Color Coordinates of the L'Oréal Skin Color Chart

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Some time ago L'Oréal, the cosmetics company, developed and published[1] a color chart showing various shades of skin color. This was based on a sampling of the spectral reflectance characteristics of women's (healthy) skin around the world. The chart is posted as an image[2], as shown in Fig. 1. The motivation for this work was for the development of cosmetic products, and to provide understanding of expectations of consumers. In our case, we are currently interested in the requirements for, and control of, image capture for dermatologists. If we understand the importance optical (color) characteristics for an imaging application, we can tailor system design and evaluation methods for improved performance. In addition to the identification of the importance camera signal-space, the chart may provide information on system tolerances, and sources of variability.
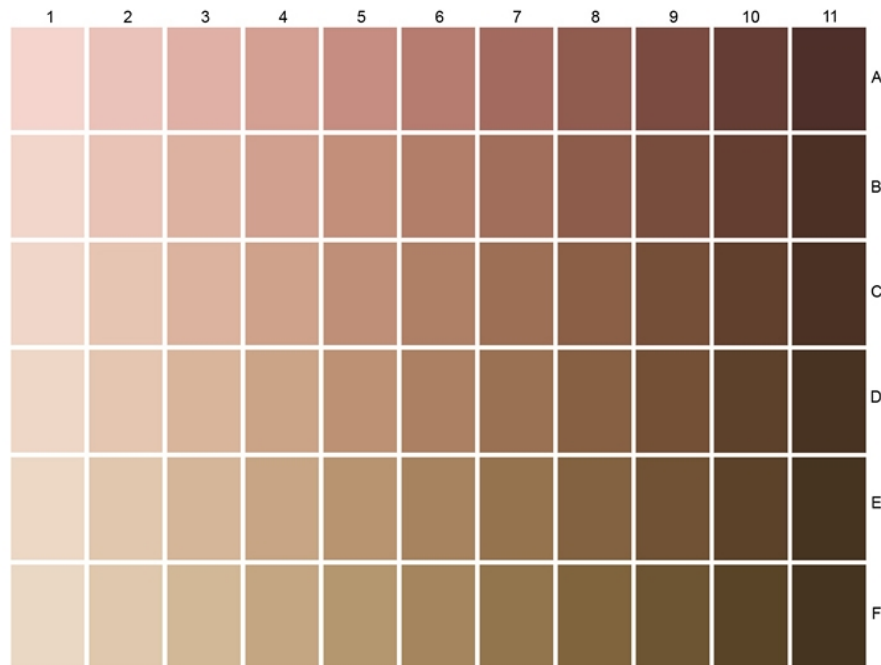

Figure 1: L'Oréal skin color chart[2]

sRGB Signal Coordinates

The posted skin color chart is posted as an sRGB-encoded image, as verified by Franck Giron, L'Oréal. *sRGB* is the default color space for most consumer and off-the-shelf imaging equipment and Fig. 2 shows these coordinates extracted from the posted image file. As expected, the set occupies a fairly narrow region around a simple function in RGB signal-space.
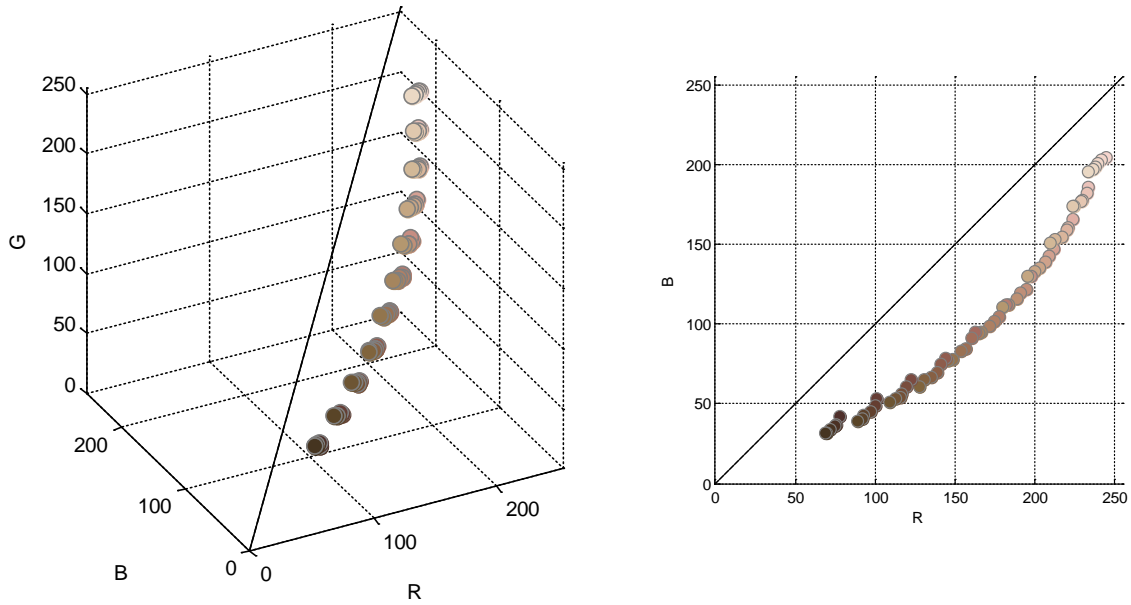
Figure 2: R,G,B coordinates for the color chart, where the line indicates the (grey) neutrals

CIELAB Coordinates

We can transform the sRGB coordinates into the corresponding values CIELAB, an approximately uniform color space. The results for a CIE D50 illuminant are shown in Fig. 3.
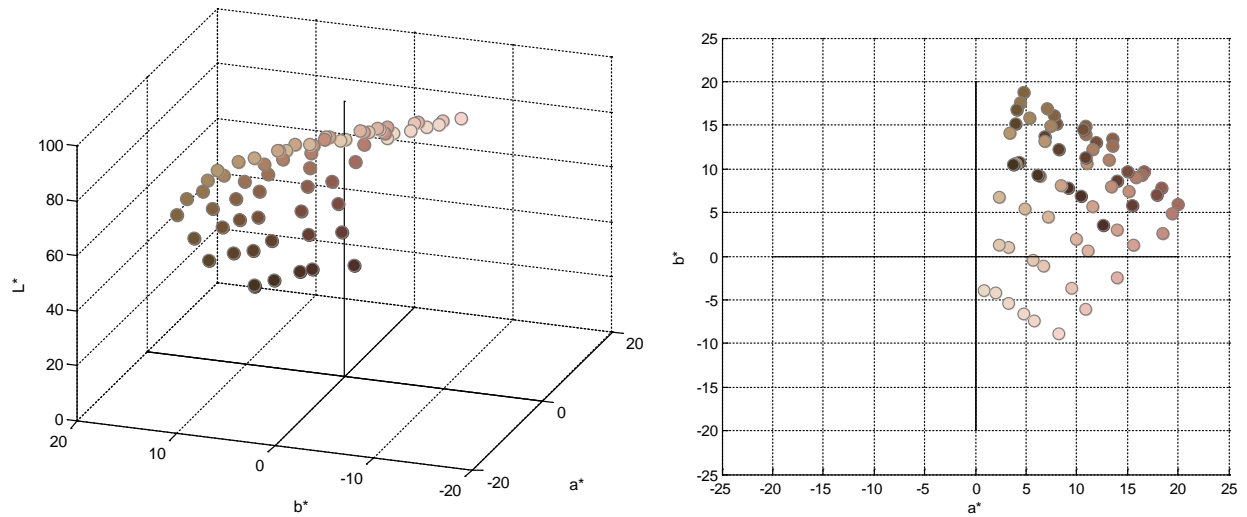

Figure 3: CIELAB coordinates for skin color chart (D50 illuminant)

Discussion

The above identification of important regions of color-space and the corresponding image signal-space are useful in several ways. Design and optimization of the image capture hardware and software can proceed with a focus on areas where user sensitivity is highest, e.g., where variation due to field conditions (lighting, camera positioning) is most visible to the dermatologist. The application of error-propagation techniques [3] can provide a useful framework. In addition, important color-regions can be used directly to build (with care) application-specific ICC color profiles.[4]

A related area is quality assurance as part of manufacturing. Examples include final system test and qualification which are likely to include measures of (image) color accuracy and variability. To this end, custom test charts[5] can be used, in combination with corresponding analysis software.

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References

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Please contact the author for more information on the specifics of this effort and related topics.