Original image

Quantized colors using RGB color space

Quantized colors using YCrCb color space

Conclusion

Congratulations for getting this work done! You have learned:

- how k-means clustering works and how to use it,
- how EM algorithm performs and how to employ it,
- how to carry out color quantization and the importance of color spaces in this context, and
- some basics for image compression.

OPTIONAL

You have used YCrCb in this notebook because you were already fimiliar with it. The truth is that, in color quantization matters, Lab color space is commonly used.

Surf the internet for information about the Lab color space and then **answer the following questions**:

- How does Lab color space work?

  *The **Lab color space** (also known as CIELAB) is designed to approximate human vision and is intended to be perceptually uniform. This means that the distance between colors in the Lab space corresponds more closely to how humans perceive color differences. Lab is composed of three channels:*

    - *L (Perceptual Lightness) - Represents the brightness or intensity of the color, ranging from black to white.*

- - ***a*** - *Represents color on the green-red axis.*
    - ***b*** - *Represents color on the blue-yellow axis.*

  Unlike RGB, which is device-dependent, Lab is device-independent and is designed to be a standardized way to describe colors as the human eye perceives them.

- Why is it typically used for color quantization?

  Mainly because of the same reason we use YCrCb. The lightness band is separated from the color, so when we quantize it, brightness details are better preserved (better compression). We can also say that the very essence of the Lab color space is a reason why it is used for color quantization: Lab is perceptually uniform, meaning that the Euclidean distance between colors in this space corresponds to the perceived color difference by human vision. This makes it more effective for grouping similar colors based on human perception.

END OF OPTIONAL PART

References

[1]: Borenstein, Eran, Eitan Sharon, and Shimon Ullman. Combining top-down and bottom-up segmentation.. IEEE Conference on Conference on Computer Vision and Pattern Recognition Workshop, 2004.