Unit 5: Animation and Virtual Reality

Basic principles of Animation and Types of Animation

- The simulation of movement created by a series of pictures is animation.
- Animation is a method of photographing successive drawings, models, or even puppets, to create an illusion of movement in a sequence. Because our eyes can only retain an image for approx. 1/10 of a second, when multiple images appear in fast succession, the brain blends them into a single moving image.
- In traditional animation, pictures are drawn or painted on transparent celluloid sheets to be photographed. Early cartoons are examples of this, but today, most animated movies are made with computer-generated imagery or CGI.
- To create the appearance of smooth motion from these drawn, painted, or computer-generated images, frame rate, or the number of consecutive images that are displayed each second, is considered.
- Moving characters are usually shot "on twos" which just means one image is shown for two frames, totaling in at 12 drawings per second. 12 frames per second allows for motion but may look choppy.
- In the film, a frame rate of 24 frames per second is often used for smooth motion.

Basic Principle of Animation

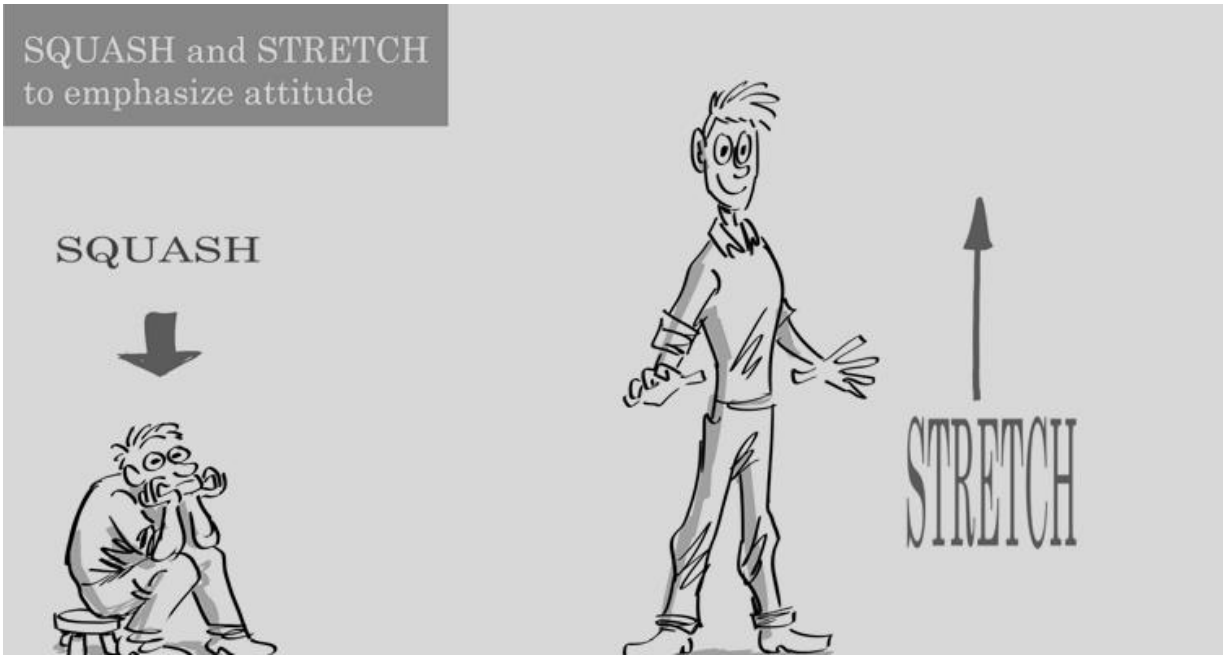
- Group of key teachings for the professional animator.
- Learn the rules before you break them.
- Animators follow a strict guideline of 12 principles to create the most believable movement. ***But 5 basic principles*** stand above the rest as the most important.
- Animation will fall flat and look wooden if they key principles are ignored

1. Squash and stretch

- This principle gives a sense of weight and volume to drawn objects.
- Squash and stretch gives weight and believability to an object.

For Example:

Imagine a rubber ball bouncing on the ground. As it hits the ground it squashes and it comes back up it stretches. A metal ball on the other hand would barely squash or stretch. This is how you give weight to your animation.

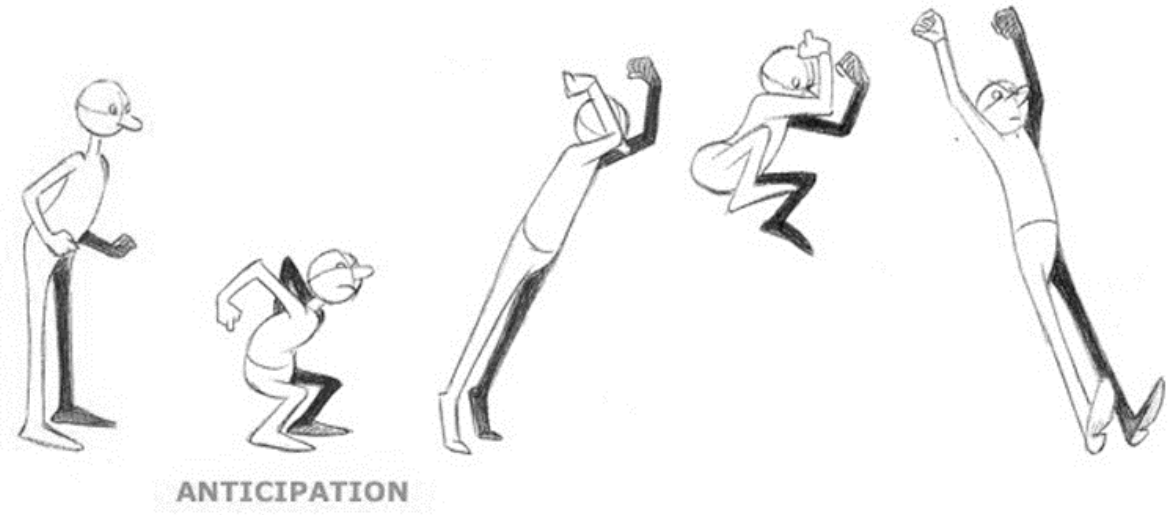


2. Anticipation

- One of the most overlooked principles.
- Anticipation is important to give animations a sense of grounding.
- Almost nothing happens suddenly.
- As the action appears more realistic if the audience is given a clue of what happens next, anticipation is used to prepare for the main action of an animated scene.

Example:

Before getting up from a chair, you need to position your body to help you move. It would be unnatural to get up without using your arms to help push your body up. This is why anticipation is so important.

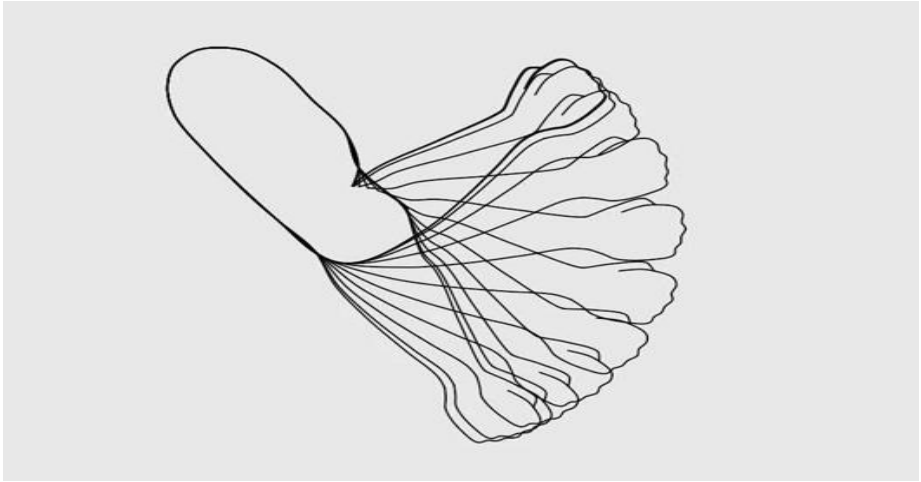


3. Ease in ease out (Slow in and Slow Out)

- This principle suggests that almost every movement needs time to accelerate and slow down.
- Your animation will look realistic if more drawings are added to the beginning and end of an action, emphasizing gradual speed up and slow down, and fewer in the middle.

Example:

Imagine a clock's swinging pendulum. It slows down on each side before gaining speed. The swing from side to side would be fastest in the middle and naturally slow down on each side. This is the basic concept of easing in and out. It makes movement feel more natural.



4. Timing

- Referring to the number of drawings or frames for a given action, correct timing is critical for establishing a character‘s mood, emotion, and reaction. Simply put, use more frames to create slower action and less frames for faster one.
- Timing will give believability to the movement of your characters and objects.

5. Solid Drawing

- Solid drawing considers an object following the rules of perspective in three-dimensional space.
- For an animator this means understanding the basics of academic drawing, Volume, depth, anatomy, weight, balance, light, and shadow, etc.

12 principle inside 5

1. Squash and stretch
2. Anticipation
    1. Staging
    2. Straight-ahead action and pose-to-pose
    3. Follow through and overlapping action
3. Slow in and slow out
    1. Arc
    2. Secondary action
4. Timing
    1. Exaggeration
5. Solid drawing
    1. Appeal

Types of Animation:

- There are many different types of animation but most of them fall into ***five major*** categories.
- There are advantages and disadvantages to each of them depending on how the artist prefers to create.

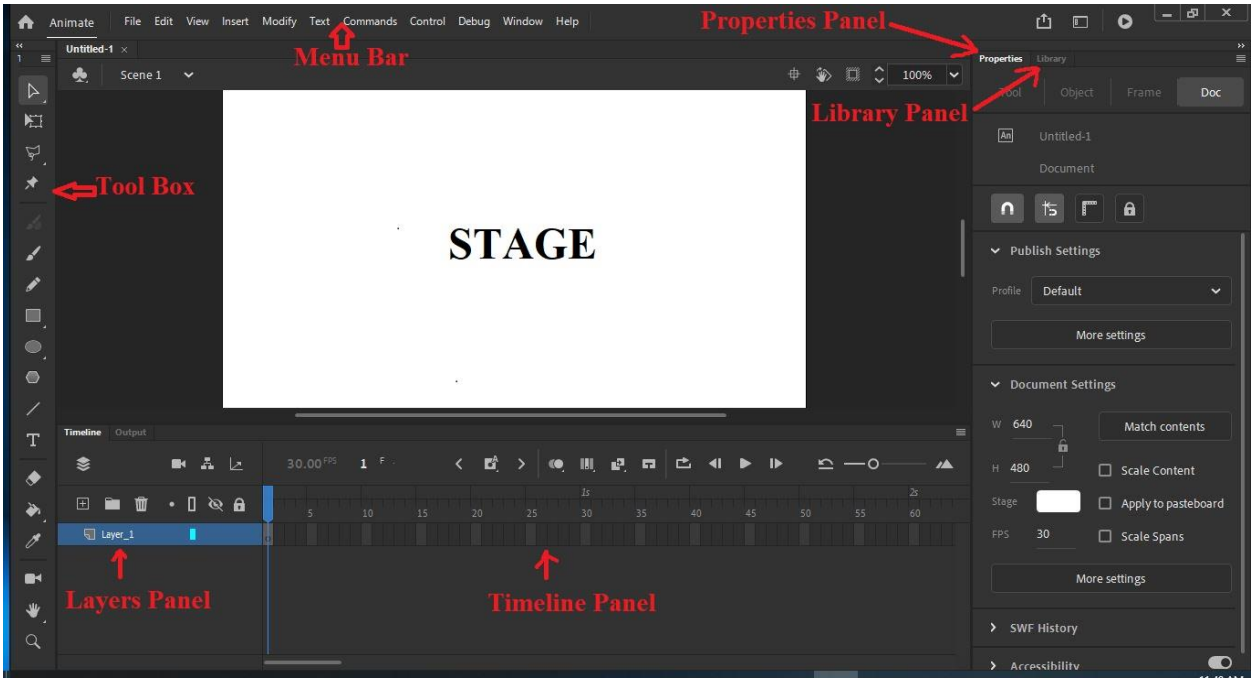
1. **Traditional Animation**
    - ✓ Traditional animation can also be referred to as cell animation.
    - ✓ This type of animation requires the animator to draw every single frame by hand to create an animated scene.
    - ✓ This is usually done on a light table that allows the artists to see the previous drawing through the top layer of paper.
    - ✓ Traditional is most often 2D animation. Though, not all 2D is traditional.
    - ✓ *Aladdin*, *The Lion King*, and other earlier cartoons are the best examples of this.
2. **2D Animation (Vector-based)**
    - ✓ This style of animation has been growing in popularity because the technology is so accessible.
    - ✓ Although artists have the option of editing frame by frame, vector-based animation gives the artist the option to create rigs for the characters and move single body parts at a time rather than constantly redrawing the characters.

- ✓ It gives more flexibility to beginners in animation because they don't have to rely so heavily on drawing skills.
- ✓ Disney movies — *Pinocchio, Beauty and the Beast,* etc. are the example of vector 2D

3. **3D Animation**
   - ✓ 3D animation is also known as computer animation and it is currently the most commonly used form of animation.
   - ✓ The process of 3D animation is very different from the traditional style but they both require the artist to share the same principles of movement and composition in animation.
   - ✓ 3D animation has less to do with drawing and more to do with moving a character in a program.
4. **Motion Graphics**
   - ✓ Motion Graphics are pieces are digital graphics that create the illusion of motion usually for ads, title sequences in films, but ultimately exist to communicate something to the viewer. They're often combined with sound for multimedia projects.
   - ✓ They're a type of animation used mostly in business, usually with text as a main player. Below are a few examples of motion graphic animation, using the top trends of today.
5. **Stop Motion**
   - ✓ Stop motion animation is very similar to traditional animation because it combines a series of still images that are slightly different to show movement.
   - ✓ The largest difference is that stop motion uses photography and captures real objects. With stop motion, the artists take a photo of an object or scene and slightly moves the objects before taking another photo.
   - ✓ The artist repeats this process until the scene is completed and uses each photo as a frame in the animation. It's similar to a flipbook with photos.
   - ✓ Stop motion animation is organic and naturally appealing but it's labor-intensive and can take a very long time and skill to execute.
   - ✓ ***Wallace and Gromit, Chicken Run***, and ***The Nightmare Before Christmas*** are all great examples of stop motion films.

Introduction to flash interface

- Flash is an incredibly powerful program that has seemingly endless potential.
- Flash can be used for creating games, making presentations, animations, visualizations, webpage components, and many other interactive applications.
- Some of the Flash interface components will look familiar to you, as they have the same functionality as other Adobe applications.
- However, Flash requires a certain mindset to work in it properly, especially when animating with vector graphics and coding with actionscript 3.0.



Stage:

- The stage is the main workspace of Flash, all your compositional elements (movie clips, buttons, graphics, and etc.) will be arranged here
- Content that is within the box in the middle of the stage will be visible when the Flash movie is output.
- The grey background area outside the box in the middle is 'off-stage'.

- You can animate content from off-stage onto the main stage area or use a background image that is larger than the main stage to move around as if the camera is panning across a background.
- The Stage has several context which are indicated along the top bar of the stage. It can present content that is in a Scene or can present sub-content such as objects from the library.
- You can show and hide the things that exceed the size of your stage by turning off/on Pasteboard (View>>Pasteboard)

Timeline:

- The numbers across the bottom correspond to the frames that occur as time progresses through the movie.
- You can navigate to any frame of your animation to perform editing. Also, Flash has layers just like many other Adobe applications.
- These appear along the left side of the Timeline.

Properties:

- The Properties tab changes depending on which tool on the toolbar you have selected or which object you have selected on the stage. Each object or tool has its own properties which can be adjusted in this tab.
- When you have the Selection Tool selected and click the background of the stage, the Properties tab shows the Document Properties. Here you can set the size of your Flash file, background color, frame rate and exporting settings.

Library:

- The library tab will be your best friend in Flash.

- It holds all the symbol objects of each Flash file. You can organize your library like you did in your windows/mac directory. (i.e. created new folders for different types of elements, or nest one symbol in another)

5.8. Introduction to Virtual Reality

- The virtual reality (VR) term was coined by the American computer scientist Jaron Lanier in 1989.
- It refers to a virtual environment, a visualization of complex data representing an imagined or styled place.

The definition of virtual reality originates from the definitions of both 'virtual' and 'reality'. "Virtual' implies near and reality implies the conditions experienced by human beings. Hence the term 'virtual reality' basically implies **'near-reality'**

OR

Virtual reality (VR) is a computer-generated environment that simulates a realistic experience, often using specialized equipment such as VR headsets.

It immerses users in a three-dimensional, interactive environment, making them feel as though they are physically present in a different place or setting.

For Example:

Imagine you have a virtual reality headset on, and you're playing a VR game where you are underwater exploring the ocean. In the real world, you're sitting in your living room, but when you put on the VR headset, you suddenly find yourself surrounded by an underwater world. You can look in any direction and see marine life, coral reefs, and the ocean floor. As you move your head or interact with controllers, your virtual perspective changes accordingly, creating a sense of immersion.

In this example, the virtual reality technology tricks your senses into believing you are in a completely different environment.

The VR systems are classified into the following groups:

1. **Non-immersive systems**, such as Desktops and LCD TVs;
2. **Augmented Reality systems** (HMD), defined as systems that simulate virtual objects for the user to see in the real world;
3. **Immersive systems** (CAVE Cave-Automatic Virtual Environment) – defined as systems that create virtual worlds in a designed indoor space. E.g. Driving Simulator

Non-immersive VR: involves interacting with digital content through conventional displays, often maintaining a strong connection to the physical surroundings.

Immersive VR: completely immerse users in a virtual environment, usually through the use of VR headsets, providing a more convincing and engaging experience by blocking out the real world and stimulating multiple senses.

Architecture of a VR system

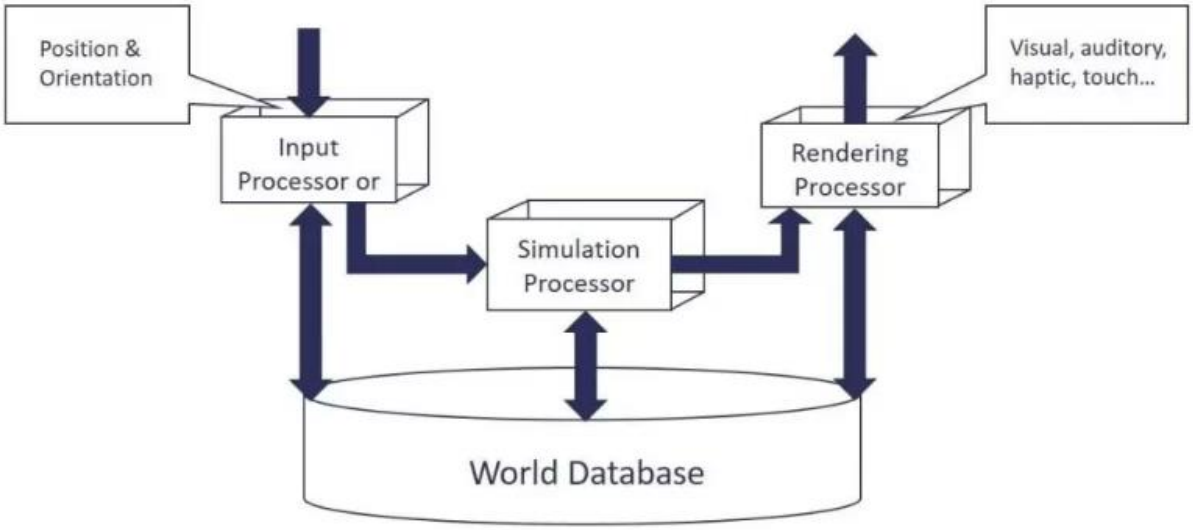


Figure: Architecture of VR system

Components of VR System

1. **Input processor**: It controls the device used to input information to the computer and to send the coordinate data to the rest of the system (mouse, trackers and the voice recognition system) in a reduced time-frame.
2. **Simulation processor: It** represents the code of the VR system. It takes the user input along with any tasks programmed and determines the actions that will take place in the virtual world.
3. **Rendering processor:** It creates the sensations, the output to the user. Different rendering processes are used for haptic, visual or auditory sensations.
4. **World database**: It stores the objects from the virtual world.

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Application Of VR System:

- VR in the Military
- VR in Education
- VR in Healthcare
- VR in Entertainment
- VR in Fashion
- VR in Business
- VR in Engineering
- VR in Sport
- VR in Media
- VR and Scientific Visualization
- VR in Telecommunications
- VR in Construction
- VR in Film
- VR Programming languages

The Pros of Virtual Reality

1. Enhanced Immersion:
2. Cost-Effective Training
3. Design and Visualization:
4. Entertainment and Gaming:

The Cons of Virtual Reality

1. High Cost:
2. Lack of Standardization:
3. Health Concerns:
4. Social Isolation