

Computer Graphics 1 - Exam 2

18.02.2022 - Online Exam

!!! ANSWERS IN THE EXAM MIGHT BE WRONG !!!

Light, Color

2 questions

Rasterization

3 questions

Texturing

Frage 6

Bisher nicht beantwortet

Erreichbare Punkte: 1,00

Frage markieren

Which of the following statements in the context of texturing are true?

- Discrete textures can suffer from over- and undersampling.
- It is in general hard to map a rectangular texture to an arbitrary shape.
- Filtering is often needed to avoid aliasing.
- Discrete textures are easily generated using cameras or scanners.

Frage 7

Bisher nicht beantwortet

Erreichbare Punkte: 1,00

Frage markieren

In practice, perspective correct interpolation of u, v values (texture coordinates) is done by premultiplying the values with the w value.

Let $a = u_1 * w_1$ and $b = u_2 * w_2$ be the premultiplied values for two vertices p_1, p_2 connected by an edge.

Provide the formula for the perspective correct interpolated value $u(t)$ at a point

$$p(t) = (1 - t) * p_1 + t * p_2 = \begin{bmatrix} x \\ y \\ z \\ w \end{bmatrix} \text{ for a scalar } t \in [0, 1]:$$

$u(t) =$

Frage 8

Antwort gespeichert

Erreichbare Punkte: 1,00

Markierung entfernen

Which phenomenon can occur when applying a texture on a triangle that is rastered on a set of pixels with an unfitting pixel resolution, resulting in a misrepresentation of texture structure?

- a. A translation of the texture on the triangle
- b. Aliasing
- c. Trilinear Filtering
- d. Texel Averaging
- Meine Auswahl widerrufen

Ray Tracing

Frage **9**

Bisher nicht beantwortet

Erreichbare Punkte: 1,00

Frage markieren

Which light model is commonly used in combination with ray tracing and evaluated whenever a ray hits an object?

- a. Global illumination
- b. Viterbi's Multi-View
- c. Phong Model
- d. Distance to the light source

Frage **10**

Bisher nicht beantwortet

Erreichbare Punkte: 1,00

Frage markieren

We want to test for a ray-triangle intersection. We therefore calculated the coordinates of the intersection point of our ray with the triangle plane p_0 . In barycentric coordinates, p_0 is expressed as:

$$p_0 = \begin{bmatrix} a \\ 0.1 \\ 0.9 - a \end{bmatrix}$$

Assuming $a \geq 0$ give a condition in form of an inequality on the variable a that needs to be fulfilled for the ray to intersect the triangle:

Frage **11**

Bisher nicht beantwortet

Erreichbare Punkte: 1,00

Frage markieren

Name 2 light-related phenomena that need additional care when projecting all geometry onto a screen (as in the standard gpu pipeline) but that are automatically implemented when using raytracing.

Antwort:

Radiosity

Frage 12

Bisher nicht beantwortet

Erreichbare Punkte: 1,00

Frage markieren

Assume radiosity for n surface element is computed using an iterative solver for the linear system, and we allow for some approximation error. What major part of the computation cannot be avoided and what is its complexity?

Antwort:

Frage 13

Bisher nicht beantwortet

Erreichbare Punkte: 1,00

Frage markieren

The discrete radiosity equation is given by:

$$B_i = E_i + \rho_i \sum_{j=1}^n F_{ij} B_j$$

Assume we only have two surface elements and their corresponding radiosity values B_1, B_2 .

The radiosity equation can be written in Matrix Form: $A \cdot B = E$ where $B = \begin{bmatrix} B_1 \\ B_2 \end{bmatrix}$, $E = \begin{bmatrix} E_1 \\ E_2 \end{bmatrix}$.

Hint: ρ is the greek letter rho and can be input by typing rho.

Give a formulation for A:

Output

Frage 14

Bisher nicht beantwortet

Erreichbare Punkte: 1,00

Frage markieren

In the JPEG - Baseline Codec the serialization of the quantized DFT coefficients is organized along a zig-zag pattern in the DCT matrix, rather than row- or column-wise. Why?

Antwort:

Frage 15

Bisher nicht beantwortet

Erreichbare Punkte: 1,00

Frage markieren

Which of the following statements about image encodings are true?

- Repetitive storage of an image using the JPEG encoding will lower the image quality.
- Repetitive storage of an image using the 8-bit color encoding will lower the image quality.
- Repetitive storage of a vector image will lower the image quality.
- Repetitive storage of an image using the run-length encoding will lower the image quality.

Mixed

Verbleibende Zeit 0:06:39

Frage 16

Bisher nicht beantwortet

Erreichbare Punkte: 1,00

Markierung entfernen

Imagine we were computing radiosity in 2D, e.g. for a closed polygon in the plane. Which statements are true in this case?

- The form factors would involve $(1 / \pi)$ as a factor, similar to the 3D case.
- The form factors would be inversely proportional to the distance (not the distance squared)
- The number of form factors would be linear (not quadratic) in the number of segments of the polygon
- The form factors would be symmetric.

Frage 17

Bisher nicht beantwortet

Erreichbare Punkte: 1,00

Frage markieren

The Bresenham algorithm is commonly described only for lines with slopes between 0 and 1. How can the algorithm handle cases with slope bigger than 1?

Antwort:

Frage 18

Bisher nicht beantwortet

Erreichbare Punkte: 1,00

Markierung entfernen

What would be an application of Bresenham's algorithm generalized to 3D?

Antwort: