



INSTITUTE OF INFORMATION TECHNOLOGY
JAHANGIRNAGAR UNIVERSITY

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Answer to the question no-1

Computer Animation: It's a Process of creating moving images using computer. It's a branch of computer generated imagery that specifically focuses on generating moving visuals.

Significance in Modern multimedia Application:

- Versatility: Animation can breathe life into any concept whether it's talking an image character.
- Enhanced Engagement: Computer to static image or text animation can grab attention and hold it.
- Cost Effectiveness: While creating complex animation can be resource intensive.
- Integration with other Media: Easier to integrate with other media.

Answer to the question no-2

Principles of Key Frame Animation:

- Setting Keyframes: you define keyframes at the beginning and end of an action.
- Interpolation: The software fills the gap between keyframes automatically generating the in-between frames.
- Timing a Spacing: the number of frames between keyframes determines the speed of the animation.

Interpolation Techniques

- Linear interpolation
- Ease in / Ease out
- Bezier Curves
- Spline interpolation

Answer to the question no-3

Process of texture mapping in Computer Animation.

1. UV Mapping: The 3D model is unwrapped into a 2D layout, similar to peeling an orange. This layout is called a UV map.
2. Texture Creation: A 2D image is created on source that corresponds to the surface details you want on the model.
3. Mapping the texture: The texture map is then applied to the UV map.
4. Rendering: During rendering the software uses the texture map to determine the color.

How texture mapping contributes to visual realism.

- Surface detail
- Material Properties
- Increased efficiency.

Answer to the question no-4

Principles of Physics-Based Animation:

1. Physics Engines: The heart of the Physics based animation is physics engine that simulate the behavior of object.
2. Constraints: Constraints are virtual limitations placed on object within the simulation.
3. Forces: Forces are applied to object within simulation to initiate movement.
4. Collisions: The Physics engine calculate the collisions between objects and calculate the resulting impact.

Application in Character and Object Animation

- Character Locomotion
- Cloth Simulation
- Fluid Simulation

Answer to the question no-5

Importance of timing and spacing:

Realistic Movement: Proper timing and spacing mimic the natural laws of physics.

Emotional weight: The speed and rhythm of movement can convey emotions.

Weight and Mass: Timing and spacing help depict an object's weight and mass.

Application in Hand Drawn Animation.

- Exposure sheets
- Limiter animation technique

Application Computer-generated Animation

- Software tools
- Physics Engine

Answer to the question no-6

Interpolation in Computer Animation:

Interpolation is a crucial technique in Computer animation used to generate smooth movement between keyframe.

• Linear Interpolation:

This is the simplest method Imagine drawing straightline between two keyframes on graph.

• Spline Interpolation:

This method offer more control compared to linear interpolation

- Varying Speeds
- Overshoot and Undershoot
- Straight line.

Answer to the question no-7

The Rasterization Process:

1. 3D Models to Triangle: 3D models used in animation software are typically made of polygons most commonly triangles.
2. Triangle Rasterization: For each triangle the rasterizer determine which pixels on the screen line within its boundaries.
3. Pixel filling: Once the pixel within the triangle are identified the rasterizer assigns a color value to each pixel.
4. Hidden Surface removal: The rasterizer also plays a role in determining which objects are visible and which are hidden behind others object.

Answer to the question no-8

2D vs 3D Animation.

2D

- Flat
- Expressive
- Full of charm

Advantage:

- Style and Versatility
- Simple work flow

Limitation:

- Depth and Perspective
- Camera angles

3D

- Impressive world and Realistic Movement

Advantage:

- Realism and Depth
- Flexibility and Control
- Integration

Limitation:

- Technical complexity
- Time consuming
- Style limitation

Answer to the question no - 9

Forward Kinematics

1. Definition: Forward Kinematics involves determining the Position and orientation of each Part of a character's body relative to its Parent Part.
2. Control: Directly manipulate joint angles
3. Use case: Precise control over individual joint.
4. Animation style: often used for keyframe animation

Inverse Kinematics

1. Definition: Inverse Kinematics involves determining the joint rotations required to Place a specific Part of the character's body at a desired Position and orientation.
2. Control: Specify target Position
3. Use case: Achieve natural-looking Poses quickly
4. Animation style: Ideal for complex interaction with objects.

Answer to the Question no-10

Rigging: Rigging is the fundamental Process of Creating a digital Skeleton.

Importance of Skeleton Rigs:

- Foundation for animation: the skeleton rigs provides foundation for all animation
- Flexibility and Control: A well designed rig allows for a wide range of motion

Importance of Skinning:

- Visual Representation of movement: Skinning translate the movement of the skeleton rig to the character visible form
- Emotion Expression: Skinning allows for subtle deformation that convey emotions.

Answer to the question no-11

Cloth Simulation Challenges:

- **Balancing realism and Performance:**
Creating highly detail and realistic cloth simulations can be computationally expensive.
- **Collisions and Self-Collisions:** Simulating cloth with other object and its own self-collisions is complex.
- **Material Properties:** Accurately representing different fabric types requires capturing their material properties.

Hair Simulation Challenges

- Massive Number of Strands
- Inter-strand Collisions
- Dynamic Wind Effect.

Answer to the question no-12

Algorithms for Cloth and Hair

- ① Particle based Methods: Imagine a Cloth as a Swarm of inter-connected Particles
- ② Mesh-Based Methods: Here 3D mesh algorithms manipulate the mesh vertices based on simulated forces
- ③ Material Property: realistic cloth behavior depends on Properties
- ④ Collision Detection: Efficient algorithm ensure the cloth doesn't clip through objects or itself.
- ⑤ Constraints: Sometimes specific area of Cloth need to remain fixed Path.

Answer to the question no-13

Motion Capture: Often abbreviated as mocap is a technology used in Computer animation to record the movement of actors and objects.

Application:

- Realistic Character Animation
- Enhanced Efficiency
- Application Beyond Humanoid Character
- Virtual reality and Augmented Reality

Limitations:

- Technical Challenge
- Not a Silver bullet
- limited to recorded Movements
- Style limitations

Answer to the question no-14

Shadding: Shadders are computer Programs written in specialized language that run on the graphic Processing decerning the rendering Process.

↳ Contribution of Shadders to achiving realistic lighting effect:

- lighting Calculations: Shadders Perform complex calculation to simulate how light interacts with Object
- Textures: Shadders apply textures to 3D model
- Special effect: Shadders can be used to create various viscial effct like fire, water, smoke etc.

Answer to the question no-15

Modern Tools for Diverse Animation

3D Animation:

- Maya (Autodesk): An industry standard for Professional 3D Animation.
- Blender (Open Source): A Powerful and free-open-source alternative
- Houdini (SideFx): A Powerhouse for complex simulation like fluids.

2D Animation:

- TVPaint Animation Pro: Provide a natural brush like feel and tools for creating 2D animation.
- Adobe Animate: A versatile tool for creating 2D Animation.
- OpenToonz: Powerful 2D animation Pipeline.

The End