**ANIMATION**

**Computer animation** is the process used for generating animated images. The more general term [computer-generated imagery](https://en.wikipedia.org/wiki/Computer-generated_imagery) (CGI) encompasses both static scenes and dynamic images, while computer [animation](https://en.wikipedia.org/wiki/Animation) *only* refers to the moving images. [Modern computer animation](https://en.wikipedia.org/wiki/Virtual_cinematography) usually uses [3D computer graphics](https://en.wikipedia.org/wiki/3D_computer_graphics), although [2D computer graphics](https://en.wikipedia.org/wiki/2D_computer_graphics) are still used for stylistic, low bandwidth, and faster [real-time renderings](https://en.wikipedia.org/wiki/Real-time_rendering). Sometimes, the target of the animation is the computer itself, but sometimes film as well.

Computer animation is essentially a digital successor to the [stop motion](https://en.wikipedia.org/wiki/Stop_motion) techniques using 3D models, and [traditional animation](https://en.wikipedia.org/wiki/Traditional_animation) techniques using frame-by-frame animation of 2D illustrations. Computer-generated animations are more controllable than other more physically based processes, constructing [miniatures](https://en.wikipedia.org/wiki/Miniature_effect) for effects shots or hiring [extras](https://en.wikipedia.org/wiki/Extra_(actor)) for crowd scenes, and because it allows the creation of images that would not be feasible using any other technology. It can also allow a single graphic artist to produce such content without the use of actors, expensive set pieces, or [props](https://en.wikipedia.org/wiki/Theatrical_property). To create the illusion of movement, an image is displayed on the [computer monitor](https://en.wikipedia.org/wiki/Computer_monitor) and repeatedly replaced by a new image that is similar to it, but advanced slightly in time (usually at a rate of 24, 25 or 30 frames/second). This technique is identical to how the illusion of movement is achieved with [television](https://en.wikipedia.org/wiki/Television) and [motion pictures](https://en.wikipedia.org/wiki/Film).

For [3D animations](https://en.wikipedia.org/wiki/3D_animation), objects (models) are built on the computer monitor (modeled) and 3D figures are rigged with a [virtual skeleton](https://en.wikipedia.org/wiki/Skeletal_animation). For 2D figure animations, separate objects (illustrations) and separate transparent layers are used with or without that virtual skeleton. Then the limbs, eyes, mouth, clothes, etc. of the figure are moved by the animator on [key frames](https://en.wikipedia.org/wiki/Key_frame). The differences in appearance between key frames are automatically calculated by the computer in a process known as [tweening](https://en.wikipedia.org/wiki/Inbetweening" \o "Inbetweening) or [morphing](https://en.wikipedia.org/wiki/Morphing). Finally, the animation is [rendered](https://en.wikipedia.org/wiki/Rendering_(computer_graphics)).[[1]](https://en.wikipedia.org/wiki/Computer_animation#cite_note-FOOTNOTESito2013232-1)

For 3D animations, all frames must be rendered after the modeling is complete. For 2D vector animations, the [rendering](https://en.wikipedia.org/wiki/Rendering_(computer_graphics)) process is the key frame illustration process, while tweened frames are rendered as needed. For pre-recorded presentations, the rendered frames are transferred to a different format or medium, like digital video. The frames may also be rendered in real time as they are presented to the end-user audience. Low bandwidth animations transmitted via the internet (e.g. [Adobe Flash](https://en.wikipedia.org/wiki/Adobe_Flash), [X3D](https://en.wikipedia.org/wiki/X3D)) often use software on the end-users computer to render in real time as an alternative to [streaming](https://en.wikipedia.org/wiki/Streaming_media) or pre-loaded high bandwidth animations.















