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.

OR

Animation means giving life to any object in computer graphics. It has the power of injecting energy and emotions into the most seemingly inanimate objects. Computer-assisted animation and computer-generated animation are two categories of computer animation. It can be presented via film or video.

Animation Techniques

Animators have invented and used a variety of different animation techniques. Basically there are six animation techniques:-

1. Traditional Animation ***framebyframe***

Traditionally most of the animation was done by hand. All the frames in an animation had to be drawn by hand. Since each second of animation requires 24 frames film the amount of efforts required to create even the shortest of movies can be tremendous.

2. Keyframing

In this technique, a storyboard is laid out and then the artists draw the major frames of the animation. Major frames are the ones in which prominent changes take place. They are the key points of animation. Keyframing requires that the animator specifies critical or key positions for the objects. The computer then automatically fills in the missing frames by smoothly interpolating between those positions.

3. Procedural

In a procedural animation, the objects are animated by a procedure − a set of rules − not by keyframing. The animator specifies rules and initial conditions and runs simulation. Rules are often based on physical rules of the real world expressed by mathematical equations.

Behavioral

In behavioral animation, an autonomous character determines its own actions, at least to a certain extent. This gives the character some ability to improvise, and frees the animator from the need to specify each detail of every character's motion.

Performance Based ***MotionCapture***

Another technique is Motion Capture, in which magnetic or vision-based sensors record the actions of a human or animal object in three dimensions. A computer then uses these data to animate the object.

This technology has enabled a number of famous athletes to supply the actions for characters in sports video games. Motion capture is pretty popular with the animators mainly because some of the commonplace human actions can be captured with relative ease. However, there can be serious discrepancies between the shapes or dimensions of the subject and the graphical character and this may lead to problems of exact execution.

Physically Based ***Dynamics***

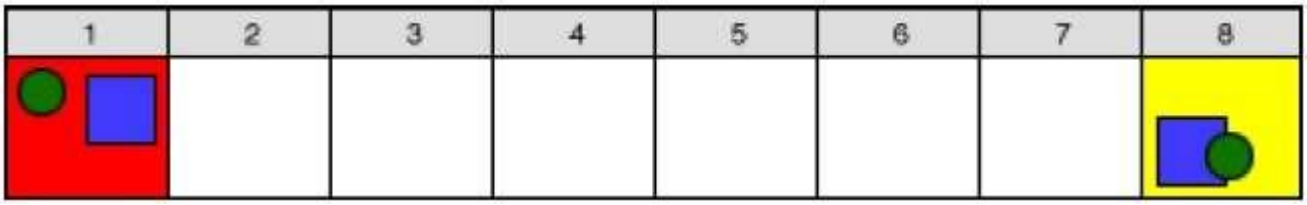
Unlike key framing and motion picture, simulation uses the laws of physics to generate motion of pictures and other objects. Simulations can be easily used to produce slightly different sequences while maintaining physical realism. Secondly, real-time simulations allow a higher degree of interactivity where the real person can maneuver the actions of the simulated character.

In contrast the applications based on key-framing and motion select and modify motions form a pre-computed library of motions. One drawback that simulation suffers from is the expertise and time required to handcraft the appropriate controls systems.

Key Framing

A keyframe is a frame where we define changes in animation. Every frame is a keyframe when we create frame by frame animation. When someone creates a 3D animation on a computer, they usually don't specify the exact position of any given object on every single frame. They create keyframes.

Keyframes are important frames during which an object changes its size, direction, shape or other properties. The computer then figures out all the in-between frames and saves an extreme amount of time for the animator. The following illustrations depict the frames drawn by user and the frames generated by computer.



4. Morphing

The transformation of object shapes from one form to another form is called morphing. It is one of the most complicated transformations.

A morph looks as if two images melt into each other with a very fluid motion. In technical terms, two images are distorted and a fade occurs between them.

ANIMATION TOOLS

(SOFTWARE TOOLS)

1 .Adobe Illustrator

It is a 2-D software for producing and editing vector graphics such as character design and creative design that may be used in designing for the web, brochures, business cards and 2-D rendering.

2. Adobe Photoshop

This is a very popular and widely used graphics creation and editing software used widely in the industry in all sectors related to graphics (GFX) and design. This

software is mainly used for image editing, retouching, digital painting, image morphing, video editing, creative design and for crafting textures for 3-D models.

3. Adobe Flash

This is a vector-based software mainly used for delivering high-impact, rich designs, animation and application user interfaces (UI).

4. Adobe After Effects

This software is mostly used in the post production process of filmmaking and television production and is mainly used for creating motion graphics and visual effects. You can use this software to animate, alter and composite media in 2-D and 3-D space with various built-in tools. It allows you to add various effects like fire, explosions and noise.

5. Autodesk Maya

This comprehensive 3-D animation software can be used for 3-D computer animation, modelling, simulation, rendering and compositing to generate interactive 3-D applications, including video games, animated film, TV series or visual effects. It has next generation display technology, accelerated modelling workflows and new tools for handling complex data.

6. Autodesk 3ds Max

This 3-D computer graphics software can be used for 3-D modelling, animation, rendering and compositing by games, film and motion graphics artists.

7. AutoDesk Mudbox

This is a digital painting and digital sculpting software that can create highly realistic 3-D characters, engaging environments, detailed props and compelling concept designs.

8. **Autodesk MotionBuilder**

This is yet another 3-D character animation software from Autodesk that can be used for virtual production and to control and refine data.

FILE FORMAT OF IMAGES

1. JPEG (or JPG) - Joint Photographic Experts Group

JPEGs might be the most common file type you run across on the web, and more than likely the kind of image that is in your company's MS Word version of its letterhead. JPEGs are known for their "lossy" compression, meaning that the quality of the image decreases as the file size decreases.

JPG vs JPEG

There is no difference between the .jpg and .jpeg filename extensions. Regardless of how you name your file, it is still the same format and will behave the same way.

The only reason that the two extensions exist for the same format is because .jpeg was shortened to .jpg to accommodate the three-character limit in early versions of Windows. While there is no such requirement today, .jpg remains the standard and default on many image software programs.

2. PNG - Portable Network Graphics

PNGs are amazing for interactive documents such as web pages but are not suitable for print. While PNGs are "lossless," meaning you can edit them and not lose quality, they are still low resolution.

3. GIF - Graphics Interchange Format

GIFs are most common in their animated form, which is used in banner ads and in the comments of social media posts. In their more basic form, GIFs are formed from up to 256 colors in the RGB colorspace. Due to the limited number of colors, the file size is drastically reduced.

4. TIFF - Tagged Image File

A TIF is a large raster file that doesn't lose quality. This file type is known for using "lossless compression," meaning the original image data is maintained regardless of how often you might copy, re-save, or compress the original file.TIFF files are also commonly used when saving photographs for print.

5. PSD - Photoshop Document

PSDs are files that are created and saved in Adobe Photoshop, the most popular graphics editing software ever. This type of file contains "layers" that make modifying the image much easier to handle. The largest disadvantage to PSDs is that Photoshop works with raster images as opposed to vector images.

6. PDF - Portable Document Format

PDFs were invented by Adobe with the goal of capturing and reviewing rich information from any application, on any computer, with anyone, anywhere.

CHALLENGES FOR MULTIMEDIA SYSTEMS

The challenges include

1. electrical resources,

2. networking,

3. application software systems,

4. human resources,

5. hardware system, and

6. risk management.

All of these challenges have to be overcome so that multimedia-based learning service can be conducted properly.

Supporting multimedia applications over a computer network renders the application *distributed*. This will involve many special computing techniques -- discussed later.

Multimedia systems may have to render a variety of media at the same instant -- a distinction from normal applications. There is a temporal relationship between many forms of media (*e.g.* Video and Audio. There 2 are forms of problems here

- Sequencing within the media -- *playing frames in correct order/time frame in video*
- *Synchronisation* -- inter-media scheduling (*e.g.* Video and Audio). Lip synchronisation is clearly important for humans to watch playback of video and audio and even animation and audio. Ever tried watching an out of (lip) sync film for a long time?

The key issues multimedia systems need to deal with here are:

- How to represent and store temporal information.
- How to strictly maintain the temporal relationships on play back/retrieval
- What process are involved in the above.

Data has to represented *digitally* so many initial source of data needs to be *digitise* -- translated from analog source to digital representation. The will involve scanning (graphics, still images), sampling (audio/video) although digital cameras now exist for direct scene to digital capture of images and video.

The data is *large* several Mb easily for audio and video -- therefore storage, transfer (bandwidth) and processing overheads are high. Data compression techniques very common.

DESIRABLE FEATURES FOR A MULTIMEDIA SYSTEM

Very High Processing Power

-- needed to deal with large data processing and real time delivery of media. Special hardware commonplace.

Multimedia Capable File System

-- needed to deliver real-time media -- *e.g.* Video/Audio Streaming. Special Hardware/Software needed *e.g* RAID technology.

Data Representations/File Formats that support multimedia

-- Data representations/file formats should be easy to handle yet allow for compression/decompression in real-time.

Efficient and High I/O

-- input and output to the file subsystem needs to be efficient and fast. Needs to allow for real-time recording as well as playback of data. *e.g.* Direct to Disk recording systems.

Special Operating System

-- to allow access to file system and process data efficiently and quickly. Needs to support direct transfers to disk, real-time scheduling, fast interrupt processing, I/O streaming *etc.*

Storage and Memory

-- large storage units (of the order of 50 -100 Gb or more) and large memory (50 -100 Mb or more). Large Caches also required and frequently of Level 2 and 3 hierarchy for efficient management.

Network Support

-- Client-server systems common as distributed systems common.

Software Tools

-- user friendly tools needed to handle media, design and develop applications, deliver media.

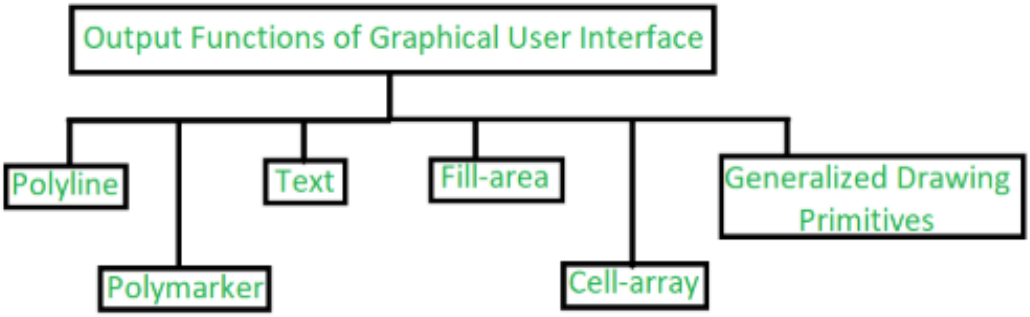
Characteristics of a Multimedia System

A Multimedia system has four basic characteristics:

- Multimedia systems must be *computer controlled*.
- Multimedia systems are *integrated*.
- The information they handle must be represented *digitally*.
- The interface to the final presentation of media is usually *interactive*.

Graphical Kernel System

Graphical Kernel System is software which used for two-dimensional graphics. It was adopted as first graphics software standard by International Standard Organization (ISO). It has features for drawing in 2-dimensional vector graphics which is suitable for charting and similar purpose. The 2-dimensional computer graphics which is closely related to six output functions of Graphical Kernel System (GKS). These are as follows :



DIFFERENT GRAPHICAL FUNCTION

- **Polyline –**
  As from the name 'poly' means 'many'. Polyline is function which has ability to draw **one or more straight lines** through coordinates` which user has given to them.

- **Polymarker –**

This function is used to **draw a symbol** at coordinate which user has provided. There are 5 types of symbols which is used by this software namely **: x + * 0**.

- **Text –**

This function is used to **add text** at given coordinates by user.

- **Fill-area –**

In this feature, it allows a polygon to be draw and it can be filled with coordinates

which are given. There is variety of fill-area which includes **hollow, solid** and there is also **variety of hatching and patterns**.

- **Cell-array –**

In this firstly pattern is defined by user and it **outputs in rectangle** according to given coordinates by user.

- **Generalized Drawing Primitives –**
  It provides user various kinds of facilities. Mostly all of systems has various kinds of software for arcs of circle or ellipse and also drawing of a smooth curve with set of given points.

There are also two terms related to Graphical Kernel System which follows this as an international standard.

1. **Computer Graphics Interface (CGI) –**
   It provides a standard of low-level between actual hardware and Graphical Kernel System and it also help on specification that how device drivers should be written.
2. **Computer Graphics Metafile (CGM) –**
   This is used for transfer purpose i.e to transfer segments of graphics such as pictures from one system to another system and also it is used for archiving purpose.