HPC - 1.4.3

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In this report, we calculate the General Color Rendering Index (R_a) for the light source simulator D65 used in the VeriVide light cabinet in laboratory 132. The reference illuminant for this calculation is the standard colorimetric illuminant D65 of the CIE. To compute the R_a, we used the CIE 1964 UWV* color space and also performed von Kries chromatic adaptation. The general color rendering index measures how well the colors of objects are rendered by the test light source compared to a reference source. In this case, the test light source is supposed to be a standard illuminant and our goal here is to check in what degree does the light booth is precise.

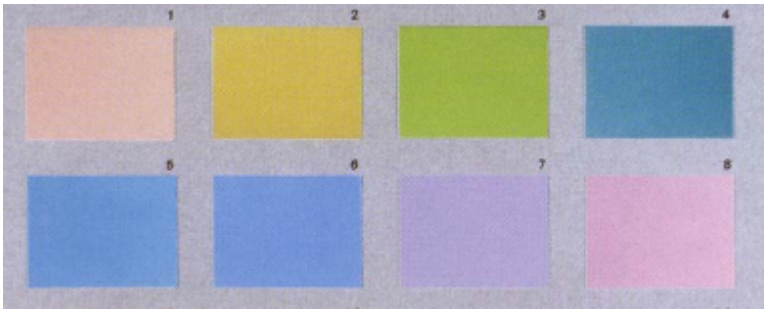
special color rendering indices R_i for each of the test colors are obtained by:

$$R_i = 100 - 4.6\Delta E_i$$

and the general color rendering index R_a is obtained by:

$$R_a = \frac{\Sigma_{i=1}^{8} R_i}{8}$$

where ΔE_i is the color difference between the test samples in reference illuminant and test illuminant in the CIE 1964 UWV* color space. The 8 colors that are used are these color patches:



after obtaining the chromaticity coordinates in the test illuminant, we use Von Kries chromatic adaptation to correct it using the formulas in the slides:

$$u'_k = u_r$$

$$v'_k = v_r$$

$$u'_{k,i} = \frac{10.872 + \frac{0.404 c_r c_{k,i}}{c_k} - \frac{4 d_r d_{k,i}}{d_k}}{16.518 + \frac{1.481 c_r c_{k,i}}{c_k} - \frac{d_r d_{k,i}}{d_k}}$$

$$v'_{k,i} = \frac{5.520}{16.518 + \frac{1.481 c_r c_{k,i}}{c_k} - \frac{d_r d_{k,i}}{d_k}}$$

For the test of effect of chromatic adaptation, we also calculated the R_a without adaptation and here is the result:

- General Color Rendering Index Without chromatic adaptation: **R_a = 99.66**
- General Color Rendering Index with Von Kries chromatic adaptation: **R_a = 99.67**

The R_a values close to 100 indicate that the light source simulator D65 in the VeriVide light cabinet performs exceptionally well in rendering colors as compared to the standard D65 illuminant. The slight difference between the values with and without chromatic adaptation suggests that the adaptation process makes a minimal difference, indicating the robustness of the light source in maintaining color accuracy.