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COMPUTER GRAPHICS I ASSIGNMENT 6

Submission deadline for the exercises: Thursday, 21th December 2006

6.1 Gamma correction (25 Points)

Graphics card gets 8 bit color components as input from an application. These 8 bit values represent the fractional part of the color value, thus go from $0.00000000b = 0$ to $0.11111111b$ which is approximately 1. Assume that the graphics card has the capabilities to perform gamma correction by a function $f(x) = x^\gamma$ with γ in the range of $[1, 2.5]$. Which accuracy (in number of bits) is required after the gamma correction to accurately represent the corrected signal?

6.2 Transforms in colorspace (50 points)

Many of today's monitors allow to change the color temperature of the image. A change in the color temperature corresponds to a movement of the white point in the color diagram and does not change the primary colors itself.

A monitor corresponding to the standard "ITU-R BT.709 (which is identical to sRGB) uses the following color coordinates $(x_r, y_r) = (0.640, 0.330)$, $(x_g, y_g) = (0.300, 0.600)$, $(x_b, y_b) = (0.150, 0.060)$, and a D65 white point $(x_w, y_w) = (0, 3127, 0.3290)$.

- Can you think of an easy way to realize a movement of the white point on a monitor?
- Calculate the necessary transformation matrix to convert a color from the color space given above into a new one with the same primaries but with the white point at $(w_x, w_y) = (0.400, 0.330)$. Explain your solution. Since this transformation is not used to change the brightness, assume a normalized white point.

6.3 Color Space (25 Points)

Compute the position of the sRGB color (1,1,0) in the CIE-XYZ and CIE-xy color space.