# 6. Animation

## Synopsis

This module provides an introduction to the magical world of animation. It explains some of the basic principles of animation and discusses aspects of storytelling. It outlines the stages in the creation of a short animation that includes storyboarding, character studies, concept art, sound design and animatic.

## Lectures

6.1 The magical world of animation
6.2 Basic principles of animation
6.3 How to create a short animation film

Fig 6.2.00

# 6.2 Basic principles of animation

**Basic principles in animation**

Many of these principles seek to communicate the fundamental laws of physics from an animator's perspective. They also serve to emphasize the understanding of emotional aspects for communicating character traits. Though these principles were developed for traditional hand-drawn animation, they are applicable to animation that is facilitated through digital tools.

These principles are:
1. Squash and stretch
2. Anticipation
3. Staging
4. Follow through
5. Slow in and slow out
6. Arcs
7. Secondary action
8. Timing
9. Exaggeration
10. Drawing

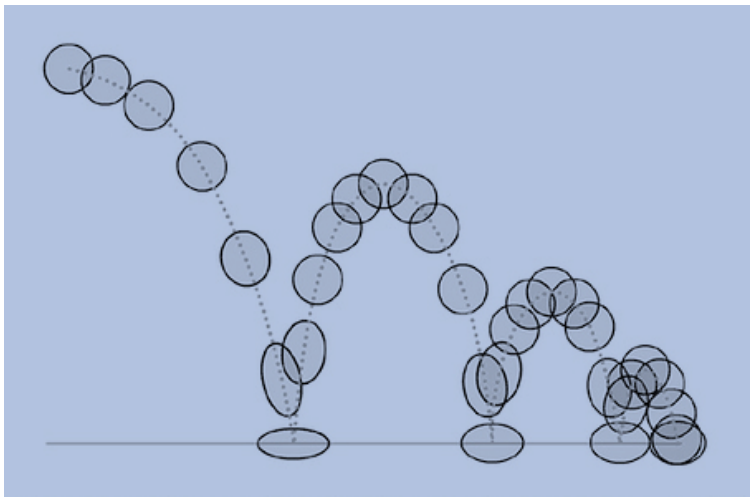

Fig. 6.2.01a
Illustration of the "squash and stretch"-principle.

Of the two balls shown in the figure, the second one animates more realistically.
This is because the first example is a series of mechanically positioned 'in-betweens' that are equally spaced. The second examples recognizes principles in physics that make a ball move faster as it reaches the ground; 'squash' and 'stretch' during the rebound and then slow down as it rises.
The same principle becomes important when animating more complex objects and figures. Extreme exaggeration of stretching and squashing can create dramatic sequences. Animation that seeks to be more realistic needs to keep in mind that the volume of an object remains the same even as it stretches and squashes.

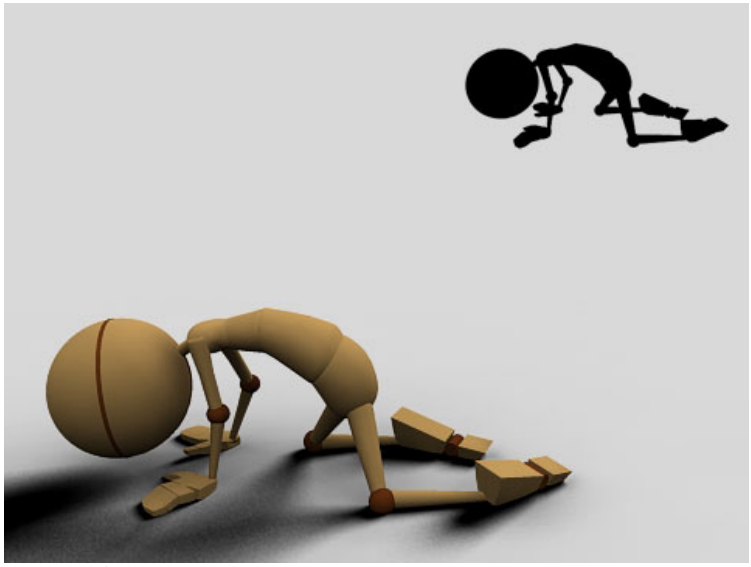

Fig. 6.2.01b
The "Squash and stretch"-principle may be used to make the movements of a crouching figure getting up, look more realistic.

Fig. 6.2.02
The young boy pouting his lips creates the anticipation for a kiss (that may or may not happen!).

Anticipation is a principle that provides a glimpse into a future event and prepares them to 'anticipate' this. A character bending down helps anticipate a leap; a crinkling of the muscles of the nose helps anticipate a sneeze.

Fig. 6.2.03
Lighting plays a very important role while staging a scene.
Staging implies communicating to the audience an idea about the scene that shall unfold. It could include introducing a character, the mood or action that is about to take place. Various ways that could help stage a scene effectively, include the use of light and shadow, the positioning of the character and the angle of the camera.

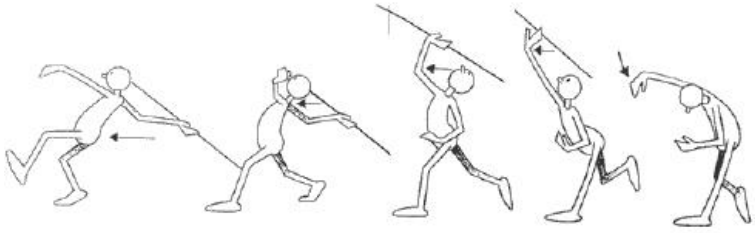

Fig. 6.2.04
After throwing the javelin, the hand does not stop abruptly, but continues to move in a follow through.

Different parts of a character may continue to move even after the character has stopped. The windows of an old car that has braked may rattle; the belly of a fat cat may continue to sway; the wings of a plane that has just landed may vibrate – and depicting these while animating requires an understanding of the 'follow-through' principle.

Fig. 6.2.05
Slow in and slow out
An animated figure or object comes across as more realistic if the animation of motion is slower to begin with and slower as the motion ceases. This requires more frames at the beginning and end of a motion sequence.

Fig. 6.2.06
Most moving body parts tend to follow an arc.
Arcs
The parts of most figures, such as an arm or a tail of some animal tend to move along an arc. A mechanical object such as box being pushed would normally move in a straight line, but a part that is pivoted at a point would move along an arc.

Fig. 6.2.07 Secondary action

Main action that is supported by some secondary action can make the animation appear more real. A character who is walking forward may be swaying its head slightly from side to side; a rat that is scurrying ahead may twitch its whiskers. Secondary actions should contribute to the sense of realism and not draw too much attention away from the main action. If the main action is dramatic, it is a good idea to include any secondary action at the beginning and ending of the main action and not at the peak of the dramatic action.

Fig. 6.2.08
Animating a yawn well, requires a good understanding of the principle of timing.
Timing is a useful principle to communicate the personality of the animated object or figure. It is related to physical laws that govern motion. A good understanding of timing can also accentuate the 'mood' of a scene. A heavy-set character who is feeling morose may stand up rather slowly from a chair. Timing this well would mean that there are more frames at the beginning of the motion as the character is in the act of getting up with an air of 'resigned-effort'.

Fig. 6.2.09
The principle of Exaggeration

At times an action might be over-stated or exaggerated in order to heighten its effect. The degree of exaggeration could lead to the action appearing as “too loud and deliberately so” or “noticeably emphasized but not-in-your-face”. The impact of a coconut falling unexpectedly on a character sleeping under the tree or the splash created by a big-fish leaping out of the surface of a lake, may be exaggerated by animators to different degrees, with the intention of making these events appear suitably dramatic.

Fig. 6.2.10
Drawing

An understanding of the anatomy of human beings and animal forms; and the ability to draw natural forms and objects holds the key to good animation. This includes a sense for the volume and weight of figures and objects drawn from various angles. Even animation that is largely computer-based derives much of its elegance from a good command over drawing.