Computer Animation

Simmy Agarwal, Rekha
Dronacharya College of Engineering

***ABSTRACT*: Computer animation, or CGI animation, is the process used for generating animated images by using computer graphics. The more general term computer-generated imagery encompasses both static scenes and dynamic images while computer animation only refers to moving images. Modern computer animation usually uses 3D computer graphics, although 2D computer graphics are still used for stylistic, low bandwidth, and faster real-time renderings. Sometimes, the target of the animation is the computer itself, but sometimes the target is another medium, such as film. In this review paper we will study about 2D and 3D computer animation and their comparison.**

I. INTRODUCTION:

Computer animators work to bring objects to life through the use of computer graphics. Like traditional animators, computer animators manipulate graphics and images to simulate movement. However, unlike traditional animators, computer animators use digital technology to create new visual effects and motions that help avoid the monotonous, frame-by-frame drawing required for each picture. Computer animation is a very lucrative business and shows no sign of slowing down in the future. Computer animators can find work in a variety of places, from film and television studios, to video game productions, to advertising companies. A computer animator usually has a flexible schedule. The number of hours they work every week can vary as long as they get their work done. Normally working about eight hours a day, five days a week, a computer animator's schedule can stretch into evenings and weekends if there is an especially important deadline approaching. Not much is demanded of a computer animator on a physical basis, but they are required to stay constantly creative. Computer animators begin their day developing ideas into storyboards. Afterwards, around noon, they meet with clients to discuss different ideas, then the animators begin putting together the images and constructing scenes on the computer.

II. METHODS OF ANIMATING VIRTUAL CHARACTERS:

In most 3D computer animation systems, an animator creates a simplified representation of a character's anatomy, which is analogous to a skeleton or stick figure. The position of each segment of the skeletal model is defined by *animation variables* for short. In human and animal characters, many parts of the skeletal model correspond to the actual bones, but skeletal animation is also used to animate other things, such as facial features (though other methods for facial animation exist). The character "Woody" in *Toy Story*, for example, uses 700 Avars (100 in the face alone). The computer doesn't usually render the skeletal model directly (it is invisible), but it does use the skeletal model to compute the exact position and orientation of that certain character, which is eventually rendered into an image. Thus by changing the values of Avars over time, the animator creates motion by making the character move from frame to frame.

There are several methods for generating the Avar values to obtain realistic motion. Traditionally, animators manipulate the Avars directly. Rather than set Avars for every frame, they usually set Avars at strategic points (frames) in time and let the computer interpolate or ' twin ' between them in a process called key framing. Keyframing puts control in the hands of the animator and has roots in hand-drawn traditional animation.

In contrast, a newer method called motion capture makes use of live action footage. When computer animation is driven by motion capture, a real performer acts out the scene as if they were the character to be animated. His/her motion is recorded to a computer using video cameras and markers and that performance is then applied to the animated character. Thus motion capture is appropriate in situations where believable, the realistic behavior and action is required, but the types of characters required exceed what can be done throughout the conventional costuming.

III. DEVELOPMENT REQUIREMENT:

Computer animation can be created with a computer and animation software. Some examples of animation software are: Amorphium, Art of Illusion, Poser, Ray Dream Studio, Bryce, Maya, Blender, True Space, Light wave, 3D Studio Max, Soft Image XSI, and Adobe Flash (2D). There are many more. Prices vary greatly, depending on the target market. Some impressive animation can be achieved even with basic programs; however, the rendering can take a lot of time on an ordinary home computer. Because of this, video game animators tend to use low resolution, low polygon count renders, such that the graphics can be rendered in real time on a home computer. Photorealistic animation would be impractical in this context.

Professional animators of movies, television, and video sequences on computer games make photorealistic animation with high detail. (This level of quality for movie animation would take tens to hundreds of years to create on a home computer.) They use many powerful workstation computers. Graphics workstation computers use two to four processors, and thus are a lot more powerful than a home computer, and are specialized for rendering. A large number of workstations (known as a render farm) are networked together to effectively act as a giant computer. The result is a computer animated movie that can be completed in about one to five years (this process is not comprised solely of rendering, however). A workstation typically costs $2000 to $16000, with the more expensive stations being able to render much faster, due to the more technologically advanced hardware that they contain.

Pixar's Render man is rendering software which is widely used as the movie animation industry standard, in competition with Mental Ray. It can be bought at the official Pixar website for about $5000 to $8000. It will work on Linux, Mac OS X, and Microsoft Windows-based graphics workstations, along with an animation program such as Maya and Softimage XSI. Professionals also use digital movie cameras, motion capture or performance capture, blue screens, film editing software, props, and other tools for movie animation.

IV. HARDWARE ANIMATION DISPLAY TECHNOLOGY:

When an image is rendered to the screen, it is normally rendered to something called a back buffer. There the computer can draw the image, making any necessary changes to it before it is done. While the computer is rendering, the screen is showing the contents of what is called the primary or active buffer.

When the image is completed, the computer tells the screen to draw from the back buffer. This can be done in one of two ways: (a) the contents of the back buffer can be copied to the primary buffer (or active buffer—the buffer currently being shown), or (b) the computer can switch where it is drawing from and make the back buffer the new primary buffer, while the primary buffer becomes the back buffer. This process, conceived by John MacArthur, is usually called double buffering or (informally) "flipping," because the computer is flipping its use of primary and back buffers.

This switching should be carried out when it is imperceptible to the user. Therefore it needs to take place during what is called the "v-sync" or vertical retrace. The v-sync, in cathode ray tubes, takes place when the electron guns reach the bottom right of the screen and need to reposition the beam to the top left of the screen. This happens very quickly and the image the guns had just projected remain on the screen as they are moving back to their starting position. While the guns are repositioning themselves, the computer has enough time to flip buffers and the new image will be rendered on the screen on the next pass of the guns. The new image will continue to be displayed until the buffers are flipped once more.

V. TRADITIONAL METHODS:

As is evident from the history, animators have used and invented a variety of different animation techniques. 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 work required to create even the shortest of movies, can be tremendous. Some of the traditionally used methods are described below .With time the technique of

animation has become more and more computer - assisted and computer- generated. All of such techniques require a trade-off between the level of control that the animator has over the finer details of the motion and the amount of work that the computer does on its own. Broadly, the computer animation falls into three basic categories: key framing, motion capture, and simulation.

Key framing:

Motion Capture

Another technique is Motion Capture, in which magnetic or vision-based sensors recordthe actions of a human or animal object in three dimensions. A computer then uses thesedata to animate the object. This technology has enabled a number of famous athletes tosupply the actions for characters in sports video games. Motion capture is pretty popularwith the animators mainly because some of the commonplace human actions can becaptured with relative ease. However, there can be serious discrepancies between theshapes or dimensions of the subject and the graphical character and this may lead toproblems of exact execution.

Simulation:

Unlike key framing and motion picture, simulation uses the laws of physics to generate motion of figures and other objects. Virtual humans are usually represented as collection of rigid body parts. These models though physically plausible are only an approximation of the human body. With more research and complex models the simulations are becoming increasingly life like. Simulations can be easily used to produce slightly different sequences while maintaining physical realism while in other animations like key framing or motion capture a mere speeding up or slowing down the playback can spoil the naturalness of motion. Secondly real-time simulations allow a higher degree of interactivity where the real person can man ever the actions of the simulated character. In contrast the applications based on key framing and motion select and modify motions form a precomputed library of motions. One drawback that simulation suffers from is the expertise and time required to handcraft the appropriate controls systems. Hardware and Software Hardware and software are two of the major factors that determine the quality of computer animation that is produced. As both of these components work in conjunction with each other it is important to make the right choice for a product that is of lasting quality and accuracy.

Hardware

Hardware comes in many shapes, sizes, and capabilities. Some hardware is specialized to do only certain tasks while other hardware are equipped for a variety of things. Some of the commonly used hardware are: Silicon Graphics Inc.(SGI)The SGI platform is one of the most widely used platforms for quality computer animation productions. SGI computers operate using the wide spread UNIX system .Produced by Silicon Graphics these computers are extremely fast and produce excellent results. They come in a variety of types, ranging from the general purpose Indy to high power Indigo Extreme that is used for animations. Onyx is another type, which is suited to the complex calculations involved in rendering. Some of the software like Wave front, Alias, and Soft Image are ran on SGI's.

PC's

PC's are very versatile machines combining flexibility and power. PC's have proven to be very useful for small companies and businesses as platforms to do computer animation. Applications such as 3DStudio and Animator Studio are used on PC's to make animations. Macintosh Mac's were originally designed for graphic and desktop publishing and hence are pretty useful platforms for producing computer graphics and animation software. Some of these applications that work well on Mac's are Adobe Products like; Photoshop and Premiere and Strata with Strata Studio Pro.

Amiga

Originally owned by Commodore, Amiga computers have held a position in the computer animation for long. The two software packages that Amiga is

associated with are: Video To aster, and Light Wave 3D. The new d'Amiga systems has been customized to be agreat graphics machine. Sophisticated hardware has to be coupled with a good software to produce good results. There are literally hundreds of computer animation and graphic software packages.

VI. CONCLUSION:

The above factors give a fairly good idea of the animation tools available in the market.With so many different tools at his disposal, the animator faces the challenge of selecting or designing the most optimal tool. The right animation tool should be intuitive enough understand what the animator wants and at the same time powerful or automatic enough so that the animator doesn't have to specify the details she or he is not interested in. Obviously, there is no single tool that can be a perfect fit, as the appropriateness of the tool will depend on what effect the animator wants to generate. A good piece of animation will require a combination of different tools to simulate reality as artistically as possible.