

CISC 3620 SP26 Midterm Sample Questions

Short Response Questions:

- What is the primary focus of computer graphics?
- Describe the main difference between 2D and 3D graphics.
- Identify the four major areas of computer graphics applications noted in class and provide a brief description and example of each.
- Explain the role of a graphics processing unit (GPU).
- What is the purpose of a frame buffer in computer graphics?
- What are the two main types of 2D graphics? Define them, explain how they differ, and give an example of each.
- Define raster graphics and provide an example of its use.
- What are vector graphics, and how do they differ from raster graphics?
- List the six major components of a computer graphics system.
- What is the difference between absolute and relative positioning in terms of input devices? Give an example of an input device for each.
- What are the two main types of input devices mentioned in computer graphics systems?
- What is the difference between the CPU and GPU in a graphics system?
- Describe the difference between absolute and relative position input devices.
- How does anti-aliasing contribute to image quality?
- Explain the difference between noninterlaced and interlaced display systems in terms of how they refresh pixels on a screen.
- What advantages does a PNG have over a GIF?
- What is the purpose of a graphics API?
- Explain the difference between additive and subtractive color models.
- What is the color gamut of a device?
- Briefly explain the role of the vertex shader in the graphics pipeline.
- List and define the five steps of a standard 3D graphics pipeline.
- What are the three necessary components that are needed to display in Three.js? Define them.
- What is a mesh in Three.js?
- What is the difference between MeshBasicMaterial and MeshStandardMaterial?
- What is the difference between MeshLambertMaterial and MeshPhongMaterial?
- Why is requestAnimationFrame() used in Three.js animations?
- In the following Phong shading model, identify these seven terms: **k_d , l_d , k_s , l_s , α , k_a , l_a**

$$I = k_d I_d \mathbf{l} \cdot \mathbf{n} + k_s I_s (\mathbf{v} \cdot \mathbf{r})^\alpha + k_a I_a$$

- What are the components that make up a 3D object in Three.js?
- What are the two types of cameras in Three.js, and how do they differ from one another?

- List the four attributes of the Perspective Camera in Three.js and what they represent.
 - What are the three main components of the Phong shading model, and how do they contribute to the appearance of a surface in 3D graphics?
 - Create a translation matrix to move a point 3 units along the x-axis and 7 units along the negative y-axis.
 - Create a 4x4 matrix to scale a point by 3 in the x dimension and 0.2 in the z dimension.
 - Create a 4x4 transformation matrix that first translates a point by (4, -2, 5) and then scales it by 2 in all directions.
 - A point $P = (1, 3, -2, 1)$ is scaled by 3 in the x-direction and 0.5 in the y-direction, then translated by (2, -4, 1).
 - Write the combined transformation matrix.
 - Compute the final coordinates of the point.
 - A point $P = (2, 1, 0, 1)$ is transformed in two different ways:
 - Case A: Scale by 2 in all directions, then translate by 3 on the x-axis
 - Case B: Translate by 3 on the x-axis, then scale by 2 in all directions.
 - Write the transformation matrices and compute the resulting point in both cases.
 - Explain why the results are different.
 - Construct a 4x4 matrix that scales a point by (2, 3, 1) and then translates it by (5, 0, -2).
 - A point is translated by (-6, 4, 2) and then scaled by 0.5 in all directions.
 - Write the two matrices.
 - Multiply them to form the combined transformation matrix.
 - What are the five types of lights in Three.js that we discussed in class? Briefly describe each.
 - How do we apply a texture to a material in Three.js?
 - What is texture tiling, and how can it improve the appearance of textures in a 3D scene?
 - What is shadow mapping, and how does it work?
 - How does Percentage-Closer Filtering (PCF) help improve shadow quality?
 - Explain the difference between castShadow and receiveShadow properties in Three.js.
 - Explain the role of UV mapping in applying textures to 3D geometries.
 - What is hierarchical modeling in computer graphics?
 - Why is hierarchical modeling useful when creating complex objects?
 - What happens if the scene is rendered only once and not inside an animation loop?
 - What is a scene graph, and how does it relate to hierarchical modeling?
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Multiple Choice Questions:

- Which of the following best describes raster graphics?
 - a) Graphics made up of lines and curves
 - b) Graphics represented by pixels
 - c) Graphics created using algorithms
 - d) Graphics that cannot be resized

- What is the primary advantage of using vector graphics?
 - a) They are easier to use than raster graphics
 - b) They are resolution-independent
 - c) They are faster to render
 - d) They are always color accurate

- The conversion of geometric entities to pixel colors and locations in the frame buffer is known as:
 - a) Rendering
 - b) Ray tracing
 - c) Rasterization
 - d) Texture mapping

- Which of the following is not a common input device?
 - a) Keyboard
 - b) Mouse
 - c) Monitor
 - d) Joystick

- The color model that involves the mixing of light is called:
 - a) Subtractive
 - b) Additive
 - c) Reflective
 - d) Inverted

- How many colors can be displayed using an 8-bit RGB color model?
 - a) 256
 - b) 65536
 - c) 16777216
 - d) 1024

- A digital image displayed with a grid of pixels is known as:
 - a) Vector image
 - b) Raster image
 - c) Geometric image
 - d) Z-buffer image

- To define color in a raster image, which color model is typically used?
 - a) CMYK
 - b) HSL
 - c) RGB
 - d) YUV
- What RGB value represents the color black?
 - a) (255, 255, 255)
 - b) (0, 0, 0)
 - c) (128, 128, 128)
 - d) (255, 0, 0)
- How can the color white be described in terms of RGB values?
 - a) (0, 0, 0)
 - b) (255, 255, 0)
 - c) (255, 255, 255)
 - d) (128, 128, 128)
- Which of the following RGB values represents a shade of gray?
 - a) (255, 128, 0)
 - b) (0, 0, 255)
 - c) (128, 128, 128)
 - d) (0, 255, 0)
- Which of these techniques is a process where geometry that's not visible from the camera is discarded to save processing time?
 - a) Culling
 - b) Clipping
 - c) Filtering
 - d) Sampling
- Which of the following transformations is NOT a linear transformation?
 - a) Scaling
 - b) Rotation
 - c) Translation
 - d) None of the above

- Which of the following formats is specifically designed for vector graphics?
 - a) WebP
 - b) PNG
 - c) SVG
 - d) GIF
- What does the term 'anti-aliasing' refer to?
 - a) Adjusting brightness in images
 - b) Reducing jagged edges in graphics
 - c) Compression of image files
 - d) Creating textures for 3D models
- Which component determines the color of pixels on a computer screen?
 - a) Memory
 - b) Graphics Processing Unit (GPU)
 - c) Central Processing Unit (CPU)
 - d) Input devices
- Which material in Three.js would you use for a surface that should reflect light and appear shiny?
 - a) MeshBasicMaterial
 - b) MeshNormalMaterial
 - c) MeshPhongMaterial
 - d) MeshLambertMaterial
- What does the dot product of two vectors indicate when it equals zero?
 - a) The vectors are equal
 - b) The vectors are orthogonal (perpendicular)
 - c) The vectors point in the same direction
 - d) The vectors point in opposite directions
- In a graphics pipeline, rasterization is the process of:
 - a) Mapping 3D coordinates to 2D space
 - b) Converting images from raster to vector
 - c) Breaking down 3D objects into pixels
 - d) Transforming model data into vertex data

- In Three.js, how do you set the background color of a scene?
 - a) `scene.color = "blue";`
 - b) `scene.background = new THREE.Color("blue");`
 - c) `scene.setBackgroundColor("blue");`
 - d) `scene.addBackground("blue");`
- How does ambient light affect a scene?
 - a) It creates sharp shadows
 - b) It adds light without direction or intensity
 - c) It reflects off surfaces
 - d) It creates a focal point
- Which of the following describes a characteristic of raster graphics?
 - a) They use geometric shapes like lines and circles.
 - b) They are resolution-independent.
 - c) They are made up of a grid of pixels.
 - d) They require less memory than vector graphics for complex images.
- What is the primary disadvantage of using Supersampling Anti-Aliasing (SSAA)?
 - a) It is the cheapest method
 - b) It is computationally intensive and can heavily load the GPU
 - c) It is only effective on high-resolution displays
 - d) It cannot smooth edges effectively
- FXAA stands for:
 - a) Fast Analysis Anti-Aliasing
 - b) Fast Approximate Anti-Aliasing
 - c) Fine Adjustment Anti-Aliasing
 - d) Full Anti-Aliasing Extension
- Multi-Sample Anti-Aliasing (MSAA) primarily samples multiple points:
 - a) Throughout the entire pixel
 - b) Only at the edges of polygons
 - c) Across all subpixels
 - d) At random positions in the image

- CSAA improves on MSAA by:
 - a) Reducing the number of color samples while increasing coverage samples
 - b) Allowing for higher resolution color samples without increasing memory usage
 - c) Increasing the number of coverage samples without significantly increasing the number of color/depth samples
 - d) Eliminating color samples altogether