Multimedia
(Lab05)

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Department of Software

Yong Ju Jung (정용주)

미래창조과학부 SW중심대학
가천대학교 소프트웨어학과
Gachon University Department of Software

Chroma Key

- Chroma key compositing, or chroma keying, is a special effects / post-production technique for compositing (layering) two images or video streams together based on color hues (chroma range).
  - The technique has been used heavily in many fields to remove a background from the subject of a photo or video – particularly the newscasting, motion picture and videogame industries.
- Implement a chroma key algorithm
  - https://en.wikipedia.org/wiki/Chroma_key

Image Source: wikipedia

- Reference basic algorithm
  - Determine Cb and Cr of key color of the foreground image; call them Cb_{key} and Cr_{key} 전경이미지의 keyColor값을 결정(가장 많이 나오는)
    - Convert the pixel values of the foreground image into the YCbCr color space, effectively separating the luminance from the chrominance color information — hence, "chroma" key. 키컬러를 YCbCr로(변환필요) 가장많이나온 Cb,Cr값을 키로.
  - Calculate the Euclidean distance between each pixel's color ("Cb" and "Cr" coordinates) and a defined constant (Cb_{key}, Cr_{key}) representing the screen color

$$dist(i,j) = \sqrt{(Cb(i,j) - Cb_{key})^2 + (Cr(i,j) - Cr_{key})^2}$$

유클리드거리. dist가 작으면 Cb,Cr키가 가깝다는 말, 즉 Green -> Threshold보다 작으면 배경으로.

  - If the distance is within an *inner threshold* (i.e. very close to the screen color), it's considered to be entirely within the background → $\alpha(i,j) = 0$ 배경=0
  - If the distance is above an *outer threshold*, it's considered to be entirely within the foreground → $\alpha(i,j) = 1$
  - In *between* the inner and outer thresholds, do a linear interpolation from 0 to 1:

$$\alpha(i,j) = \frac{(dist(i,j) - T_{in})}{(T_{out} - T_{in})}$$

  - Then, the final output image will be given by linear blending between foreground and background images :

Output$(i,j) = (1-\alpha(i,j))$ * **BG**$(i,j) + \alpha(i,j)$ * **FG**(i,j);

Implementation Issues

- The biggest challenge when setting up a bluescreen or greenscreen is even lighting and the avoidance of shadow, because it is best to have as narrow a color range as possible being replaced.
  - A shadow would present itself as a darker color to the camera and might not register for replacement.

- Higher quality result image will be given with higher score.

- Hints
  - You can determine the key color using **color histogram** of the foreground image.

키는 히스토그램에서 빈도수가 가장 많은 것.