Morphing

Introduction

Morphing is probably most noticeably used to produce incredible special effects in the entertainment industry. It is often used in movies such as *Terminator* and *The Abyss*, in commercials, and in music videos such as Michael Jackson's *Black or White*. Morphing is also used in the gaming industry to add engaging animation to video games and computer games. However, morphing techniques are not limited only to entertainment purposes. Morphing is a powerful tool that can enhance many multimedia projects such as presentations, education, electronic book illustrations, and computer-based training. This paper discusses what morphing is, different morphing techniques and examples of morphing software packages available for multimedia developers to use when creating multimedia projects.

Significance of Topic

Animation techniques are constantly increasing in quality and creativity. Because consumers demand better quality special effects and effects that will captivate and engage themselves grows profoundly, industries must strive to appease these audiences. Multimedia users and entertainment seekers are no longer satisfied with simple animation, they desire fancier transitions and animation to amaze them and keep them interested in the product. The special effect known as morphing has been one way to satisfy consumers' need to be entertained, impressed, and amazed by the final product.

Discussion of Topic

What is Morphing?

The word morph derives from the word metamorphosis meaning to change shape, appearance or form. According to Vaughn (112) morphing is defined as "an animation technique that allows you to dynamically blend two still images, creating a sequence of in-between pictures that, when played in QuickTime, metamorphoses the first image into the second." Yongyue Zhang gives a detailed explanation of the process of morphing:

> Morphing is achieved by coupling image warping with color interpolation. As the morphing proceeds, the source image is gradually distorted and is faded out, while the target image is faded in. So, the early images in the sequence are much like the first image. The middle image of the sequence is the average of the first image distorted halfway towards the second one and the second image distorted halfway back towards the first one. The last images in the sequence are similar to the second one. Then, the whole process consists of warping two images so that they have the same "shape" and then cross dissolving the resulting images.

Another term that warrants being defined is ‘warping’ because it is frequently used when discussing the process of metamorphosis. A warp is a two-dimensional geometric transformation and generates a distorted image when it is applied to an image (Thalmann). Warping is similar to morphing, except that no fade occurs and only one image is distorted (Cybulski and Valentine). According to Claypoole, et al. there are two ways to warp an object. The first method is forward mapping in which each pixel in the source image is mapped to an appropriate place in the destination image. The second is reverse mapping, which goes through each pixel in the destination image and samples an appropriate source image pixel.

Morphing Techniques

Image morphing techniques can be classified into two categories such as mesh-based and feature-based methods in terms of their ways for specifying features. In mesh-based methods, the features on an image are specified by a nonuniform mesh. Feature-based methods specify the features with a set of points or line segments. (Thalmann)

One way of achieving the morphing effect is to transform one image into another by creating a cross-dissolve between them. According to Claypoole et.al., in this method, the color of each pixel is interpolated over time from the first image value to the corresponding second image value. However, this is not very effective in portraying an actual metamorphosis and the metamorphosis between faces does not look good if the two faces do not have about the same shape. This method also tends to wash away the features on the images (Thalmann).

A second way to achieve morphing is feature interpolation, which is performed by combining warps with the color interpolation. The features of two images and their correspondences are specified by an animator with a set of points or line segments. Then, warps are computed to distort the images so that the features have intermediate positions and shapes. The color interpolation between the distorted images finally gives an in-between image (Thalmann).

In morphing the most difficult task is the warping of one image into another image (Claypoole et.al.). It is the stretching and pulling of the images that makes the morphing effect so realistic. The actual morphing of the image can be accomplished either by using morph points or morph lines. Morph points are the markers that you set up on the start image and the end image. The morphing program then uses these markers to calculate how the initial image should bend/warp to match the shape of the final image. The second method uses lines (edges) instead of individual points. Both methods produce very realistic morphing effects. One of the most time consuming tasks in morphing is selecting the points or lines in the initial and final image so that the metamorphosis is smooth and natural

There are several useful tips to remember when morphing objects. The first is to choose carefully those pictures to morph (Morphing Software). For example, if you wish to morph two animals, it is best to use pictures that have the same general size and outline. If one picture of the animal is a close up of the head then the other picture should also be a close up of the head to obtain successful results. A second tip is to carefully select the background (Morphing Software). If a single color background is used, the morphing effect focuses on the object. Ideally, it is best to use the same background for each picture.

Software Used for Creating Morphing

The following examples provide multimedia authors a list of software products that can be used to produce the morphing effect. Internet links for the appropriate software products have been included as well as a brief description of different features of each brand of software.

Morpher (Mac or Win Platform)
http://graphicssoft.about.com/gi/dynamic/offsite.htm?site=http%3A%2F%2Fwww.asahi-net.or.jp%2F%7EFX6M-FJMY%2Fmop00e.html

"Morpher" makes Digital movies using a 2-D morph between two still images. Morpher is a shareware. You may distribute this product on a non-profit basis.

MorphInk 2.0 (Free Trial Download)
http://www.morphink.com/technology/technology.htm
http://www.morphink.com/press/press_media.htm

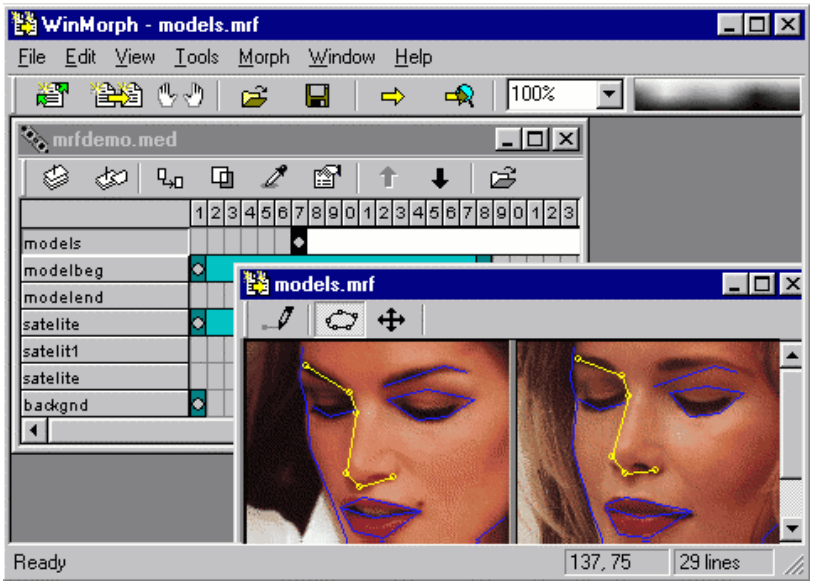
MorphInk produces full screen, full motion animations that are far smaller in file size than Flash or Animated GIF. MorphInk's compact files reduce or eliminate download times eliminated and full motion movies in any Web ad format become possible. MorphInk Corporation's animation authoring tools are noted for their ease of use due to automatic creation of in-between frames and unique interactive editing capabilities. MorphInk animation authoring tools empower novice animators while creating a new paradigm of efficiency for professionals.

Blender 2.12 (Free Download), Cross Platform
http://www.blender.nl/

Blender is a professional 3D modeling and animation. It supports the modeling of polygon meshes, curves, NURBS, text, and metaballs, as well as animation with key frames, motion curves, morphing, and inverse kinematics (IK). Other notable features include field rendering, several lighting modes, animation motion paths, animation curves, and vertex key framing for morphing. Blender can read and write Targa, JPEG, Iris, SGI movie, and Amiga IFF formats, and can also read Inventor files.

WinMorph 2.01 (Free Download) PC Platform
http://www.crosswinds.net/~sskr/winmorph/index.htm

WinMorph is a highly optimized morphing and warping software. Features include the ability to warp individual images and create digital movies by morphing between key frames. With a little effort, you can create professional morphing sequences using WinMorph. You can also use this software to create custom effects on images and to rotate, resize, and twist images. The following is a screen shot of the WinMorph software.



You can use WinMorph v2.01 to:

- Warp & distort images.
- Create simple animations like a car moving along a road, or zooming into a picture.
- Create complex morphing movies in which one image morphs to another image. The movie sequences created can be saved as AVI or MPEG or individual BMP files.
- Combine many separate morphing sequences into a single movie, with special effects like moving morphs, or transparent morphs.
- Create cool videos by combining many WinMorph projects, individual bitmaps and even existing AVI videos. Apply special effects like transparency and motion tracks to each of these elements.

MorphMan 2.01 and MorphMan 2000 (Free Demo. Registered $49.95), PC Platform
http://www.stoik.com/?tag=ex.dl.10079-601-908130.dir.manu

The MorphMan program allows you to perform not only static morphing (from two images), but also dynamic morphing--the transformation from one video sequence to another. It manages color, points, and movement curves, supports all popular image and video file formats, and provides three morphing algorithms. Version 2.01 adds three add-on applications for video editing and composing, support for morphing projects and more. The following is a screen shot from the MorphMan software.

Version 2000 has multiple algorithmic and interface enhancements. MorphMan 2000 radically facilitates the process of setting marker points and lines that control the transformation with the use of conventional vector drawing tools. MorphMan 2000 is based on Microsoft DirectShow API and thus supports modern compression formats , such as MPEG.

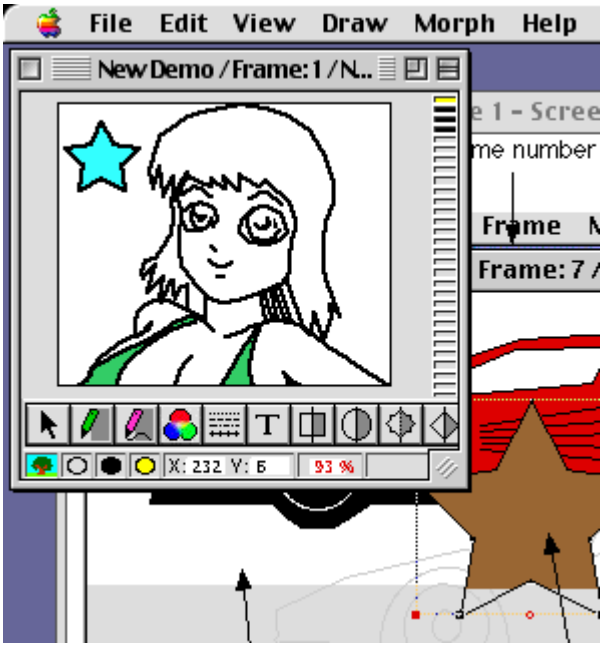
Also new morph Morph project creation and editing features:

- Vector drawing tools for fast, easy, and precise positioning of control points and lines
- Primitives and shapes for setting control markers
- Grouping and ungrouping of markers
- Transformation tools for groups of control markers
- 8-bit mask to define region of interest
- Vector editing tools for mask

Tracer 3.7.1 (Shareware fee $15) Mac Platform

http://graphicssoft.about.com/gi/dynamic/offsite.htm?site=http%3A%2F%2Fwebsite.lineone.net%2F%7Eandy.pritchard%2Ftracer.html

A utility for vector graphics, image tracing, and morphing, Tracer can help speed the development of animation for QuickTime movies. Animation and special effects can be overlaid onto existing QuickTime movies. Tracer is designed to be useful for a variety of multimedia tasks, including games, education, CBT (computer-based training), electronic books, and presentations. The following is a screen shot from the Tracer software:



Features of Tracer include:

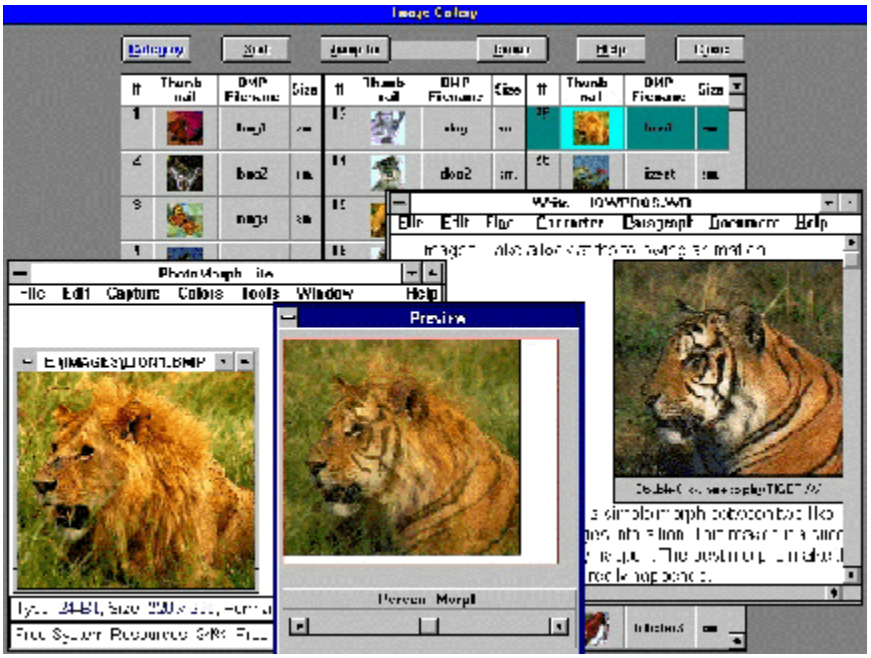
- Morph-animation from a frame to any other frame - either Vector Graphics or Bitmap morphing
- Rapid development of vector graphics from bit mapped images
- Presentation tool with Animation and multimedia support
- Add special effects to existing live-action Quicktime movies.
- Develop multi-layered animation.
- Animation in-betweening between key frames.
- Develop tiles and sprites for game development
- Morphing Text.
- Capture and manipulation of bitmap images in vector graphic shapes.
- Easy-to-use drag-and-drop frame-copying and animation sequencing.

MorphWizard PC platform
http://www.iwsinc.com/mwizard.htm

MorphWizard by ImageWare Software. Inc. is a powerful "morphing" product that alows users to manipulate and force transitions between multiple images to create special effects. MorphWizard is unique in that it allows users with little technical skill to create their own animated movies on a desktop.

Morphology 101 ($9.95)
http://graphicssoft.about.com/gi/dynamic/offsite.htm?site=http%3A%2F%2Fwww.imagesco.com%2Farticles%2Fsoftware%2FMorphTutorial01.html

Morphology 101 is a CD-Rom that contains several useful programs. One of these programs is Photomorph Lite, which is a stripped down version of PhotoMorph 2 but is still a powerful morphing package.



The morphing points placed in the starting picture are points. This is a more intuitive interface providing a greater control over the resulting morph animation.

PhotoMorph 2 ($19.95)

http://graphicssoft.about.com/gi/dynamic/offsite.htm?site=http%3A%2F%2Fwww.imagesco.com%2Farticles%2Fsoftware%2FMorphTutorial01.html

Photomorph 2 is an advanced morphing program. It has pre-production and post-production features make this software suitable for professional broadcast quality video. In addition to doing standard morphing as described for Photomorph Lite, it has the added abilities to morph two .AVI movie files (shows a moving morph), filters for special effects, masking, blue screen, chroma key and luminance key.

Video Craft 3.0 ($34.95)
http://graphicssoft.about.com/gi/dynamic/offsite.htm?site=http%3A%2F%2Fwww.imagesco.com%2Farticles%2Fsoftware%2FMorphTutorial01.html

VideoCraft 3.0 is a Windows 95 (32bit) version of Photomorph 2. It contains all the features of Morphology 101 and Photomorph 2.

Summary

In conclusion, morphing is an image processing technique used for the metamorphosis of one image to another. This technique can be performed in several different ways. The first is by creating a cross-dissolve between the images and the second is by using feature interpolation. There are a variety of software products such as MorphMan, WinMorph, Tracer, etc. that you can download or purchase to add the morphing special effect to your own computer files, movies and multimedia projects.

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Related Links

http://graphicssoft.about.com/gi/dynamic/offsite.htm?site=http%3A%2F%2Fwebsite.lineone.net%2F%7Eandy.pritchard%2Ftracer.html
Double-click on the image to see an example of morphing.

http://hotwired.lycos.com/webmonkey/01/10/index2a_page5.html?tw=multimedia
This site illustrates how to morph one shape into another using Flash.

http://graphicssoft.about.com/cs/morphing/?once=true&
This site provides a list software programs for creating morph animations and movies, plus examples and galleries of morph transformations and distortions.

http://forum.swarthmore.edu/~annie/gsp.handouts/morphing/
This site describes morphing using Sketchpad.

http://www.cis.ohio-state.edu/~parent/book/Full.html#Shape
This site provides a detailed explanation of both two-dimensional and three-dimensional metamorphosis.

http://www.visgraf.impa.br/cgi-bin/morphQuery.cgi?output=html
This site provides a list of publications related to morphing.

http://archives.obs-us.com/obs/english/books/paperl/chap023.htm
Page 67 of this site lists two additional morphing software products.

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