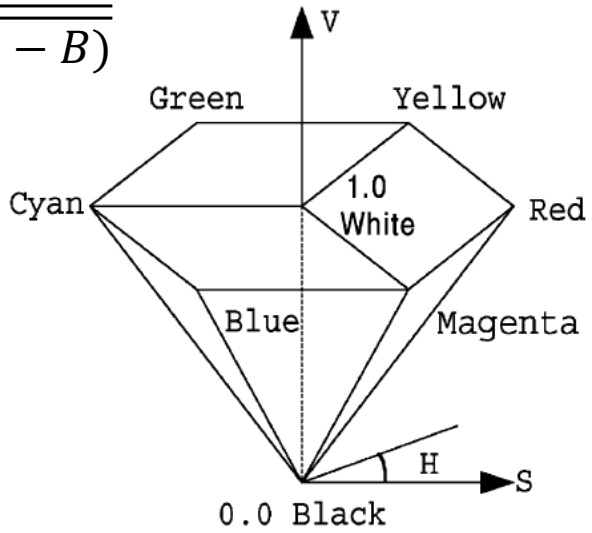
- HSV

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

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

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

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



01

Old skin tone detection method

- **Normalized RGB**

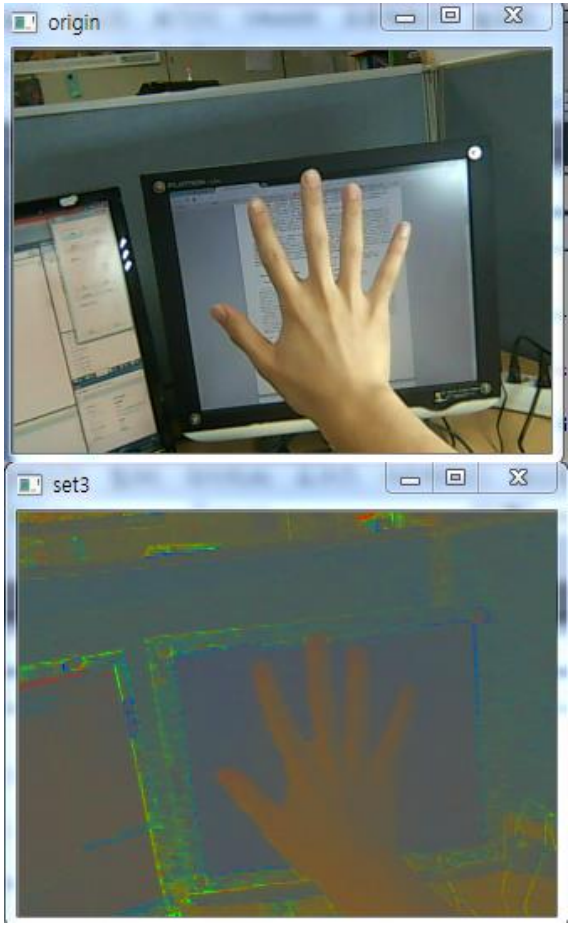
$$f(x, y) = (R, G, B)$$

$$I = R + G + B$$

$$\text{Normalized } R' = \frac{R}{I}$$

$$\text{Normalized } G' = \frac{G}{I}$$

$$\text{Normalized } B' = \frac{B}{I}$$



01

Old skin tone detection method

- **Existing Method**

$$0.36 \leq R' \leq 0.465$$
$$0.28 \leq G' \leq 0.363$$
$$0 \leq H \leq 25$$
$$51 \leq S \leq 173$$
$$90 \leq V \leq 255$$

02

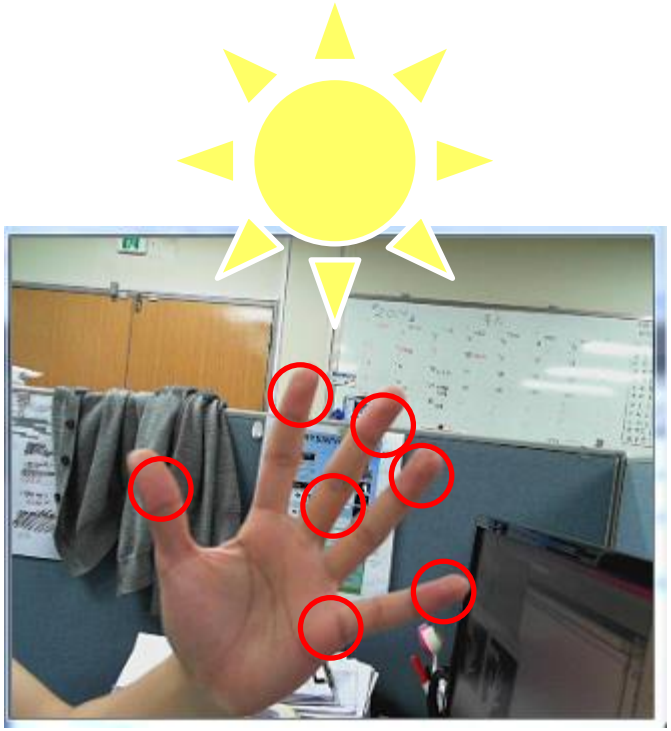
New skin tone detection method

CHEDDAD, Abbas, et al. A skin tone detection algorithm for an adaptive approach to steganography. *Signal Processing*, 2009, 89.12: 2465-2478.

Image no.	Number of pixels	Time elapsed in seconds			
		[4]	[25]	[28]	Proposed
1	840 450	0.5160	33.515	7.796	0.125
2	478 518	0.4060	22.094	4.156	0.047
3	196 608	0.2970	4.547	2.188	0.062
4	196 608	0.3280	3.563	1.906	0.062
5	849 162	0.5160	33.062	7.531	0.078
6	850 545	0.6090	39	8.343	0.062
7	849 162	0.6090	39.219	6.641	0.078
8	849 162	0.5160	39.172	8.484	0.078
9	849 162	0.6100	38.203	6	0.078
10	7 750 656	3.1720	>600[a]	54.86	0.562
11	982 101	0.6410	79.469	7.297	0.078
12	21 233 664	9.3910	>600[a]	144	1.531

02

New skin tone detection method



02 New skin tone detection method

$f(x, y) = (R, G, B)$ → *RGB image*

- **First Luminance.**

$\vec{\alpha} = [0.29893602129377539 0, 0.58704307445112136 0, 0.11402090425510325 0]^T$

$I = f(x, y) \otimes \vec{\alpha}$

- **Second Luminance.**

$\hat{I} = \max(G, B)$

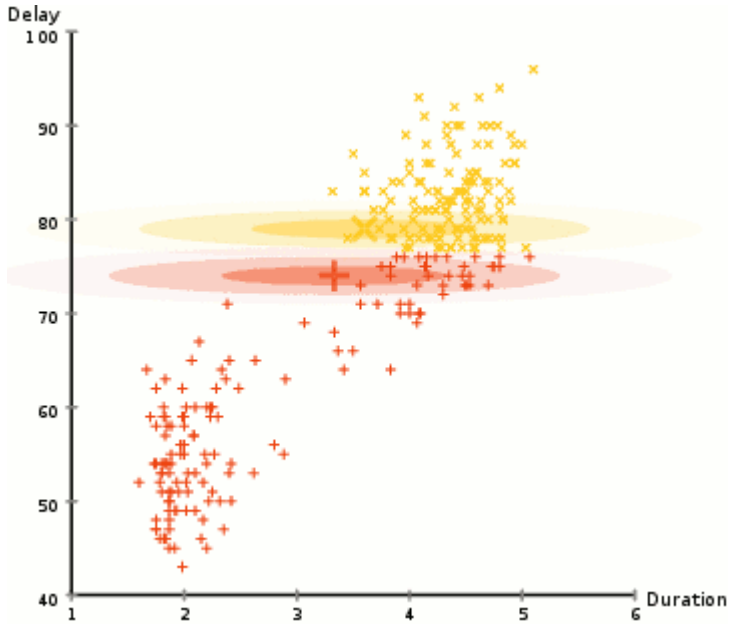
- **Error Signal**

$e = I - \hat{I}$

02

New skin tone detection method

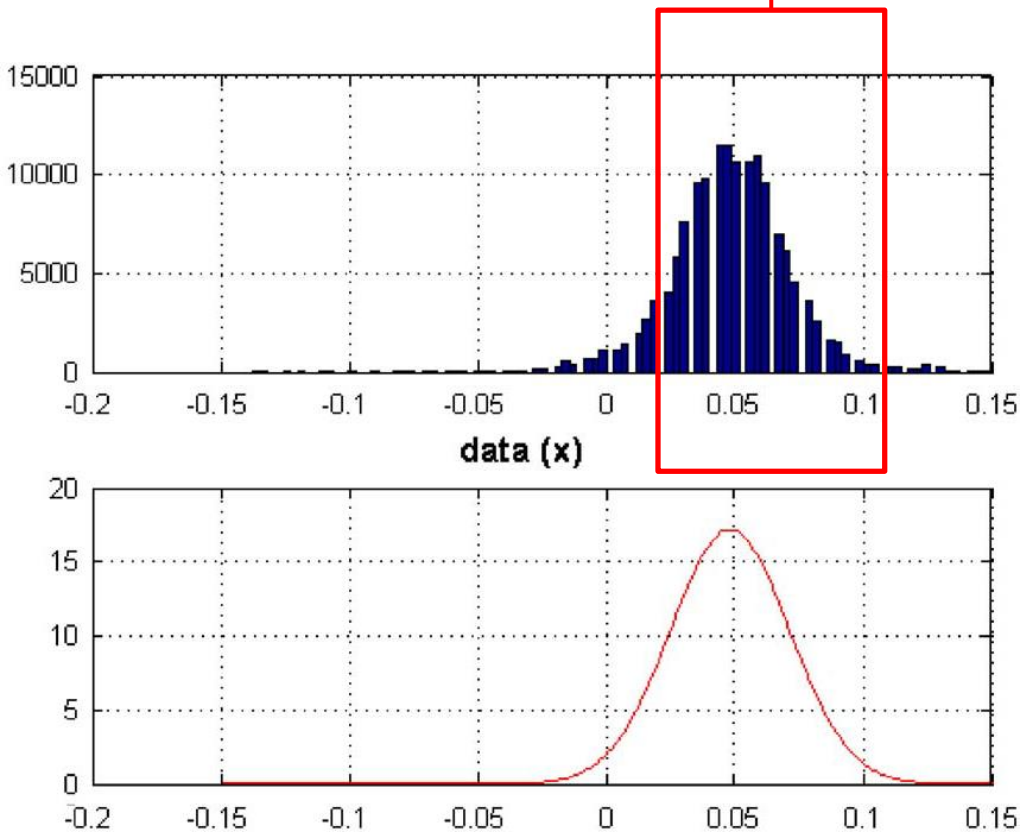
- Expectation Maximization.



02

New skin tone detection method

$0.02511 \leq e \leq 0.1177$



03 Result(WYSIWYG)

Origin *New* *Old*

감사합니다.