COMPUTER GRAPHICS

JOHN BWALE

TODAY

1 SECTION (A) CHOICE MAKING

1.1 Which of the following is NOT a primary colour in the RGB colour model?

- A.RED

- B.GREEN

- C.BLUE

- D.YELLOW

- ans (D) Yellow is NOT a primary color in the RGB color model. In the RGB model, the primary colors are Red, Green, and Blue.

1.2 When light travels from air into water, it generally:

- A. Slows down and bends away from the normal.

- B. Speeds up and bends away from the normal.

- C. Slows down and bends toward the normal.

- D. Speeds up and bends toward the normal

- ans (B) When light travels from air into water, it generally slows down and bends toward the normal. This phenomenon is known as refraction.

1.3 In ray tracing, what is the term used to describe the process of determining which objects in the scene are visible from a specific point of view?

- A.Shading

- B.Reflection

- C.Shadowing

- D.Ray intersection

- ans (C) In ray tracing, the term used to describe the process of determining which objects in the scene are visible from a specific point of view is "Ray intersection." Ray tracing involves casting rays from the camera's viewpoint and determining which rays intersect with objects in the scene.

1.4 Which rendering technique is primarily used to simulate the way light interacts with translucent materials such as glass or water?

- A. Ray casting

- B.Photon mapping

- C.Refraction

- D.Specular reflection

- ans (D) The rendering technique primarily used to simulate the way light interacts with translucent materials such as glass or water is "Refraction." Refraction is the bending of light as it passes through different materials with varying refractive indices, and it is crucial for simulating realistic effects in transparent or translucent materials.

2 SECTION (B) RAY TRACING AND ANIMATION

2.1 Briefly explain the concept of specular reflection and provide an example of a real-world situation where it occurs.

- Specular reflection is the phenomenon in which light reflects off a surface in a concentrated and mirror-like manner, resulting in a highlight. This type of reflection occurs when light rays hit a smooth and polished surface, such as glass, water, or a shiny metal, and bounce off at consistent angles. An example of specular reflection can be seen when sunlight reflects off the surface of a calm lake, creating a bright and well-defined glint or highlight on the water's surface.

2.2 Define "ray tracing" and "ray casting" in the context of computer graphics. Explain how they differ.

- Ray tracing is a rendering technique that simulates the path of individual rays of light as they interact with objects in a scene. It takes into acccount various optical phenomena, such as reflection, refraction, shadows, and complex lighting effects. Ray tracing can produce highly realistic and detailed images, but it is computationally intensive, as it traces rays through the scene to calculate the color of each pixel. It is commonly used for generating photorealistic images and animations.Ray casting, on the other hand, is a simplified rendering technique that traces rays from the camera's viewpoint into the scene to determine which objects are visible from that viewpoint. It is less computationally intensive than full ray tracing and is often used for basic scenes and real-time applications like video games. Ray casting doesn't account for complex lighting effects, such as reflections and refractions, and is primarily used for visibility calculations.

2.3 Describe the term "interpolation" as it relates to animation and its importance in creating smooth motion.

- Interpolation in animation refers to the process of generating intermediate frames between keyframes to create smooth motion. Keyframes are specific frames in an animation sequence that define key positions, rotations, and other attributes of objects or characters. Interpolation is essential for creating fluid and realistic animations. It calculates the in-between frames to smoothly transition between keyframes, ensuring that the motion appears natural and continuous. Without interpolation, animations would appear jerky and less lifelike. Different types of interpolation methods, such as linear, cubic, or bezier interpolation, can be used to control the ease-in, ease-out, and overall timing of animation sequences, allowing animators to achieve the desired level of realism and artistic expression.

3 SECTION (C) PROBLEM SOLVING RAY OF LIGHT

Question:

Consider a ray tracing scenario where a ray of light travels from air ($n_1 = 1.00$) into a glass block ($n_2 = 1.50$). The incident angle is 30°. Calculate the angle of refraction using Snell's Law. Show all your work.

Instructions:

1. Convert the incident angle from degrees to radians. 2. Use Snell's Law to relate the angles of incidence and refraction. 3. Substitute the given values into Snell's Law equation. 4. Solve for the angle of refraction. 5. Optionally, convert the angle of refraction back to degrees. 6. Present the final answer clearly.

Solution:

The angle of refraction is approximately 19.47°.