Computer Graphics 1 - Exam 1

13.12.2021 - Online Exam

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

Input

2 questions

Transformation and Representation

Frage **3**

Bisher nicht beantwortet

Erreichbare Punkte: 1,00

Frage markieren

Write down a 4x4 transformation matrix in homogeneous coordinates representing a shear. The identity transformation is **NOT** allowed:

1	2	2	0
2	1	2	0
2	2	1	0
0	0	0	1

Frage **4**

Bisher nicht beantwortet

Erreichbare Punkte: 1,00

Frage markieren

Consider a scene graph with three nodes:

root -> car -> wheel

The root contains the global coordinate system, car is a child of root, wheel is a child of car.

The local to parent transformation matrices are:

$$A_{car->world} = \begin{bmatrix} 2 & 0 & 0 & 0 \\ 0 & 2 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

$$A_{wheel->car} = \begin{bmatrix} 1 & 0 & 0 & 3 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

A vertex position in the wheel mesh is given in local coordinates as:

$$p = \begin{bmatrix} 2 \\ 0 \\ 0 \\ 1 \end{bmatrix}$$

Give its position in world coordinates:

Frage **5**

Bisher nicht beantwortet

Erreichbare Punkte: 1,00

Frage markieren

Which of the following combinations of affine transformations are generally commutative?

- ☐ Translation and translation
- ☐ Rotation and translation
- ☐ Rotation and rotation
- ☐ Rotation and isotropic scaling

Rotation and Homogeneous Coordinates

2 questions

Perspecive Transformation

1 question and the following two

Frage **9**

Bisher nicht beantwortet

Erreichbare Punkte: 1,00

Frage markieren

Consider the following homogeneous projection matrix:

$$\begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 1 & 1 & 1 \end{bmatrix}$$

Give two different points at infinity p_1, p_2 (in homogenous coordiantes) that are projected to finite points.

p_1:

$$\begin{bmatrix} 3 \\ 0 \\ 1 \\ 0 \end{bmatrix}$$

p_2:

$$\begin{bmatrix} 8 \\ 0 \\ 1 \\ 0 \end{bmatrix}$$

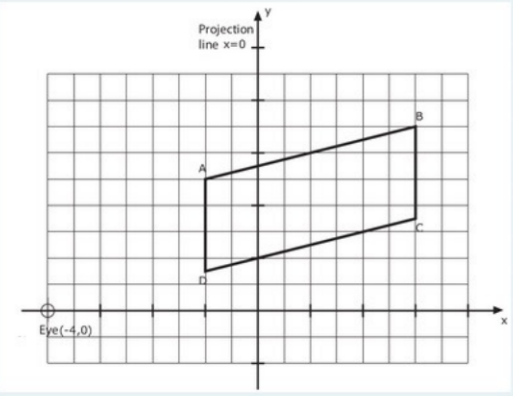
Frage **10**

Bisher nicht beantwortet

Erreichbare Punkte: 1,00

Frage markieren

Consider a perspective transformation with eye position $(-4, 0)$, view direction along the x axis and projection line $x = 0$.



Which of the two sets of parallel lines are still parallel after applying the perspective transformation?

- ☐ Lines through A, B and D, C
- ☐ Lines through A, D, and B, C

Culling and Visibility

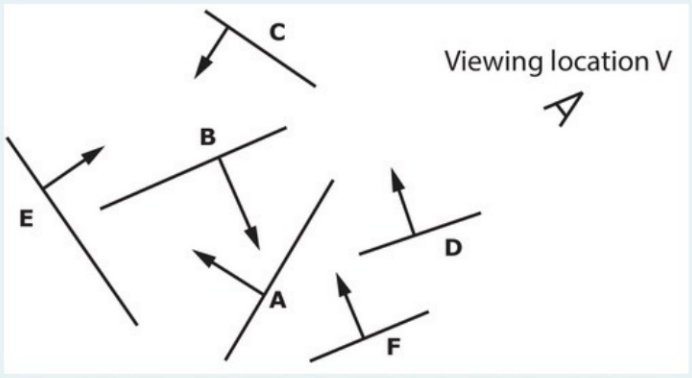
1 question and the following one:

Bisher nicht beantwortet

Erreichbare Punkte: 1,00

Markierung entfernen

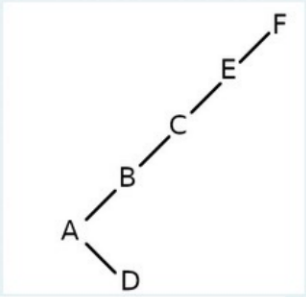
Verbleibende Zeit



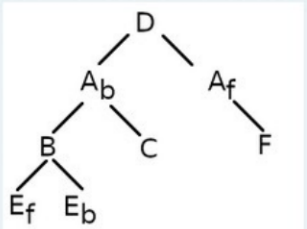
Which of the following trees form a BSP according to the following rules:

1. Normals point to the front side of a line segment and the left subtree contains the segments in the front.
2. When a line segment is split, the subscript f for the front and b for the back is used.

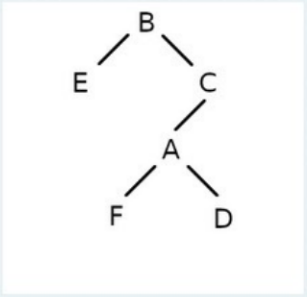
1.



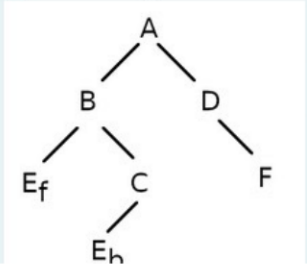
2.



3.



4.



Shading

3 questions

Mixed

1 question and the following two:

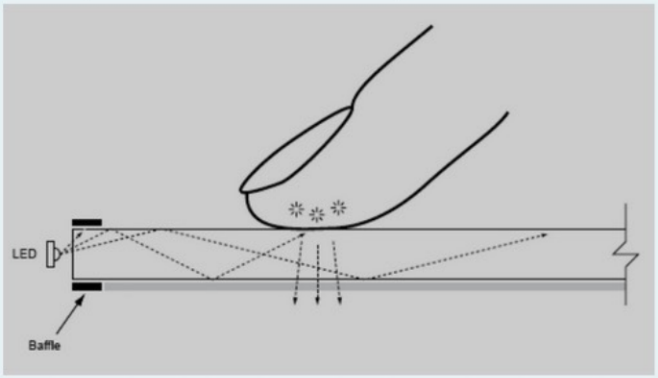
Frage **17**

Bisher nicht beantwortet

Erreichbare Punkte: 1,00

Frage markieren

Given an optical touch screen as seen below. Why do we need a baffle in front of the LED?



Antwort:

Frage **18**

Bisher nicht beantwortet

Erreichbare Punkte: 1,00

Frage markieren

The Gouraud interpolation method is almost always faster than the Phong interpolation method. Describe a theoretical situation where Gouraud interpolation is **slower** than Phong interpolation.

Antwort: