

Unit 05

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Unit: Computer Graphics - Animation and GKS Standards

- Animation: Introduction to Animation,
- Principles of Animation,
- Types of Animation,
- Types of Animation Systems:
 - § Scripting, → predefined scripts
 - § Procedural, → predefined rules & procedure
 - § Representational, → mimic real world
 - § Stochastic, etc. → Randomness & based on probability
- GKS Standards,
- GKS Primitives – Polyline, Polymarker, and Fill area, Text, GKS Workstation and Metafiles.

1. Animation:

→ **illusion of motion**

- **Introduction to Animation:** Animation is the process of creating a sequence of images or frames to give the illusion of motion. It brings static objects to life by adding movement and interactivity.

- **Principles of Animation:** These principles guide the creation of realistic and engaging animations. They include concepts like squash and stretch, anticipation, timing and spacing, follow-through, and more.

The 12 principles of animation were developed by Disney animators Ollie Johnston and Frank Thomas in their book "The Illusion of Life: Disney Animation." These principles serve as guidelines for creating appealing and realistic animations. Here are the 12 principles of animation:

- 1. Squash and Stretch:** This principle adds flexibility and exaggeration to objects and characters. It gives a sense of weight, volume, and elasticity.
- 2. Anticipation:** Anticipation prepares the audience for an action or movement. It involves a brief action or movement in the opposite direction before the main action takes place.
- 3. Staging:** Staging refers to the presentation of an idea or action clearly through composition, timing, and arrangement of elements. It helps to direct the viewer's attention and enhances storytelling.
- 4. Straight Ahead and Pose to Pose:** These are two different approaches to creating animation. "Straight Ahead" means animating frame by frame from start to finish, creating a fluid and spontaneous movement. "Pose to Pose" involves creating key poses at important points and then filling in the intermediate frames.
- 5. Follow-through and Overlapping Action:** These principles add naturalness and believability to animations. "Follow-through" refers to the continuation of movement after the main action is completed, while "overlapping action" involves parts of a character or object moving at different rates or times.
- 6. Slow In and Slow Out:** Objects and characters often accelerate or decelerate when starting or stopping. This principle adds realism by showing a gradual increase or decrease in movement.
- 7. Arcs:** Most natural movements follow curved paths rather than straight lines. Animating along arcs makes the motion smoother and more organic.
- 8. Secondary Action:** Secondary actions support the main action and help to enhance the overall performance. They add depth and richness to animations.
- 9. Timing:** Timing determines the speed and pace of an action or movement. It plays a crucial role in conveying weight, emotion, and the illusion of reality.
- 10. Exaggeration:** Exaggeration is used to emphasize certain actions, emotions, or characteristics. It brings liveliness and appeal to animations.
- 11. Solid Drawing:** Solid drawing refers to creating characters or objects with a three-dimensional appearance. It involves understanding form, volume, weight, and balance.
- 12. Appeal:** Appeal refers to creating characters, designs, and animations that are visually appealing, interesting, and relatable to the audience. It involves finding the right balance between realistic and stylized elements.

These principles are widely used in the field of animation and serve as a foundation for creating high-quality and captivating animations. Understanding and applying these principles can greatly enhance the quality and impact of animated sequences.

- **Types of Animation:** Various types of animation techniques are used, including traditional hand-drawn animation, computer-generated animation, stop motion animation, 2D and 3D animation, and special effects animation.

There are various types of animation techniques used in the field of animation. Each type has its own unique characteristics and methods of creation. Here are some of the commonly used types of animation:

- 1. Traditional Animation (2D Animation):** Traditional animation, also known as 2D animation, involves creating hand-drawn or digitally created frames that are sequenced to create the illusion of motion. It is the classic form of animation and has been used for decades in films, cartoons, and commercials.
- 2. Computer-generated Animation (CGI):** Computer-generated animation refers to the use of computer software to create animated sequences. It involves modeling and animating 3D objects or characters using specialized software such as Autodesk Maya or Blender. CGI animation is widely used in movies, video games, and visual effects.
- 3. Stop Motion Animation:** Stop motion animation involves physically manipulating objects or models, capturing each frame individually, and then playing them in sequence to create the illusion of movement. It can be done with various materials like clay (claymation), puppets (puppet animation), or objects (object animation). Popular examples include Wallace and Gromit and The Nightmare Before Christmas.
- 4. 3D Animation:** 3D animation involves creating computer-generated objects or characters in a three-dimensional space. It utilizes techniques like modeling, texturing, rigging, and animation to bring objects to life. 3D animation is widely used in movies, video games, architectural visualization, and product design.
- 5. Motion Graphics:** Motion graphics involve the use of animation techniques to create visually appealing and informative graphics. It combines elements like text, shapes, and images with animation to communicate messages or concepts effectively. Motion graphics are commonly used in title sequences, explainer videos, and advertising.
- 6. Cut-out Animation:** Cut-out animation involves using pre-existing elements or characters that are cut out from paper, cardboards, or other materials. These cut-outs are then moved and manipulated frame by frame to create the illusion of motion. Software like Adobe After Effects or Toon Boom Harmony can be used to streamline the process.
- 7. Clay Animation (Claymation):** Clay animation, also known as claymation, uses clay or plasticine models to create characters and objects. The models are sculpted and manipulated frame by frame to create the desired motion. Wallace and Gromit and Shaun the Sheep are popular examples of clay animation.
- 8. Puppet Animation:** Puppet animation involves the use of puppets or figurines with movable joints. These puppets are manipulated and photographed frame by frame to create the animation. The puppets can be made of various materials like wood, wire, or foam. The TV series "The Muppet Show" is a well-known example of puppet animation.
- 9. Rotoscoping:** Rotoscoping is a technique where live-action footage is traced frame by frame to create animation. It involves capturing live-action footage and then drawing over it to create animated sequences. This technique allows for realistic movement and is often used to combine live-action and animation seamlessly.

These are just a few examples of the many types of animation techniques used in the industry. Each type has its own unique characteristics, challenges, and applications. Animators often use a combination of these techniques to achieve their desired results and bring their creative visions to life.

2. Types of Animation Systems:

- **Scripting Animation System:** In this system, animations are created using scripts or programming languages. It involves defining the desired motion and specifying how objects should behave.
- **Procedural Animation System:** Procedural animation involves generating animation based on predefined rules or algorithms. It is often used for simulating natural phenomena or complex movements.
- **Representational Animation System:** This system focuses on representing real-world objects or characters in an animated form. It aims to mimic real-life motions and behaviors.
- **Stochastic Animation System:** Stochastic animation involves randomness and probabilistic methods to generate animation. It can create dynamic and unpredictable motion patterns.

3. GKS Standards:

- **GKS (Graphical Kernel System):** GKS is a standard graphics library that provides a set of functions for generating computer graphics. It offers a standardized interface for applications to interact with graphical devices and workstations.
- **GKS Primitives:** GKS provides a range of graphical primitives to create various graphical elements. Some commonly used primitives include:
 - **Polyline:** A series of connected straight line segments used to draw shapes, outlines, or paths.
 - **Polymarker:** Individual points or markers used to mark specific positions or create patterns.
 - **Fill area:** Filling closed shapes or regions with colors, patterns, or textures.
 - **Text:** Rendering text and displaying it on the screen using different fonts, sizes, and styles.

4. GKS Workstation and Metafiles:

- **GKS Workstation:** A GKS workstation represents a device or output medium used for graphics display. It can be a physical device like a monitor or a logical device like a file or memory buffer. GKS provides functions to initialize, configure, and control workstations.
- **Metafiles:** GKS supports metafiles, which are files that contain a sequence of GKS function calls and parameters. Metafiles can record and store graphical operations for later playback or printing. They provide a way to store graphics data in a device-independent format.

12 principles of animation

- 1 Squash & stretch
- 2 Anticipation
- 3 Staging
- 4 Straight-ahead
- 5 Follow-through & overlapping action
- 6 Slow-In & Slow-Out
- 7 Arc
- 8 Secondary Action
- 9 Timing
- 10 Exaggeration
- 11 Solid Drawing
- 12 Appeal

Types of Animation System

- 1 Scripting
- 2 Procedural
- 3 Representational
- 4 Stochastic
- 5 Behavioral

Output functions of GKS

- 1 Polyline
- 2 Polymarker
- 3 Text
- 4 Fill Area
- 5 Cell Array