Animation:

Animation is a dynamic medium in which images or objects are manipulated to appear as moving images. In traditional animation, images are drawn or painted by hand on transparent celluloid sheets to be photographed and exhibited on film. Today most animations are made with computer generated (CGI).

 Commonly the effect of animation is achieved by a rapid succession of sequential images that minimally differ from each other.

Apart from short films, feature films, animated gifs and other media dedicated to the display moving images, animation is also heavily used for video games, motion graphics and special effects.

The history of animation started long before the development of cinematography. Humans have probably attempted to depict motion as far back as the Paleolithic period. Shadow play and the magic lantern offered popular shows with moving images as the result of manipulation by hand and/or some minor mechanics

Computer animation has become popular since toy story (1995), the first feature-length animated film completely made using this technique.

Types:

Traditional animation (also called cel animation or hand-drawn animation) was the process used for most animated films of the 20th century. The individual frames of a traditionally animated film are photographs of drawings, first drawn on paper. To create the illusion of movement, each drawing differs slightly from the one before it. The animators' drawings are traced or photocopied onto transparent acetate sheets called cels which are filled in with paints in assigned colors or tones on the side opposite the line drawings. The completed character cels are photographed one-by-one against a painted background by   rostrum camera onto motion picture film.

The traditional cel animation process became obsolete by the beginning of the 21st century. Today, animators' drawings and the backgrounds are either scanned into or drawn directly into a computer system. Various software programs are used to color the drawings and simulate camera movement and effects. The final animated piece is output to one of several delivery media. The "look" of traditional cel animation is still preserved, and the character animator's work has remained essentially the same over the past 70 years. Some animation producers have used the term "tradigital" (a play on the words "traditional" and "digital") to describe cel animation that uses significant computer technology.

Full animation refers to the process of producing high-quality traditionally animated films that regularly use detailed drawings and plausible movement, having a smooth animation. Fully animated films are animated at 24 frames per second, with a combination of animation on ones and twos, meaning that drawings can be held for one frame out of 24 or two frames out of 24.

Limited animation involves the use of less detailed or more stylized drawings and methods of movement usually a choppy or "skippy" movement animation. Limited animation uses fewer drawings per second, thereby limiting the fluidity of the animation. This is a more economic technique.

Rotoscoping is a technique patented by Max Fleisher in 1917 where animators trace live-action movement, frame by frame. The source film can be directly copied from actors' outlines into animated drawings.

Live-action/animation is a technique combining hand-drawn characters into live action shots or live action actors into animated shots.

Stop-motion animation is used to describe animation created by physically manipulating real-world objects and photographing them one frame of film at a time to create the illusion of movement. There are many different types of stop-motion animation, usually named after the medium used to create the animation. Computer software is widely available to create this type of animation; traditional stop motion animation is usually less expensive but more time-consuming to produce than current computer animation.

Puppet animation typically involves stop-motion puppet figures interacting in a constructed environment, in contrast to real-world interaction in model animation. The puppets generally have an armature inside of them to keep them still and steady to constrain their motion to particular joints.

Puppetoon : created using techniques developed by George Pal, are puppet-animated films that typically use a different version of a puppet for different frames, rather than simply manipulating one existing puppet.

Clay animation or plasticine animation (often called *claymation*, which, however, is a trademarked name), uses figures made of clay or a similar malleable material to create stop-motion animation. The figures may have an armature or wire frame inside, similar to the related puppet animation (below), that can be manipulated to pose the figures.

Strata-cut animation is most commonly a form of clay animation in which a long bread-like "loaf" of clay, internally packed tight and loaded with varying imagery, is sliced into thin sheets, with the animation camera taking a frame of the end of the loaf for each cut, eventually revealing the movement of the internal images within.

Cutout animation is a type of stop-motion animation produced by moving two-dimensional pieces of material paper or cloth.

Silhouette animation is a variant of cutout animation in which the characters are backlit and only visible as silhouettes.

Model animation refers to stop-motion animation created to interact with and exist as a part of a live-action world. Intercutting, matte effects and split screens are often employed to blend stop-motion characters or objects with live actors and settings.

Go motion is a variant of model animation that uses various techniques to create motion blur between frames of film, which is not present in traditional stop-motion

Object animation refers to the use of regular inanimate objects in stop-motion animation, as opposed to specially created items.

Graphic animation uses non-drawn flat visual graphic material (photographs, newspaper clippings, magazines, etc.), which are sometimes manipulated frame-by-frame to create movement. At other times, the graphics remain stationary, while the stop-motion camera is moved to create on-screen action.

Pixilation involves the use of live humans as stop motion characters. This allows for a number of surreal effects, including disappearances and reappearances, allowing people to appear to slide across the ground, and other effects.

Computer animation encompasses a variety of techniques, the unifying factor being that the animation is created digitally on a computer. 2D animation techniques tend to focus on image manipulation while 3D techniques usually build virtual worlds in which characters and objects move and interact. 3D animation can create images that seem real to the viewer.

2D animation figures are created or edited on the computer using 2D bitmap graphics and 2D vector graphics. This includes automated computerized versions of traditional animation techniques, interpolated morphing, onion skinning and interpolated rotoscoping.

2D animation has many applications, including analog computer animation, flash animatio, and power point animation. cinemagraphs are still photographs in the form of an animated GIF file of which part is animated.

3D animation is digitally modeled and manipulated by an animator. The animator usually starts by creating a 3D polygon mesh to manipulate. A mesh typically includes many vertices that are connected by edges and faces, which give the visual appearance of form to a 3D object or 3D environment. Sometimes, the mesh is given an internal digital skeletal structure called an armature that can be used to control the mesh by weighting the vertices. This process is called rigging and can be used in conjunction with key frames to create movement.

Animator

An animator is an artist who creates a visual sequence (or audio-visual if added sound) of multiple sequential images that generate the illusion of movement, that is, an animation. Animations are currently in many areas of technology and video, such as cinema, television, video games or the internet. Generally, these works require the collaboration of several animators. The methods to create these images depend on the animator and style that one wants to achieve (with images generated by computer, manually).

Animators can be divided into animators of characters (artists who are specialized in the movements, dialogue and acting of the characters) and animators of special effects (for example vehicles, machinery or natural phenomena such as water, snow, rain).

Production

The creation of non-trivial animation works (i.e., longer than a few seconds) has developed as a form of filmmaking, with certain unique aspects. Traits common to both live-action and animated feature length films are labor-intensity and high production costs.

The most important difference is that once a film is in the production phase, the marginal cost of one more shot is higher for animated films than live-action films. It is relatively easy for a director to ask for one more take during principal photography of a live-action film, but every take on an animated film must be manually rendered by animators (although the task of rendering slightly different takes has been made less tedious by modern computer animation). It is pointless for a studio to pay the salaries of dozens of animators to spend weeks creating a visually dazzling five-minute scene if that scene fails to effectively advance the plot of the film. Thus, animation studios starting with Disney began the practice in the 1930s of maintaining story departments where storyboard artists develop every single scene through storyboards, then handing the film over to the animators only after the production team is satisfied that all the scenes make sense as a whole. While live-action films are now also storyboarded, they enjoy more latitude to depart from storyboards (i.e., real-time improvisation).

Another problem unique to animation is the requirement to maintain a film's consistency from start to finish, even as films have grown longer and teams have grown larger. Animators, like all artists, necessarily have individual styles, but must subordinate their individuality in a consistent way to whatever style is employed on a particular film. Since the early 1980s, teams of about 500 to 600 people, of whom 50 to 70 are animators, typically have created feature-length animated films. It is relatively easy for two or three artists to match their styles; synchronizing those of dozens of artists is more difficult.

This problem is usually solved by having a separate group of visual development artists develop an overall look and palette for each film before animation begins. Character designers on the visual development team draw model sheets to show how each character should look like with different facial expressions, posed in different positions, and viewed from different angles. On traditionally animated projects, Maquettes were often sculpted to further help the animators see how characters would look from different angles.

Unlike live-action films, animated films were traditionally developed beyond the synopsis stage through the storyboard format; the storyboard artists would then receive credit for writing the film. In the early 1960s, animation studios began hiring professional screenwriters to write screenplays (while also continuing to use story departments) and screenplays had become commonplace for animated films by the late 1980s.

Criticism

Criticism of animation has been common in media and cinema since its inception. With its popularity, a large amount of criticism has arisen, especially animated feature-length films. Many concerns of cultural representation, psychological effects on children have been brought up around the animation industry, which has remained rather politically unchanged and stagnant since its inception into mainstream culture.

Animation and Human Rights

Currently, animation is used as a method of entertainment, and employed to criticize or defend certain aspects of society. Most of these projects have been nominated for the Oscars or have gone viral on the Internet. For example, in a Heartbeat, directed by the American Esteban Bravo and Beth David, is one of the candidates to take the Best Animated Short Film award at the Oscars 2018.

"In a Heartbeat" is about a love story between two teenage boys, as the directors wanted to break the prejudices towards the LGBT community. It's a short animation without dialogue where the heart of one of the boys escapes to pursue the other young person. The short film already has more than 32 million views on YouTube, and despite its success, it has created some controversy.

There are several examples of early sequential images that may seem similar to series of animation drawings. Most of these examples would only allow an extremely low frame rate when they are animated, resulting in short and crude animations that are not very lifelike. However, it's very unlikely that these images were intended to be somehow viewed as an animation. It is possible to imagine technology that could have been used in the periods of their creation, but no conclusive evidence in artifacts or descriptions have been found. It is sometimes argued that these early sequential images are too easily interpreted as "pre-cinema" by minds accustomed to film, comic books and other modern sequential images, while it is uncertain that the creators of these images envisioned anything like it. The notion of instances smaller than a second that are necessary to break down an action into sufficient phases for fluent animation would not really develop before the 19th century.

History:

Early examples of attempts to capture the phenomenon of motion into a still drawing can be found in Paleolithic cave paintings, where animals are often depicted with multiple legs in superimposed positions. It has been claimed that these superimposed figures were intended for a form of animation with the flickering light of the flames of a fire or a passing torch illuminating different parts of the painted rock wall, revealing different parts of the motion.

Archaeological finds of small Paleolithic discs with a hole in the middle and drawings on both sides have been claimed to be a kind of prehistoric thaumatropes that show motion when spun on a string.

A 5,200-year old pottery bowl discovered in Iran has five sequential images painted around it that seem to show phases of a goat leaping up to nip at a tree.

Shadow play has much in common with animation: people watching moving figures on a screen as a very popular form of entertainment, usually a story with dialogue, sounds and music. The figures could be very detailed and very articulated.

The earliest projection of images was most likely done in primitive shadowgraph dating back to prehistory. It evolved into more refined forms of shadow puppetry, mostly with flat jointed cut-out figures which are held between a source of light and a translucent screen. The shapes of the puppets sometimes include translucent color or other types of detailing.

Moving images were possibly projected with the magic lantern since its invention by Christian Huygens in 1659. His sketches for magic lantern slides have been dated to that year and are the oldest known document concerning the magic lantern. One encircled sketch depicts Death raising his arm from his toes to his head, another shows him moving his right arm up and down from his elbow and yet another taking his skull off his neck and placing it back. Dotted lines indicate the intended movements.

Techniques to add motion to painted glass slides for the magic lantern were described since circa 1700. These usually involved parts (for instance limbs) painted on one or more extra pieces of glass moved by hand or small mechanisms across a stationary slide which showed the rest of the picture. Popular subjects for mechanical slides included the sails of a windmill turning, a procession of figures, a drinking man lowering and raising his glass to his mouth, a head with moving eyes, a nose growing very long, rats jumping in the mouth of a sleeping man. A more complex 19th century rockwork slide showed the then known eight planets and their satellites orbiting around the sun. Two layers of painted waves on glass could create a convincing illusion of a calm sea turning into a very stormy sea tossing some boats about by increasing the speed of the manipulation of the different parts.

Thaumatrope :

In April 1825 the first *thaumatrope* was published by W. Phillips and became a very popular toy. The pictures on either side of a small cardboard disc seem to blend into one combined image when it is twirled quickly by the attached strings. This is often used as an illustration of what has often been called "persistence of vision." Although a thaumatrope can also be used for two-phase animation, no examples are known to have been produced with this effect until long after the phenakistiscope had established the principle of animation.

The **phenakistiscope** or fantascope was the first animation device using rapid successive substitution of sequential pictures. The pictures are evenly spaced radically around a disc, with small rectangular apertures at the rim of the disc. The animation could be viewed through the slits of the spinning disc in front of a mirror. It was invented in November or December 1832 by the Belgian Joseph Plateau.

Zoetrope:

In 1865 William Ensign Lincoln invented the definitive zoetrope with easily replaceable strips of images. It also had an illustrated paper disc on the base, which was not always exploited on the commercially produced versions.

Flip book: a flip book (sometimes, especially in British English, called a flick book) is a book with a series of pictures that vary gradually from one page to the next, so that when the pages are turned rapidly, the pictures appear to animate by simulating motion or some other change. Flip books are often illustrated books for children, they also be geared towards adults and employ a series of photographs rather than drawings. Flip books are not always separate books; they appear as an added feature in ordinary books or magazines, often in the page corners. Software packages and websites are also available that convert digital video files into custom-made flip books.

Persistence of vision refers to the optical illusion whereby multiple discrete images blend into a single image in the human mind and believed to be the explanation for motion perception in cinema and animated films. Like other illusions of visual perception, it is produced by certain characteristics of the visual system.

Animation works by using an optical illusion. By presenting a sequence of still images in quick enough succession, the viewer interprets them as a continuous moving image. This is the same principle that enables live action film making and projection to work. Film theorists often refer to this illusion of movement as the persistence of vision.

Persistence of vision works because the human eye and brain can only process 10 to 12 separate images per second, retaining an image for up to a sixteenth of a second. If a subsequent image replaces it in this period of time it will create the illusion of continuity.

Layers:

In graphics software, a layer is the term used to describe the different levels at which you can place an object or image file. In the program, you can stack, merge or define layers when creating a digital image. Layers are used in digital image editing to separate different elements of an image. A layer can be compared to a transparency on which imaging effects or images are applied and placed over or under an image. Today they are an integral feature of image editors.

There are different kinds of layers, and not all of them exist in all programs. They represent a part of a picture, either as pixels or as modification instructions. They are stacked on top of each other, and depending on the order, determine the appearance of the final picture.

Layers can be partially obscured allowing portions of images within a layer to be hidden or shown in a translucent manner within another image, or you can use layers to combine two or more images into a single digital image. For the purpose of editing, working with layers allows you to go back and make changes within a layer as you work.

The standard kind of layer is called simply "Layer" in most programs. It contains just a picture which can be superimposed on another one. The picture can cover the same area as the resulting picture, just a part of it, or, in some cases, a bigger part than the final picture.

A Layer can have a certain transparency/opacity and a number of other properties. In a high end program like Adobe Photoshop, a basic layer may have more than a hundred different possible settings. Even though some of them overlap and give the same result, they give a skilled user a lot of flexibility.

A layer mask is linked to a layer and hides part of the layer from the picture. What is painted black on the layer mask will not be visible in the final picture. What is grey will be more or less transparent depending on the shade of grey. As the layer mask can be both edited and moved around independently of both the background layer and the layer it applies to, it gives the user the ability to test a lot of different combinations of overlay.

An adjustment layer typically applies a common effect like brightness or saturation to other layers. However, as the effect is stored in a separate layer, it is easy to try it out and switch between different alternatives, without changing the original layer. In addition, an adjustment layer can easily be edited, just like a layer mask, so an effect can be applied to just part of the image

keyframes:

A keyframe in animation and filmmaking is a drawing that defines the starting and ending points of any smooth transition. The drawings are called "frames" because their position in time is measured in frames on a strip of film.

A sequence of keyframes defines which movement the viewer will see, whereas the position of the keyframes on the film, video, or animation defines the timing of the movement. Because only two or three keyframes over the span of a second do not create the illusion of movement, the remaining frames are filled with inbetweens.

In drawn animation, moving characters are often shot "on twos", that is to say, one drawing is shown for every two frames of film (which usually runs at 24 frames per second), meaning there are only 12 drawings per second.

Frame rate:

 (Expressed in **frames per second** or **fps**) is the frequency (rate) at which consecutive images called frames appear on a display.

In drawn animation, moving characters are often shot "on twos", that is to say, one drawing is shown for every two frames of film (which usually runs at 24 frames per second), meaning there are only 12 drawings per second. Even though the image update rate is low, the fluidity is satisfactory for most subjects. However, when a character is required to perform a quick movement, it is usually necessary to revert to animating "on ones", as "twos" are too slow to convey the motion adequately. A blend of the two techniques keeps the eye fooled without unnecessary production cost.