
Exercise Sheet 4

Submission: 30.05.2023, 10:15 AM

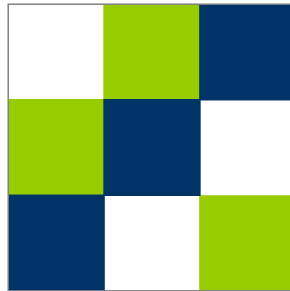


Figure 1: Image for texturing.

Exercise 1. (6 points) Let $p_0 = (2, 0, 0)$, $p_1 = (0, 2, 0)$, $p_2 = (0, 0, 2)$ be vertices of a triangle \mathcal{T} in \mathbb{R}^3 , $p = \frac{1}{5}(3, 5, 2)$ a point in \mathcal{T} , and an image with image domain $D_I = [0, 2] \times [0, 2]$ shown in Figure 1.

- i) Provide an example for a texture map $t : \mathcal{T} \rightarrow D_T = [0, 1]^2$ (D_T is normalized texture domain) and a map $L : D_T \rightarrow D_I$ mapping it to the image domain. Sketch your maps and the result of the texture remapped to the triangle.
- ii) What are the barycentric coordinates of p w.r.t. \mathcal{T} ? Which color is assigned to p , i.e. evaluate $I \circ L \circ t(p)$, with $I : D_I \rightarrow C$ a color map into some color space C representing colors from the image in Figure 1?

Exercise 2. (5 points) Show the following statements about *isometries*¹:

- i) Let $\varphi : \mathbb{R}^n \rightarrow \mathbb{R}^n$ be a linear map. Then φ is an isometry if and only if $\|\varphi(x)\| = \|x\|$ for all $x \in \mathbb{R}^n$.
- ii) Isometries are injective.

Exercise 3. (5 points) Create a textured² house having a square base and a hip roof. Therefore, find or create fitting textures. Submit³ a JVX file and an image (PNG, JPG, ...) of your result.

¹An isometry preserves distances between points.

²In the wiki (<http://www.mi.fu-berlin.de/w/AGGeom/JavaView>) you can find information about geometry creation and textures.

³Please make sure to create a zip-archive when you send it by mail as otherwise single files might get blocked due to safety issues.