WIKIPEDIA – TWELVE BASIC PRINCIPLES OF ANIMATION

Disney's **Twelve Basic Principles of Animation** is a set of principles of animation introduced by the Disney animators Ollie Johnston and Frank Thomas in their 1981 book *The Illusion of Life: Disney Animation*.[a][1] Johnston and Thomas in turn based their book on the work of the leading Disney animators from the 1930s onwards, and their effort to produce more realistic animations. The main purpose of the principles was to produce an illusion of characters adhering to the basic laws of physics, but they also dealt with more abstract issues, such as **emotional timing** and **character appeal**.

The book and some of its principles have been adopted by some traditional studios, and have been referred to by some as the "Bible of animation."[2] In 1999 the book was voted number one of the "best animation books of all time" in an online poll.[3] Though originally intended to apply to traditional, hand-drawn animation, the principles still have great relevance for today's more prevalent computer animation.

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The 12 Principles of Animation
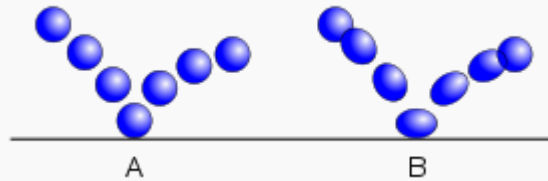
Squash and stretch[edit]

Illustration of the "squash and stretch"-principle:

Example **A** shows a ball bouncing with a rigid, non-dynamic movement. In example **B** the ball is "squashed" at impact, and "stretched" during fall and rebound. The movement also accelerates during the fall, and slows down towards the apex (see "slow in and slow out").

Animated sequence of a race horse galloping. Photos taken by Eadweard Muybridge. The horse's body demonstrates squash and stretch in natural musculature.

The most important principle is "squash and stretch",[4] the purpose of which is to give a sense of weight and flexibility to drawn objects. It can be applied to simple objects, like a bouncing ball, or more complex constructions, like the musculature of a human face.[5][6] Taken to an extreme point, a figure stretched or squashed to an exaggerated degree can have a comical effect.[7] In realistic animation, however, the most important aspect of this principle is the fact that an object's volume *does not* change when squashed or stretched. If the length of a ball is stretched vertically, its width (in three dimensions, also its depth) needs to contract correspondingly horizontally.[8]

Anticipation

Anticipation is used to prepare the audience for an action, and to make the action appear more realistic.[9] A dancer jumping off the floor has to bend his knees first; a golfer making a swing has to swing the club back first. The technique can also be used for less physical actions, such as a character looking off-screen to anticipate someone's arrival, or attention focusing on an object that a character is about to pick up.[10]

Anticipation: A baseball player making a pitchprepares for the action by moving his arm back.

Staging

This principle is akin to staging, as it is known in theatre and film.[11] Its purpose is to direct the audience's attention, and make it clear what is of greatest importance in a scene;[12] Johnston and Thomas defined it as "the presentation of any idea so that it is completely and unmistakably clear", whether that idea is an action, a personality, an expression, or a mood.[11]This can be done by various means, such as the placement of a character in the frame, the use of light and shadow, or the angle and position of the camera.[13] The essence of this principle is keeping focus on what is relevant, and avoiding unnecessary detail.[14][15]

Straight Ahead Action and Pose to Pose

These are two different approaches to the actual drawing process. "Straight ahead action" means drawing out a scene frame by frame from beginning to end, while "pose to pose" involves starting with drawing a few key frames, and then filling in the intervals later.[12] "Straight ahead action" creates a more fluid, dynamic illusion of movement, and is better for producing realistic action sequences. On the other hand, it is hard to maintain proportions, and to create exact, convincing poses along the way. "Pose to pose" works better for dramatic or emotional scenes, where composition and relation to the surroundings are of greater importance.[16] A combination of the two techniques is often used.[17]

Computer animation removes the problems of proportion related to "straight ahead action" drawing; however, "pose to pose" is still used for computer animation, because of the advantages it brings in composition.[18] The use of computers facilitates this method, as computers can fill in the missing sequences in between poses automatically. It is, however, still important to oversee this process and apply the other principles discussed.[17]

Follow Through and Overlapping Action

Follow through and overlapping action is a general heading for two closely related techniques which help to render movement more realistically, and help to give the impression that characters follow the laws of physics, including the principle of inertia. "Follow through" means that loosely tied parts of a body should continue moving after the character has stopped and the parts should keep moving beyond the point where the character stopped to be "pulled back" only subsequently towards the center of mass and/or exhibiting various degrees of oscillation damping. "Overlapping action" is the tendency for parts of the body to move at different rates (an arm will move on different timing of

the head and so on). A third related technique is "drag", where a character starts to move and parts of him take a few frames to catch up.[12] These parts can be inanimate objects like clothing or the antenna on a car, or parts of the body, such as arms or hair. On the human body, the torso is the core, with arms, legs, head and hair appendices that normally follow the torso's movement. Body parts with much tissue, such as large stomachs and breasts, or the loose skin on a dog, are more prone to independent movement than bonier body parts.[19] Again, exaggerated use of the technique can produce a comical effect, while more realistic animation must time the actions exactly, to produce a convincing result.[20]

The "moving hold" animates between similar key frames, even characters sitting still can display some sort of movement, such as the torso moving in and out with breathing.[21]

Slow In and Slow Out

The movement of the human body, and most other objects, needs time to accelerate and slow down. For this reason, animation looks more realistic if it has more drawings near the beginning and end of an action, emphasizing the extreme poses, and fewer in the middle.[12] This principle goes for characters moving between two extreme poses, such as sitting down and standing up, but also for inanimate, moving objects, like the bouncing ball in the above illustration.[22]

Arc

Most natural action tends to follow an arched trajectory, and animation should adhere to this principle by following implied "arcs" for greater realism. This can apply to a limb moving by rotating a joint, or a thrown object moving along a parabolic trajectory. The exception is mechanical movement, which typically moves in straight lines.[23]

As an object's speed or momentum increases, arcs tend to flatten out in moving ahead and broaden in turns. In baseball, a fastball would tend to move in a straighter line than other pitches; while a figure skater moving at top speed would be unable to turn as sharply as a slower skater, and would need to cover more ground to complete the turn.

An object in motion that moves out of its natural arc for no apparent reason will appear erratic rather than fluid. Therefore when animating (for example) a pointing finger, the animator should be certain that in all drawings in between the two extreme poses, the fingertip follows a logical arc from one extreme to the next. Traditional animators tend to draw the arc in lightly on the paper for reference, to be erased later.

Follow through/Overlapping Action: as the horse runs, its [mane](#) and [tail](#) follow the movement of the body.

Secondary Action

Adding secondary actions to the main action gives a scene more life, and can help to support the main action. A person walking can simultaneously swing his arms or keep them in his pockets, he can speak or whistle, or he can express emotions through facial expressions.[24] The important thing about secondary actions is that they emphasize, rather than take attention away from, the main action. If the latter is the case, those actions are better left out.[25] In the case of facial expressions, during a dramatic movement these will often go unnoticed. In these cases it is better to include them at the beginning and the end of the movement, rather than during.[26]

Timing

"Timing (animation)" redirects here. For the animation technique, see [Blocking (animation)](#).

Timing refers to the number of drawings or frames for a given action, which translates to the speed of the action on film.[12] On a purely physical level, correct timing makes objects appear to obey the laws of physics; for instance, an object's weight determines how it reacts to an impetus, like a push.[27] Timing is critical for establishing a character's mood, emotion, and reaction.[12] It can also be a device to communicate aspects of a character's personality.[28]

Exaggeration

Exaggeration is an effect especially useful for animation, as perfect imitation of reality can look static and dull in cartoons.[12] The level of exaggeration depends on whether one seeks realism or a particular style, like a caricature or the style of an artist. The classical definition of exaggeration, employed by Disney, was to remain true to reality, just presenting it in a wilder, more extreme form.[29] Other forms of exaggeration can involve the supernatural or surreal, alterations in the physical features of a character; or elements in the storyline itself.[30] It is important to employ a certain level of restraint when using exaggeration; if a scene contains several elements, there should be a balance in how those elements are exaggerated in relation to each other, to avoid confusing or overawing the viewer.[31]

Solid drawing

The principle of solid drawing means taking into account forms in three-dimensional space, giving them volume and weight.[12] The animator needs to be a skilled draughtsmanand has to understand the basics of three-dimensional shapes, anatomy, weight, balance, light and shadow, etc.[32] For the classical animator, this involved taking art classes and doing sketches from life.[33] One thing in particular that Johnston and Thomas warned against was creating "twins": characters whose left and right sides mirrored each other, and looked lifeless.[34] Modern-day computer animators draw less because of the facilities computers give them,[35] yet their work benefits greatly from a basic understanding of animation principles, and their additions to basic computer animation.[33]

Appeal

Appeal in a cartoon character corresponds to what would be called charisma in an actor.[36] A character who is appealing is not necessarily sympathetic – villains or monsters can also be appealing – the important thing is that the viewer feels the character is real and interesting.[36] There are several tricks for making a character connect better with the audience; for likable characters a symmetrical or particularly baby-like face tends to be effective.[37] A complicated or hard to read face will lack appeal, it may more accurately be described as 'captivation' in the composition of the pose, or the character design.

Notes

a. ^ The twelve principles have been paraphrased and shortened by Nataha Lightfoot for Animation Toolworks.[12] Johnston and Thomas themselves found this version good enough to put it up on their own website.[38]

Found at https://en.wikipedia.org/wiki/12_basic_principles_of_animation