

How Pro's Morph

Morphology 101

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I Introduction

A *Why We Wrote How Pro's Morph*

This document is the result of months of creating animations with *PhotoMorph*, discussing morphing with customers of our company, Andover Advanced Technologies, and picking the brains of the developers of *PhotoMorph* at North Coast Software (who are arguably among the leaders in developing sophisticated imaging software). We wrote it so that a user of *PhotoMorph* (or of any morphing package) can learn how to create professional animations without spending months figuring out all the hot tips of the trade. Although there are a ton of tips about morphing here, this list is by no means exhaustive. In fact, we are always looking for new ideas and applications for *PhotoMorph* and we welcome your suggestions for future revisions of *PhotoMorph* and *Morphology*. Remember that in the world of computer animation, the only limitation is in the mind of the animator.

Throughout this document, we refer to the person who uses *PhotoMorph* as the **animator** and the result of the person's work, the **animation**. Realize that animations are not necessarily 'Walt Disney' style cartoons; but in the broader context of computer-generated imaging, animation can be generated from photographs, computer 3-D models, or simple doodles. As we use the term **clips** we refer to pieces of the animation and **images** are pictures that the animator used to create the morph. **AVI** files are animation files that *PhotoMorph* generates and **.PMP** files are *PhotoMorph Project* files that can be loaded and edited with *PhotoMorph*. The **resolution** of the .AVI file pertains to the size (i.e.: 100x200) of the animation in pixels. On most machines, the larger the resolution, the slower the playback.

Although the document is broken into a number of topics, there are tips that apply to all sorts of animations scattered throughout. Even the novice will benefit from reading the sections geared to the more serious user, and vice versa.

For those who want even more information about morphing, including the math involved, we recommend: *Morphing Magic* by Scott Anderson (1993, Sams Publishing, ISBN: 0-672-30320-5). Although *PhotoMorph* is not mentioned in the text, the ideas conveyed, coupled with the theory and history presented makes for a handy reference tool for those serious about (or addicted to) morphing.

B *Using How Pro's Morph*

This Write file contains links to various animations throughout. To play any animation, simply double-click on the picture; the animations shown will illustrate the ideas conveyed in the text. Realize that every animation referred to in this text

is contained in the \animations directory on the *Morphology 101* CD-ROM and most have their respective *PhotoMorph* .PMP files in the \projects directory. The best way to learn How the Pro's Morph is to analyze these .PMP files within *PhotoMorph*.

To find references to any topic in this document, use the Find option in Write. For example, to find any references to screen capture: under the Find menu in Write, choose Find..., type *screen capture*. Press OK and Write will find the first instance screen capture occurs. Keep clicking on OK to move on to the next reference. Don't forget that you can move the Find window out of your way, and that the F3 key repeats the last find. More documentation on Window's Write can be found in your Microsoft Windows Manual.

Finally, this document is designed so that it can be printed. Feel free to do so for your own reference, but kindly refrain from copying it or any part of it. And please refrain from pirating this or any software product. You can take it from us (as refugees from several companies whose fortunes have been adversely affected by pirating) it hurts real people. To print this document, choose Print from the File menu of Write.

II General Morphing

A Basic Techniques

1. *What makes a successful Morph?*

The word 'Morph' comes from 'Metamorphosis' which means to change radically. Thanks to software such as *PhotoMorph* by North Coast Software, everyday people can do the impossible and create images and animations that could never happen in the "real" world. Some of your morphs will be almost as miraculous as a caterpillar changing into a butterfly. The applications of this can be for business or pleasure; the only limitation is that of the creativity of the animator - the laws of physics do not apply here.

Unfortunately, this does not give the animator free reign to instantly morph two radically different images. Sometimes the total animation must be broken down into several clips. A discussion of this occurs later in this document. Right now we'll concern ourselves with basic morphing between somewhat similar images. Take a look at the following animation:



This animation is a simple morph between two like images. Notice how the tiger seamlessly changes into a lion. This makes it a successful morph; it almost looks like it could really happen. The best morphs make the viewer believe that something impossible really happened.

2. *Tips for Point Placement*

When creating a morph in *PhotoMorph*, the animator places a point on the starting image. A corresponding point appears on the ending image. The two points are "married"; in other words, they are connected together. When the animation is rendered, *PhotoMorph* drags the location of the first point to the location of the married partner. While this dragging occurs, the starting image fades out and the ending image fades in.

When creating a morph, the animator must carefully select each point. In the TIGER.AVI example shown above, points were placed on the eye, nose, ears and back of the respective felines. *PhotoMorph* users who can look at the .PMP file for this animation will note that there are a number of points used, especially on the eye, nose and ears. With *PhotoMorph*, hundreds of points can be used, and the generation time of the animation will not be significantly increased.

Note also that the animator can zoom in on the images, down to the pixel level, to aid in point placement. A good technique to follow is to place a few points on the animation on the important features. Then, after carefully analyzing the results, edit the points, adding more where needed. Zoom in on the image and ensure that if you are placing a point along an outline, that the point is right on the edge. This will reduce fuzzy imaging during the animation.

Places to put points:

- Along outside edges

- On obvious corresponding features

- Along lines that are common between the two images

Places to avoid placing points: (unless animator is seeking unusual results)

- In open areas

- Within 2 pixels of the edge of the entire image

- Such that the points cross each other

In general, the more points that are placed on the animation, the better the results.

Realize that the animator can place a point on the starting image, and not move it on the ending image. By anchoring a point in place, common to the two images, there will be no dragging of those points during the animation. This technique is super useful when morphing images that are substantially different in size or shape.

When analyzing the results of a morph, be sure to carefully scrutinize all parts of the animation. What is happening in the background? How about along the edges? Does each frame look like it could stand on its own? If each frame can stand on its own, you've created a successful morph.

3. *How to deal with unlike images*

Take a look at this animation:



Almost every image in this animation differs radically from the previous image, yet the viewer is left with a satisfying series of morphs. Maybe the pyramids were built by the Romans! Notice that although every image is different, there is some commonalty between the images. For example, even though the image of the Great Wall of China differs significantly from the Hollywood sign, a convincing morph is produced by marrying points on the two images so that "Hollywood" appears like graffiti on the wall. For another example, see the HOUSES.AVI animation where houses of all different shapes and sizes morph successfully by finding common references between the images.

B *Advanced Tips & Tricks*

1. *Creative Point Placement*

As discussed in the previous section, unlike images can be successfully morphed by finding a common bond between the two images. It has also been mentioned that successful morphing relies upon proper point placement. There are a number of creative techniques that the animator can use so that the animation looks believable.

Anchoring

Points can be used so that stationary areas appear in the morph or warp. For example, look at this AVI file:



Notice how the person with the camera remains stationary while the sand dunes move around. The deficiency in this morph is that not enough anchor points were used, giving the cameraman a hunched back.

To create an anchor: Enter the Morph/Warp editor and place a point on the starting image where the feature in the image is to be anchored. Be sure not to move the point after its placement on either the starting or ending image. By placing a point without moving it, the point will remain stationary through the animation sequence.

Growing

There are times when pieces of an image simply fade into or fade out from the background. A more effective morph can be achieved by having the piece grow out of (or into) another part of the image. Look at the following example where the thermos morphs into the Coke can:



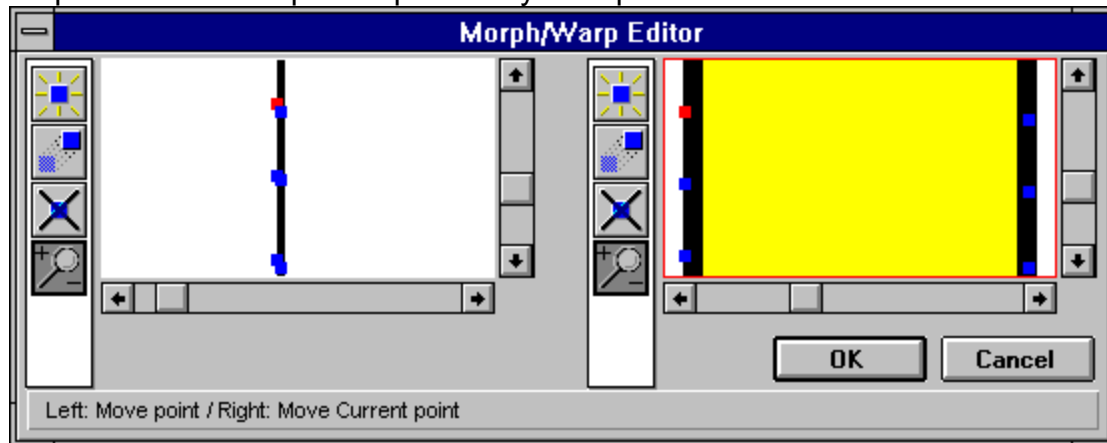
See how the straw disappears into the can. In this case, the animator placed points at the top of the straw then placed the married pairs of those points near the top of the can. Because *PhotoMorph* drags the points on the image from one to another, the whole straw gets dragged to the top of the can.

This technique can be combined with Anchoring so that other pieces of the image do not get dragged along. In the Coke example, the backgrounds are very similar and no odd problems appear in the morph. If, for example, there was something above the straw that the animator preferred not to be dragged, points could be anchored above the straw.

Expanding / Compressing

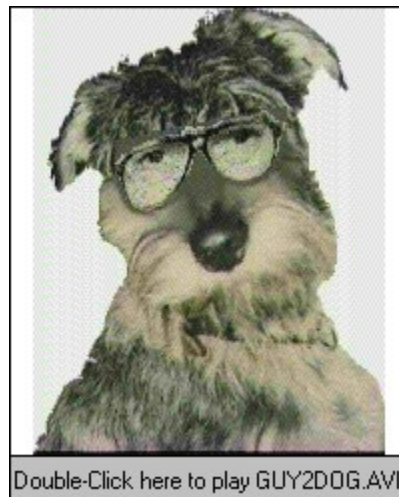
Suppose it was desired to morph a very tall and skinny object into a tall, wide object. Rather than placing points in the center of both objects, consider the effect of placing the points along the edges of both objects. The wide object would expand out from the skinny object. Of course this effect could be reversed to have

larger objects compress into smaller objects. The following screen shot from Photomorph shows an example of expanding. Because the skinny object is so thin, the points had to be placed practically on top of each other.



2. Transition Images

A transition image is an image that was created by some means to serve as a go-between in an animation. All advanced animation techniques use this concept. Examine this AVI file:



Notice how the person morphs into the dog with eyeglasses then into the complete dog. The image of the dog wearing the eyeglasses is a transition image. Generally, transition images are used in conjunction with other special effects; in this example, Cutting and Pasting. Outstanding animations can be achieved through the combination of transition images and other techniques.

Transition images can be created within *PhotoMorph* through the use of the preview button. Suppose the desired animation was to consist of an image warping to a second image, then a morph from the second image to a third image. To

accomplish this effect, a transition image is needed. First, create the warp. Second, use the preview button to preview the warp and save the warp as a new file. Next, create a new clip in the storyboard with the transition image as the start image and the third image as the end image. Thus, the animation is created by using the preview button and the storyboard features of *PhotoMorph*. A complete morphing project, including detailed transition images and use of the storyboard, is discussed in *Liquid Metal Morphing*, below.

3. *Using Screen Capture*

The screen capture utility within *PhotoMorph* allows the animator to use any image that can be displayed on the screen as an image suitable for morphing. Some applications of this might include morphing a screen shot from the word processor or spreadsheet of your choice. Maybe there's an image in an .AVI file would be perfect in the animation. The possibilities are outstanding.

Some Screen Shot Tips:

Run DOS applications in a Window if a screen shot of a DOS screen is necessary.

Note that the capture utility allows the user to capture the active window, the entire screen, or a user defined area.

When capturing a window, the whole window can be captured, or only the image within the window.

The image can be captured to the Windows Clipboard, to a *PhotoMorph* window, or to a file.

By selecting the appropriate options, a series of images can be captured with sequential filenames.

Suppose there is an image in an .AVI file that you wish to grab an image from for use in *PhotoMorph*. First, load *PhotoMorph* and choose the desired options under the Capture menu. In this case, choose Active Window, then from Set Options, choose To Window so that the captured image shows up in *PhotoMorph*, rather than the clipboard or in a file; and choose Capture Contents, so that just the image is captured, not including the window around the image. Next, minimize *PhotoMorph* and open the AVI file in *Media Player*. Using the *Media Player's* controls, set the frame of the AVI file to the image that you wish to capture. Click on the image's window and press F11; this will create the image in *PhotoMorph*. Close *Media Player* and maximize *PhotoMorph*. The image you captured will be in a new window for your editing and morphing pleasure.

If you have *PhotoMorph Lite* (which is included free on *Morphology 101*), you can still do a "Poor Man's Screen Capture" by: Putting the image you wish to capture on the screen; Pressing **Print Screen** on your keyboard; Entering

PhotoMorph; Choosing New Image under File; and choosing Paste under Edit.
This will reproduce the screen in *PhotoMorph*.

4. *Use of Framing*

PhotoMorph has a built in feature that allows the user to place a colored frame or border around an image. The Frame / Caption menu item under the Image menu can not only place captions or titles on images, but will also allow the addition of a border from one to four sides of the object in any color or thickness.

This feature is useful when morphing an image that hugs the edge of the screen. Refer back to MONUMNT2.AVI in the above section on *How to deal with unlike images*, looking closely at the image of the second pagoda. There is a frame along the right hand side that is two pixels wide. A point needs to be placed on the upper right hand corner of the roof to produce an effective morph. Unfortunately, there is no such position on this image, and placing the point against the edge of the image will result in the unwanted side dragging effect, discussed later. By creating this border on the edge, the point can be placed on the edge of the original image, and no side dragging will occur. This technique was also used to correct the starting and ending image in the HOUSES.AVI animation (found below under *Practical Applications*).

5. *Choosing a Compression Algorithm & File Format*

The third button over from the right in the *PhotoMorph* Project Editor opens up the Animation Parameters screen. On this screen, the compression algorithm and file format can be selected. The compression algorithms include Indeo, Cinepak and none. Each has its own advantages and disadvantages and one is not best for all. Experiment with each algorithm on a given animation.

Some general tips:

Indeo 3 will not work with large resolution (i.e.: 640x480) images, choose Cinepak.

Both Indeo 3 and Cinepak blur some types of images; experiment with each to see which yields the best result on a particular animation. If the results are unacceptable, try using no compression or the .FLC file format.

Although animations that have no compression may look better, playback will be slower as hard disk access will be significantly increased. See TRANSFMR.AVI (found below under *Liquid Metal*

Morphing) for an example of a non-compressed .AVI file.

Because .FLC files contain no sound synchronization information, playback of these files is more reliable than .AVI files. Note that the Windows Media Player will play .FLC files whereas the .AVI player built into *PhotoMorph* will not. There is a

public domain program, ANIPLAY that will play .FLC files in DOS quickly, and at full screen. For full screen display of silent animations, consider the .FLC file format. ANIPLAY is included on the *Morphology 101* CD-ROM.

Also in the Animation Parameters screen, there is an option to change the quality settings of the rendering. Note that as quality is increased, rendering time is likewise increased. However, the difference in output is significant. In general, use low quality when beginning to render the animation. Once the animation is finalized and the bugs have been ironed out, change the setting to high. Note also that some compression algorithm's setups include quality settings as well; ensure that these settings are always on high.

6. *Choosing the Resolution*

The biggest problem with existing hardware and software is the inability to play back synchronized audio and video at a decent rate and size. Look at MASKS.AVI in the \fullscr directory. The resolution is 320x200, and the audio will not stay in sync with the sound, even with the best of hardware. It is imperative that the animator take into account the limitations of the technology. Thankfully, most multimedia applications do not require full screen video - quarter screen is more than adequate. *PhotoMorph's* High Quality Scaling, and Cropping features are particularly useful for reducing large images down to reasonable sizes.

III Common Morphing Problems

A Removing Spider-Webs

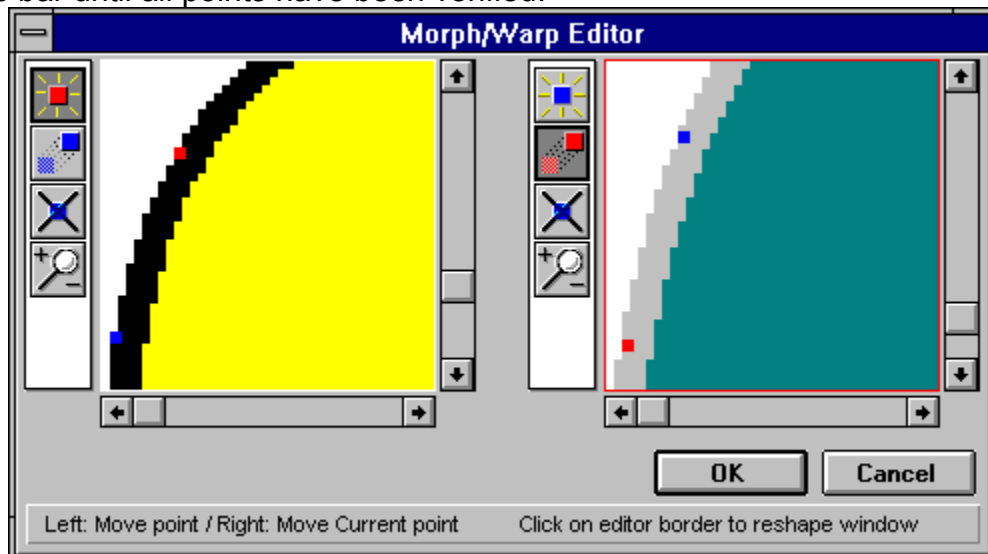
Spider webbing is the most common problem that animators encounter when morphing images. These webs show up as lines or wrinkles in the animation that may flash once or many times during the animation. Fortunately this common problem is corrected easily.

To correct Spider-Webs:

- Ensure there is no point crossing
- Increase the Quality setting
- Increase the number of points

An example of point crossing: a point on the left side of the start image is married to a point on the right side of the end image and a point on the right side of the start image is married to a point on the left side of the end image. Unless this crossing effect is desired, it should be avoided. For an example where point crossing is effective, see the DANCER.AVI animation.

Here is a trick using the *PhotoMorph* editor to determine whether point crossing is occurring unintentionally: Enter the Morph/Warp editor and notice the currently selected point in red. Ensure that the points are in their proper respective places and then press the space bar. This will select (and make red) the next set of married points. Ensure that these points are properly set. Continue pressing the space bar until all points have been verified.



The previous illustration, a screen shot from *PhotoMorph*, has point crossing. Recall that the currently selected married pair is in red, the other is in blue. See how the points cross each other; they don't match up properly. Ensure that this does not

happen in your animation by tapping the space bar and carefully inspecting each married pair.

Access the quality settings for animation generation through the Animation Parameters section of the Project Editor of *PhotoMorph*. Click on the third button from the left, the one with the camera with the arrows coming out of it, to open up this area of the Project Editor. Note that the settings buttons may also include quality parameters. Ensure that all are set at highest quality before rendering the final .AVI file.

Sometimes the best way to eliminate spider-webs is to add more points to the images. Ensure that enough points are placed in the area where the spider web occurs and along the outlines of the objects within the images. Don't worry about adding too many points; the generation time of the animation in *PhotoMorph* will not significantly increase. When all else fails, delete all the points in the area of the spider-web and replace the points, ensuring that each is placed carefully and accurately. Use the Preview button to preview to the frame or frames where the spider-web occurs. Notice the change as each point is added after the window is updated. If the spider-web goes away from the preview, it will disappear from the .AVI file as well.

B *Ghosting*

Ghosting occurs when *PhotoMorph* does not have a piece of an image to drag into an area. It appears as if a section of the image has been duplicated and then fades out. Take a look at these animations:



Both suffer from Ghosting. Durring the second half of MONSTER.AVI , the animation appears fuzzy along the edges, then the extra fades away. In WMN2DOG.AVI the head of the woman appears to split into two parts: one morphs into the head of the dog, the other fades away into the background.

To correct Ghosting:

- Increase the Quality setting

- Increase the number of points

- Ensure that there is something to drag over the ghosted section of the image

The first two corrective measures are discussed above in Removing Spider-Webs and no further elaboration is needed. These techniques would correct the ghosting that occurs in MONSTER.AVI. The third corrective measure, described below, would correct the ghosting occurring in WMN2DOG.AVI.

To best explain how to correct ghosting, it is important to know how the morphing algorithm basically works. Morphing starts as a fade between two images; in fact, if no points are placed in a Morph, the animation would simply fade from the start image to the end image. The points placed on the starting and ending images are used as references during the fade. As the fade occurs, the first point on the start image is dragged to the first point on the end image; the second point on the start image is dragged to the second point on the end image; and so on. If there is nothing to drag into a given area, a fade occurs.

In WMN2DOG.AVI there is nothing to drag to occupy the space where the woman's head occupies in the starting image. To correct this, in this case, place one or more points in the upper right hand corner of the start image. Marry those points to the area just to the right of the dog's ear. This gives the morphing algorithm something to place in the area occupied by the woman's head and the ghost image of the head will disappear.

C Side Dragging

Side dragging is a variation on ghosting where *PhotoMorph* drags in the edges of the image during the morph. Pay attention as to what happens on the bottom of this animation:



Notice how the black comes up from the bottom. GRL2TRLL.AVI (in the \fullscr directory) also exhibits this problem along its sides.

The problem is caused by placing points too close to the edge of the image. Best results are achieved by ensuring that points are two or more pixels away from the edge of the screen. Use the Zoom In/Out button in the Morph/Warp Editor to examine the location of each point.

Often times, the animator will want to place points along the edges of the image. A good trick is to use the Frame feature of *PhotoMorph* to add a two pixel wide edge on the side of the image where the point needs to be placed. Note that a border can be any color, and finding an unobtrusive border is possible for almost any given image. Once the border is in place, the point can be placed properly and side dragging will not occur. Other examples of this technique are described above in the *Advanced Tips and Tricks* section under *Use of Framing*.

IV Special Effects

A Transition Effects

PhotoMorph comes equipped with ten Transition Effects that can be used in various ways to enhance the animation. Some Transition Effects are to be used with just one image, others require both a start and an end image. The effects that require only a starting image apply only to a single image. Those that require a start and end image are used as transitions between the two images.

The effects that use only a starting image are:

- Duplicate Start
- Fade From Black
- Fade To Black

The effects that use both starting and ending images are:

- Curtain Close
- Curtain Open
- Fade To Image
- Slide Down
- Slide Left
- Slide Right
- Slide Up

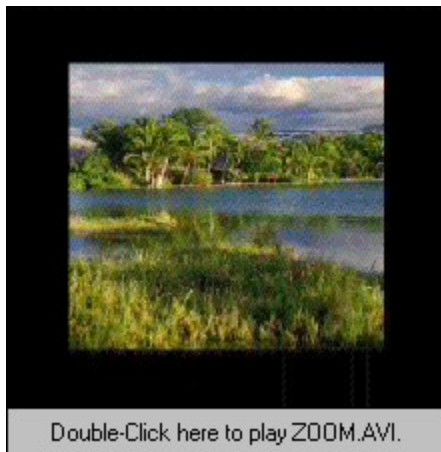
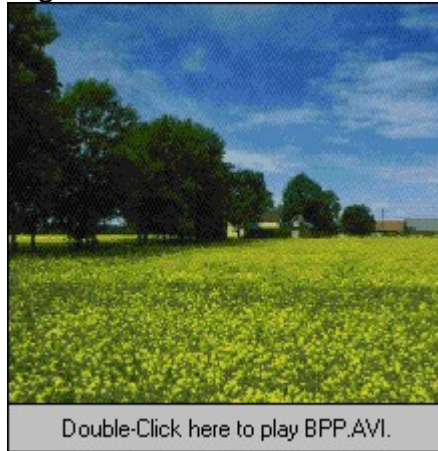
Some animations that use various Transition Effects:



Demonstrates:

- Fade From Black
- Fade To Image
- Duplicate Start
- Fade To Black

Demonstrates:
Fade To Image



Demonstrates:
Curtain Open
Slide Down

Demonstrates:
Slide Left
Curtain Open

Fade To Black



Each Transition Effect is detailed below:

Duplicate Start -

This is used for creating pauses in the animation. The duration of the pause is specified by the number of frames in the Project Editor.

Fade to/from Black -

Fades the starting image to or from a black screen. An end image has no effect on the transition. See IMAGEMOD.AVI for an example.

Curtain Close/Open -

Curtain Open splits the starting image and slides it to the sides to reveal the ending image. Curtain close does the inverse. Use a black image to create interesting opening or closing effects, such as in MONUMNT2.AVI (which appears previously in this document).

Fade to Image -

Fade to Image fades from the start to the end image. This is particularly useful when creating animations using variations on the same image, such as in BPP.AVI.

Slide Down/Left/Right/Up -

These effects slide the start image away, bringing in the end image. A marquee display can be created with a line of text and a Slide Left transition effect. Sliding to or from a black image creates an interesting start or end clip, such as in the ending clip of ZOOM.AVI. Notice how the slide left is used to swim in the shark in SHARK2.AVI.

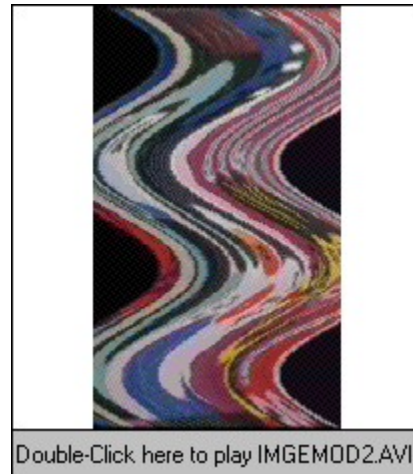
B *Distortion Effects*

18 Distortion Effects are available to the *PhotoMorph* user. These effects can be used on their own to distort images, or used to create transitions between two images. Really nifty results can be achieved by combining two or more Distortion Effects. Look at this animation that illustrates each of the eighteen distortion effects on a basic checkerboard grid:



Each clip clearly illustrates one effect. Remember that every Distortion Effect can be played forwards or in reverse. These have all be played forwards; in reverse the image would start distorted, then animate back into the undistorted, original image.

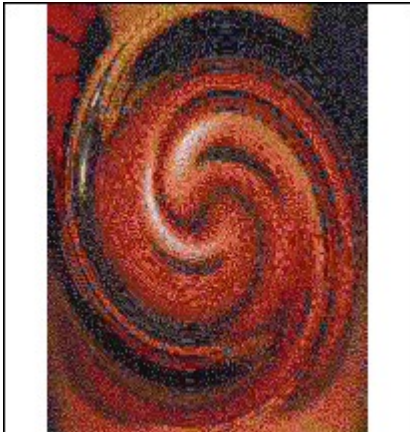
Each effect can be used to transition from image to image. Watch this animation:



This animation starts with a reverse Wave Distortion Effect, illustrating the concept discussed above - reverse effects. The animation continues with a Spherize Distortion Effect; a normal distortion technique. The image that is faded to was created by using a combination of techniques; see Image Modification, below, to see how this image was created. The three Spherizes that follow were created by using the same image as the start and end image. *PhotoMorph* spherizes the image in forward, then reverse to give the illusion of a bucking horse.

The next transition in IMGEMOD2.AVI was done using the Zig Zag Distortion Effect with both a start and end image. These sorts of transitions are incredible to watch, yet are simple to accomplish. Tweaking of the Source, Merge, and Destination percentages may be required. Consider starting with initial settings of 33%, 34%, and 33%, then adjusting each figure as needed, noting that the sum of the three values must equal 100%. The animation closes with a normal Wave Distortion Effect.

The following animations illustrate other various Distortion possibilities. For a demonstration of the Zoom In and reversed Zoom Out Distortion Effects, see ZOOM.AVI in the above *Transition Effects* section.



Double-Click here to play BUG2WMN.AVI.

Illustrates:

Swirl (Reverse)
Stretch Width

Illustrates:

Lens
Wave



Double-Click here to play FIELDS.AVI.



Double-Click here to play PIXEL.AVI.

Illustrates:

Zig Zag

The Distortion Effect clip series in STILLIFE.AVI is worth noting (shown below in the *Still Life* section). The series starts with a Swirl. A transition image was created to Zoom In upon by previewing the Swirl and saving the image. The Zoom In gives way to another transition image; this one created by previewing a Spherized image. In the third clip of the series, the original image is animated by running the Spherize Distortion Effect in reverse. *PhotoMorph* users may want to examine this .PMP file found in the /projects directory.

C Cutting & Pasting

The technique of Cutting & Pasting is very useful in creating transition images. For example look at the following animation:



The animator used some sort of image editing software to cut two faces from other files and paste them onto the woman's body. Every user of Microsoft Windows has a copy of *Paintbrush*, a simple graphics editor that allows the user to cut pieces of an image and paste it onto another. With some time and practice, good results can be achieved by using *Paintbrush* to edit images. Of course, this process is easier with more sophisticated software. For further information about *Paintbrush*, consult your Microsoft Windows manual.

Two *Paintbrush* tips:

Remember that more than one copy of *Paintbrush* can be run at one time; facilitating modification (such as cutting and pasting) from one image to the next.

Although the Zoom In feature of *Paintbrush* has no middle setting to make cutting and pasting easier, users whose monitors support various resolutions (i.e.: 1024x768) can reduce this setting to 640x480 in the Windows Setup so the images appear larger on the screen, making editing easier.

D *Image Modification*

Image Modification is a generic grouping of some of the other techniques that animators can use and combine in *PhotoMorph*. Some of the ideas provided here require the use of other software, such as *Paintbrush* and *Conversion Artist 2.0*. Other image editing software may have comparable features.

1. *Techniques using PhotoMorph alone*

Warping

Warping allows the animator to change the appearance of any given image in such a way that areas of the image are dragged to other areas of the image. In the *Ghosting* section above, the basic Morphing algorithm was explained. Warping is the same as morphing except no fading to another image occurs. When Warping in *PhotoMorph*, two copies of the image appear in the editor. Placing points on the first image causes married points to appear on the second. By altering the position the married points on a single image, the animator can create the illusion of motion or entirely new images.

Percent Morphing

By previewing the morph (or any *PhotoMorph* operation), the animator can create a new image. This image can be saved and reprocessed in *PhotoMorph*. This is useful for combining two (or more) images, then doing something interesting with the combined image. See *IMAGEMOD.AVI* (shown above in *Transition Effects*) and *IMGEMOD2.AVI* (shown above in *Distortion Effects*) for examples of image combination.

Cutting & Pasting with Percent Morphing

Of course this concept of Percent Morphing can be combined with the Cutting and Pasting Technique described above. In *IMAGEMOD.AVI*, this was done to the temple / parachute image. The grass below the temple was erased using *Paintbrush*, then this edited image was combined using a Percent Morph preview with the parachute. The same was done with the background behind the horse in *IMGEMOD2.AVI*, but the space was filled with purple, rather than left white. These are just two examples of results possible by combining various techniques. Recall that morphing itself is the combination of warping and cross-fading. There are many new and useful combinations waiting to be discovered.

Image Menu Options

The image menu of *PhotoMorph* gives the animator additional image modification tools. Invert Image produces a "negative" of the original image. Flip Image turns the image upside down whereas Mirror Image turns the image from Left to Right. Crop and Scale allow the images to be re-sized in various ways. Rotate turns the image by degrees. The usefulness of Frame / Caption where borders and text can be added to the image was described in the *Advanced Tips & Tricks* section under *Use of Framing*. The Tile feature takes the image and multiplies it upon itself, as in SHARK2.AVI where Tiling was combined with Scaling. Finally, the Mask tool allows the animator to place one of 17 masks on top of the image, so that the image shows through (or around) the mask.

2. *Techniques using PhotoMorph with Paintbrush*

Cutting & Pasting

The technique of Cutting & Pasting using *Paintbrush* is discussed in two other sections of this document: *Cutting & Pasting*, above, and below in *Liquid Metal Morphing*. Both sections are worth reviewing.

Filling / Erasing areas

This technique was touched upon in the above section of *Cutting & Pasting* with *Percent Morphing*. Recall that *Paintbrush* allows the user to draw upon or erase any part of an image. The animator can erase sections of an image, or fill areas in with a few clicks of the mouse. Another application of this idea is discussed in the *Liquid Metal Morphing* section, below.

3. *Techniques using PhotoMorph with other software*

Please Note: The features of *Conversion Artist* that are described below have been included in the *PhotoMorph* patch on *Morphology 101*. To add these new features to an existing copy of *PhotoMorph*, run the patch included on *Morphology 101* CD-ROM.

Filters of Conversion Artist

North Coast Software's *Conversion Artist 2.0* is one of many image editors for the PC. Many .AVI files included on *Morphology 101* use images that have been modified using the Filters menu of this program. This menu contains the following filters: Sharpen, Sharpen Edges, Despeckle, Emboss, Blur, Median, Trace Edges, Noise, Maximum, and Minimum. Other image editors may have similar filters suitable for use with *PhotoMorph*. See the section on *Liquid Metal Morphing* for an example of a technique combining the Emboss filter with *Cutting & Pasting*.

Contrast / Brightness & Hue / Saturation

Two other features of *Conversion Artist 2.0* include Contrast / Brightness and

Hue / Saturation controls. These tools allow the animator to change the coloring of the image. Both IMAGEMOD.AVI and IMGEMOD2.AVI include images where the coloring has been altered with these filters. A neat effect, used in IMAGEMOD.AVI is to adjust the coloring of an Inverted image, then do a Percent Morph of this image with another. This was done to create the "plankton under the sea" image in IMAGEMOD.AVI. The two images used are the flowers and the beach. The beach was inverted, then the flowers were Percent Morphed on top of the inverted sea. The resulting image was color corrected using the Contrast / Brightness and Hue / Saturation controls of *Conversion Artist 2.0*.

E *Still Life*

Through the combination of *PhotoMorph*'s Warping capabilities, its effects, and the use of techniques discussed above, an animator can bring life to a still image. Watch this animation; concentrate first on the second half of the animation where the mouth of the stone statue closes.



Note that the anchoring technique, the concept of transition images, the use of the Duplicate Start Transition Filter and the Warping capabilities of *PhotoMorph* are all combined in this section of the animation.

To accomplish the Warp on the statue in STILLIFE.AVI, points were placed around the edges of the statue's open mouth; the married points were placed in the middle of the mouth. When *PhotoMorph* generated the animation, the top and bottom of the mouth were dragged towards each other, yielding the mouth-closing effect. The 'breathing' effect of the statue, as well as the effects on the lobster were generated in exactly the same way. In general: place points along the edge of the section of the image where the motion is to occur, place the married points in the section of the image where the motion is to end, and place anchor points as needed.

Note that sometimes it is better to morph, rather than warp, from a warped image back to the original. This was done on the lobster, where the claw changes back to the original shape and on the statue, when it breathes. No matter which technique is used, careful point placement is crucial to create the illusion of motion

with still images.

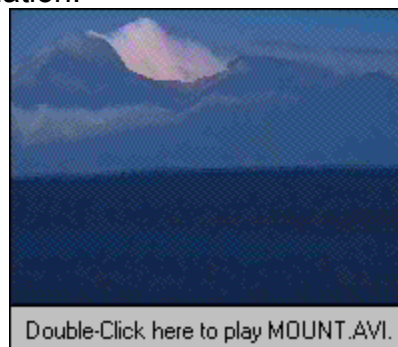
Another technique to still life is to use the Spherize Distortion Effect. Moderate use of this effect on some images can yield good results. Besides having an outstanding series of warps on the end of this animation, the animator used Spherize to intensify the close up of the lizard's eye:



Some other animations on this CD-ROM that use the Warping techniques described above are: DANCER.AVI, DUNES.AVI, FISHLIFE.AVI, MICE.AVI, and MONUMNT1.AVI.

F *Warp / Fade Combinations*

An interesting trick is to combine Warping and Fading. Look for this technique during the following animation:



Notice the clip where the mountain Warps into a completely different shape, then fades into the next mountain. This was done by warping the outline of the first mountain onto the outline of the second. In *PhotoMorph*, it is possible to chose an 'end image' for warping. The end image is not shown in the animation, but can be used by the animator as a reference for point placement.

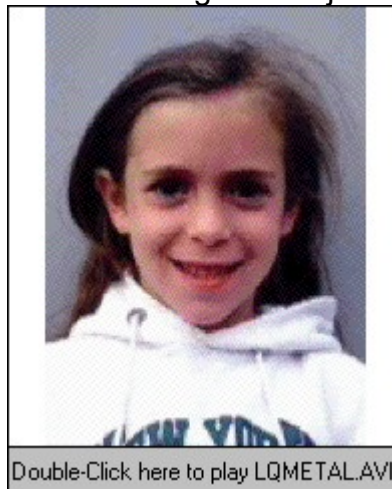
In this case, the second mountain was used as a guide for point placement. Preview was used to generate the transition image, and in the next clip, the

warped, transition image fades to the second mountain, creating a two step morph.

G *Liquid Metal Morphing*

Creating a liquid metal morph using *PhotoMorph* is a multi-step process that requires time and patience to generate astounding animations. As with any large animation, the project must be subdivided into smaller transitions. It is necessary to think of the entire animation in this manner as there is no "Liquid Metal Morph" filter in *PhotoMorph*. A typical subdivision process consists of determining the start and end images, visualizing the images needed for the morph to take place, generating those intermediate images and determining any resting points or pauses in the animation.

The first step of this process, determining the start and end images, is fairly straightforward. The animator must consider whether the entire object of the morph will turn to liquid metal, or only a portion. In the example, LQMETAL.AVI, only the skin turns to metal, the hair and clothing are subject to a normal morph.



Next, the animator must determine the intermediate images needed to create a convincing morph. Generally, the following images will be needed: a liquid metal version of the original image, a transition liquid metal image, and a liquid metal version of the final image. This is the case with the example animation; there are three intermediate images: a liquid metal version of the little girl, a transition image that consists of portions of both images, and a liquid metal version of the older woman.

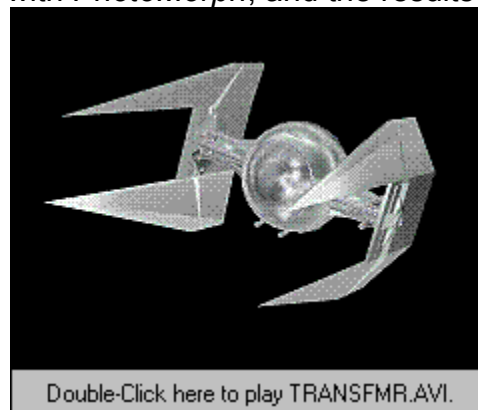
The intermediate images can be created in a number of ways. Owners of sophisticated image editing software may find this to be a trivial task, but the rest of us have limited options. Luckily, Windows 3.1 comes with the *Paintbrush* accessory, a simple graphics editor that can be used to modify images. A simplistic approach to generating the liquid metal version of the start and end image would involve loading the image into *Paintbrush*, tracing the important features in dark

gray, and filling the other sections of the image in varying shades of gray. However, the results from this exercise may be less than convincing.

An alternate method for creating a liquid metal image would require taking the original image into *PhotoMorph*, changing the image colors to grayscale, and cutting and pasting the metal portion of the image on top of the original background. See the above section on *Cutting & Pasting* for some tips. Combine this with the *Percent Morph* and *Contrast / Brightness & Hue / Saturation* techniques described under *Image Modification*, and better results are available.

In the example, the liquid metal images were created using an Emboss filter. Although the release version of *PhotoMorph 1.2* does not include this filter, it is included as a special bonus in the *PhotoMorph* patch on *Morphology 101*. This, as well as the other filters, will be added in forthcoming releases of *PhotoMorph*. After Embossing a grayscale version of the original image, the cut and paste feature of *Paintbrush* was used to create the liquid metal version of the start and end images.

If the animator has access to sophisticated rendering or 3-D Modeling software, excellent results are possible. The following animation was generated combining such software with *PhotoMorph*, and the results are very professional:



Once the liquid metal versions are created, a composite image can be created, if desired. In the example, the older woman's metalized face was pasted on top of the girl's metalized body. The resulting image has an eerie sci-fi look to it that is sufficient for this animation. Alternatively, a composite image could be generated by morphing the two metalized images together, previewing the morph, and copying a 50% morph to another window or file. This technique of previewing a partial morph can also be used in conjunction with a *Paintbrush* edited image to create the liquid metal version of an image. Revisit the section on *Image Modification* for more ideas on generating metalized and composite images.

All metalized images can be improved upon in various ways. *Paintbrush* is

handy for editing on the pixel level to fix any rough spots created during the cut and paste. Experiment with the new Contrast / Brightness and Hue / Saturation controls to change the color tinting within the image. In the example, the yellow contrast and brightness were increased to give each metalized image a more metallic look. To offset the resulting glossy background, the blue contrast and brightness were increased as well. Caution should be used when changing color contrasts and hues because it is very easy to overdo the effect. Ensure that the images have been saved before tweaking them.

In the final step of the preparatory process, the animator determines the points in the animation where pauses should occur. A slight pause gives the viewer the opportunity to focus on the transition. In the example, a pause was inserted after the original image changes to its metalized form, and after the transition image changes to the metalized form of the final image.

Once the original image, the metalized version of the original image, the transition image(s), the metalized version of the final image, and the final image have been created and loaded back into *PhotoMorph*, the actual animation process can begin. A *PhotoMorph* animation can consist of one or more clips combined on the *PhotoMorph* Storyboard. The Storyboard button is located on the top of the Project Editor Window, the 5th button from the left which has two arrows converging onto a filmstrip. (See the Project Editor section of *PhotoMorph* manual for more information about the Storyboard.)

The complete animation can be laid out in the Storyboard. The example, LQMETAL.AVI, was done in the following manner:

- Clip 1: The starting image fading to the metalized starting image.
- Clip 2: A pause on the metalized starting image.
- Clip 3: A morph from the metalized starting image to the transition image.
- Clip 4: A morph from the transition image to the metalized final image.
- Clip 5: A pause on the metalized final image.
- Clip 6: The metalized final image fading to the final image.

The animator can create the complete animation using the same basic outline. The fade to images (Clips 1 & 6) are created using the Transition filter set to the Fade to Image option. Because the images have the same outline, only the colors change, the Fade to Image Transition saves animation and computation time. Pauses (Clips 2&5) are created by using the Duplicate Start Transition with no ending image. Finally, the morphs (Clips 3&4) are set up; starting with just the basic points as more detail will be added later.

When using the Storyboard, the animator should realize the importance of the New Clip button (fourth from the left, with the single arrow pointing to a filmstrip).

Once the first clip (in our example, Fading from the girl to the metalized version of the girl) has been created, clicking on the New Clip button creates a new clip where the metalized version of the original image is automatically inserted as the start image of the new clip. Clicking on the Storyboard button (described above) will show all clips, with the clip that is currently loaded in the Project Editor outlined in red and the selected clip outlined in blue. Double Clicking on any clip selects it and loads it into the the project editor. Note also that the new clip button preserves morph/warp points. This is useful when morphing from image A to B then from B to C, as done in the example with clips 3 and 4. The points set in the first clip on image B will be preserved when creating a new clip so that only the points on image C will need to be adjusted.

The complete animation can now be produced. To save time during the first renderings, keep the quality setting on the animation set to low. When the animation needs only final tweaking, change the quality setting(s) to high. To change the quality of the animation, click on the Animate Parameters button, the third button from the left. Click on the Compression and Output setup buttons to ensure each is set to the highest quality level, and change the overall animation quality to high. Trips to the coffee machine will be in order while rendering an animation with these settings, but the improvement in the final .AVI (or .FLC) file will be quite noticeable. See the above *Advanced Tips & Tricks* section for further discussion of these issues.

Once the basic animation has been rendered, it will be apparent where improvements will be necessary. Analyze each image for any flesh that may be showing through the metal. The Median filter, included in the *PhotoMorph* patch will help correct some rough edges created while cutting and pasting. Trips back to the *Paintbrush* editor and more experimenting with the color contrasts and hues may also be in order. Always be sure to have a backup copy of your images, just in case.

Each morph can be tweaked to perfection. Using the Preview Window (the seventh from the left, with the magnifying glass on it), the animator can set the morph on any rough spot during the animation, add points using the Morph/Warp editor, and then use the update button in the Preview Window to see the changes. This saves the time of having to render an animation repeatedly while trying to smooth out a rough spot in the morph. Solutions to common morphing problems such as ghosting, spider webs, and side dragging are discussed above. However, it should be repeated that adding points to a morph or warp does not significantly change the computation time required to render the animation.

The last step for the animator to consider is the timing of each clip in the animation. *PhotoMorph* allows the user to specify the number of frames each clip

should occupy. Note that the number of frames for the currently loaded clip are specified in the Project Editor Window, under the ending image. For example, if the pauses in the animation are too long, decrease the number of frames that the pause occupies. For more dramatic results, the speed of a morph can be decreased by increasing the number of frames that the morph occupies.

Although using *PhotoMorph* alone may not yield *Terminator 2* quality liquid metal transformations, the package is flexible enough to produce startlingly good results. Using specialized photo-editing software, the metal versions of the start and end images would appear more realistic, dramatically improving the quality of the animation. As with any animation project, the better the still images, the better the final product.

V Practical Applications

A Corporate Use

PhotoMorph, combined with other multimedia software packages, can be used to enhance business presentations, demonstrations, and interactive kiosks. Why not morph a series of products, such as in this animation:



Of course this concept can be taken to any industry. Eye-catching animated logos can be created. Skin care professionals can morph before and after shots of clients to show aging. Animal lovers can cross-breed various animals. Entirely new automobiles can be designed (Cross a Volvo with a VW?). A graphic artist can use morphing in pre-press graphic design for advertising, fine art, etc. Professional photographers can tweak their photographs - or distort them. Artists can use morphing and warping for caricatures and cartoons. With all the interactive CD-ROM games coming out, surely one can feature morphed animations. Even that custom tee-shirt maker in the mall can use *PhotoMorph* to graphically distort people for their tee-shirts. The possibilities are endless.

B Educational Use

Morphing can be used to illustrate various scientific theories. Morph a monkey into a man to show the Theory of Evolution. Human development, weather patterns and continental drift can all be animated through morphing. As software such as

PhotoMorph becomes available to anyone, educators can use animation to liven up classroom demonstrations.

C *Video Production*

As a special effect, morphing is hard to beat. Take a look at this animation:



When combined with video editing software, *PhotoMorph* can be used to create special effects for feature film and television production projects. Eye catching ads are easily created with *PhotoMorph*. In a digital video editing suite, *PhotoMorph* becomes an invaluable special effects device.

D *Personal Use*

It appears that many people enjoy morphing people into their pets. Of course, the whole family can be brought in on the fun to illustrate family heritage and resemblances, bringing boring slide shows to life. Remember that morphing is only one tool in the creative toolbox, the limits of its use is determined solely by the animator.