Graphics Systems and Interaction

Normal Call 2022-02-15

No. _____ Name _____

Assessment duration: 45 minutes
Value of each question: marked with brackets
Multiple choice questions: each wrong answer deducts 1/3 of the question's value

Part I **10%**

a. **[3.3]** Computer graphics representation known as bitmaps

   i. Are obsolete, having been replaced by their vector counterparts
   ii. Have a computational complexity of O(no. of vertices / vectors)
   iii. Allow the execution of operations such as rotation and scaling without loss of precision
   iv. None of the above

b. **[3.3]** Consider two generic points P e Q (non-coincident) and point R resulting from the affine combination $R = (1 - \alpha) * P + \alpha * Q$

   i. If $\alpha = 0$, then point R coincides with point Q
   ii. If $\alpha = 1$, then point R coincides with point P
   iii. If $\alpha = ½$, then point R coincides with the midpoint of segment PQ
   iv. If $0 < \alpha < 1$, then point R does not belong to segment PQ

c. **[3.3]** When using an orthographic projection

   i. The viewing volume has the shape of a pyramid trunk
   ii. The viewing volume has the shape of a cone trunk
   iii. The apparent size of objects being displayed decreases with increasing the distance from the camera
   iv. None of the above

d. **[3.3]** When encoding solids based on pointers to a list of vertices

   i. Each face explicitly stores the ordered list of its vertex coordinates
   ii. There is a list of vertices and faces reference their vertices through pointers to that list
   iii. Information redundancy is greater than with explicit encoding
   iv. None of the above

e. **[3.3]** Spotlights are an example of a

   i. Positional light source
   ii. Directional light source
   iii. Omnidirectional light source
   iv. None of the above

e. **[3.3]** In three.js texture mapping, the trilinear filtering method

   i. Uses the texel that lies nearest to the center of the pixel within the nearest mipmap
   ii. Uses a weighted linear average of the 2 x 2 array of texels that lie nearest to the center of the pixel within the nearest mipmap
   iii. Uses the nearest texel in each of the two nearest best choice of mipmaps and then interpolates linearly between these two values
   iv. Uses a weighted linear average of the 2 x 2 array of texels in each of the two nearest best choice of mipmaps and then interpolates linearly between these two values

Graphics Systems and Interaction

Normal Call 2022-02-15

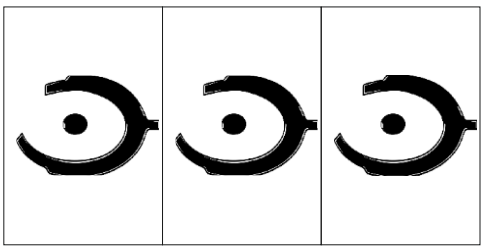
No. _____ Name _____

Part II 20%

a. **[4.0]** Suppose you want to map the texture represented in Figure 1 to a rectangle so that it looks like the one shown in Figure 2. Enter the texture coordinates corresponding to each polygon vertex.

Figura 1

Figura 2



v0: _____, _____ v1: _____, _____

v2: _____, _____ v3: _____, _____

b. **[2.0]** Consider a sphere made of an orange material (1.0, 0.5, 0.0) illuminated by a single aquamarine light source (0.0, 8, 1.0). What are the primary components (R, G, B) of the resulting color? Specify the calculations made.

R = _____ G = _____ B = _____

c. **[1.4]** A Mesh object combines

i. Geometry and Material
ii. Geometry and Camera
iii. Material and Scene
iv. Light and Scene

d. **[1.4]** In an OrthographicCamera, the zoom factor can be adjusted with

i. Field-of-view
ii. Width and Height
iii. Aspect ratio
iv. Far

e. **[1.4]** The use of indices to define a geometry reduces the number of

i. Vertices
ii. Edges
iii. Materials
iv. Faces

f. **[1.4]** A DirectionalLight positioned at (0.0, 0.0, 0.0) and oriented towards the positive direction of the Z axis will light up

   i. Only the objects above ($z > 0.0$) OXY plane
   ii. Only the objects below ($z < 0.0$) OXY plane
   iii. Only the objects that include the origin (0.0, 0.0, 0.0)
   iv. All the objects

g. **[1.4]** When using a SpotLight, shadow projection implies a computational overhead of *n* renderings, being *n* = ?

   i. 1
   ii. 2
   iii. 4
   iv. 6

h. **[1.4]** When creating an AmbientLight, the supplied parameters are usually

   i. Color and Distance
   ii. Color and Intensity
   iii. Color and Position
   iv. Position and Direction

i. **[1.4]** A faster texture rendering can be obtained by using

   i. LinearFilter
   ii. NearestFilter
   iii. ExtralinearFilter
   iv. CubicFilter

j. **[1.4]** In three.js, picking is normally achieved by using

   i. ClickEngine
   ii. PickingMode
   iii. MouseXtra
   iv. RayCaster

k. **[1.4]** FogExp2, when compared with Fog

   i. Is more realistic from the point of view of physics
   ii. Is computationally more complex
   iii. Is easier to adjust
   iv. Is equivalent in terms of result

l. **[1.4]** Post-processing makes it possible to easily attain

   i. The look of a black and white film
   ii. Surfaces with greater detail
   iii. A faster rendering
   iv. The optimization of RAM memory usage