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How it Works: 2d and 3d

Though a person might decide that watching animation on T.V. is easy, but creating it is not. Claire Wyckoff, writer of Communications and the Arts, states that for each animated project, artists create characters, scripts, and story-boards (Wyckoff, 2007). The storyboard is really the first step in the animation process, which visually outlines the story of a movie by depicting the action and staging of the films script. Wycoff states that clean-up artists go over the work and make sure everything is neat, colors match, and details are the same from frame to frame (Wyckoff, 2007). He makes a reference that a typical day for an animator can begin with a review of dailies, which are filmed sections of animation from the previous days. At these meetings, animators, directors, and editors gather to discuss if the animation has been done properly or needs improvement. Then animators usually go back to the drawing board, working alone and together to bring the script to life. If working on 3-D computer animation, an artist may spend the bulk of the day making map paintings of 3-D images to use as scene backgrounds. These computer paintings are usually of nature—snow, rain, clouds, etc. Once they are created, they save other artists time because they don't have to recreate backgrounds in every frame, they simply pop the map paintings into the background. Other artists focus on clean-up, inbetween frames, or developing the storyboards that outline the main action of a film. At the end of the day, supervisors go to each animator's office to review their work one more time (Wyckoff, 2007). There are more steps to the animation process, but how it's done is determined by what dimension it'll be.

According to animators, one of these dimensions is referred to as 2D. Steve Roberts writes that 2D animation consists of a series of drawings shot one after another and played back to give the illusion of movement. He writes that animation shot in film and projected is played at 24 frames per second (FPS) (Roberts, 2007). He also makes reference that animation for television in Europe, Africa, the Middle East and Australia is played at 25 FPS that in these countries they use a television system called PAL which plays at 50 fields (frames) per second and 25 FPS is compatible with this. If an animated film plays at 24 FPS on the television, a black bar would be seen rolling up the screen. The Americas, the West Indies and the Pacific Rim countries use NTSC, which runs at 60 fields per second (FiPS). Quite often a type of digital converter is used to transfer one speed of film to another speed of video, allowing 24 frames per second film to be shown on a 60 FiPS (NTSC) TV. If one were to stop frame through a video of an animated film, they would find that there are points at which one frame will blur into another. This is how they overcome the incompatibility of the two systems, stop framing through animated movies is a very good way of learning about animation (Roberts, 2007). Tony Mullen writes that an animator would draw a series of pictures, several frames apart, representing main points in the character's motion are called 'keyframes' (Mullen, 2011). He further states that these points would usually be the "extreme" poses, which were the ones most crucial to conveying the illusion of physical substance and motion (Mullen,

2011). Mullen goes on to say that after the animator finished the task of drawing the keyframes, an assistant would come around and draw the in-betweens also known as 'tweening' (2011). He writes that the inbetween drawings provide the characterization or detail. Roberts states that there are three skills that are invaluable when animating with pencils and paper; flipping, flicking and rolling. He writes that these allow the animator to see the drawings moving while you are animating. This principle of animation timing is relevant to all animation. The closer the drawings are together, the slower the movement, the further apart they are then the quicker the movement (Roberts, 2007). Bruce Wands writes that the creative process for 2D animation is a fairly straight process; the idea, the research, script, storyboard, animatic, roughs, In-betweens, clean up, ink and paint, camera, editing, and the final product (Wands, 2001).Wands goes on to say that the first part of this stage is the writing of the story and the script. Normally this is done before any animation drawing is started. However, it is common for some sketching to be done as the story is being written. This generally takes the form of inspirational sketches to define the mood and look of the story or characters (Wands, 2001). While 2D is a fairly straight forward process, 3D branches off in other directions.

Because of this direction, according to the book, *Digital Creativity : Techniques For Digital Media And The Internet,* designing for 3D animation requires the ability to think in four dimensions: the three dimensions of space and the fourth dimension of time (Wands, 2001). The book writes that one of the easiest ways to think of 3D animation is to compare it to a television studio environment. In this live action environment, there are actors, lights, and a camera. In the 3D environment, the actors are the mathematically created objects and characters, and there are digitally simulated lights and a digitally simulated camera. Wands writes that when Hollywood films are made using live action and 3D animation, a mathematical model of the live action set is created in the computer and the two are perfectly matched, so that when the 3D animation and special effects are created, they will blend seamlessly with the live action (Wands, 2001). The book states that the production process starts from an idea or concept, then onto research or sketching, then the script and storyboards, an animatic, what sets it truly apart from 2D animation is that modeling is involved, then the process can go in two directions, animating or lighting and texture maps, then the process goes onto rendering then editing and then it's done (Wands, 2001). There are three commonly used methods of advanced animation; hierarchical animation, inverse kinematics, and particle systems. Hierarchical Animation Hierarchies allow you to link objects together so that they can be animated both as a group and independently (Wands, 2001). A variation of hierarchical animation is inverse kinematics. Instead of the animation happening from the top down, it happens in reverse, from the bottom up. For inverse kinematics to work properly, limits and precise movements of the parts need to be defined mathematically before the animation starts (Wands, 2001). Finally, particle systems are used for a variety of purposes. One of the best things about particle systems is that they generate their own geometry. They can be used to simulate rain, water, fire, sparks, and a whole host of other effects. Though the steps to creating animation between 2D and 3D have similarities, there are some notable differences.

These notable differences are that computer animators develop models of their characters, often using points and lines connected together and situated in a 3-D virtual space. To flesh out their basic models, they use techniques such as shading and rendering which smooth's out the geometric construction to produce realistic shape, light, and shadows. The computer cuts down on the actual animation work, nevertheless. While a stop-motion or celluloid animator creates 24 frames for one second of film, the computer animator can create only three or four key frames and the computer fills in the inbetween frames (Wyckoff, 2007). Wyckoff states that computer animation makes the process less time consuming and less costly, and it has been generating more profit for the studios that produce animated features ( 2007). Wands further explains the process of character animation for 3D animation is similar to the 2D process only in the beginning stages. Once the character is designed, the process is much different. In 2D character animation, everything is drawn by hand and the computer is used only for the scanning, painting, and production of the final movie. For 3D animation, the character is animated within the computer and nothing is drawn by hand, except the texture maps and possibly the backgrounds. (Wands, 2001).

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