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## COMPUTER GRAPHICS I ASSIGNMENT 7

**Submission deadline for the exercises:** Monday, 17th December 2007

**Rule:** Solutions have to be submitted in the lecture room before the lecture.

### 7.1 Gamma correction (25 Points)

A 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  $0.0000000b = 0$  to  $0.1111111b$  which is approximately 1. Assume that the graphics card has the capabilities to perform gamma correction by a function  $f(x) = x^\gamma$  with  $\gamma$  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?

### 7.2 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 themselves.

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.

### 7.3 Color Space (25 Points)

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