• SOUNDMORPH™ OWNER'S MANUAL

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Before we begin please let me state plainly and clearly that although the interface for SoundMorph™ is extremely simple, and actually creating a SoundMorph™ is a nearly automatic process, the processing that goes on within the program is extremely complex. This means a couple of things, 1) the program takes a long time to run, and 2) you may have to work to create the "perfect" morph. SoundMorph™ is a musical process, and you will have to think about what harmonic qualities or frequency components your sounds have in common. Remember - though you may have played a song your first day on guitar, you did not have it mastered by the next day. Be patient, and listen to the examples - they are proof that you too can achieve great results. Have fun!!

Table of contents

•• Section 1 Introduction

Thank you and congratulations on your purchase of SoundMorph™. SoundMorph™ represents an important leap in the application of computer power for anyone who wants to work with sound on their desktop.

Although SoundMorph™ produces professional quality output and goes through extremely complex calculations, it has been designed so that anyone can use it within minutes of installing it onto their hard disk..

SoundMorph™ allows you to create transitions between any two sounds through microscopic interpolation of their harmonic content. By carefully selecting morph regions and the setting of simple parameters you can create sound morphs that range from simple cross fades to ...

• Setting up

Hardware/software requirements

SoundMorph™ makes extensive use of your computer's resources, so to actually run it you need at least

A Macintosh II computer or above (except PowerPC), 660AV and 840AV Macs are the easiest
At least 2Mb of free RAM (preferably 4Mb)
System 7.0
Sound Manager 3.0 (for record and playback functions)
For 48 kilohertz sounds, at least 1 megabyte of free disk space for each second of morph (this is temporary storage and is released once SoundMorph™ finishes processing)

•Technical support

Although SoundMorph™ is very simple to use, it is still an extraordinarily complex program, so if you have any

problems, questions, suggestions, or bug reports, please call or fax tech support in the USA at1(212)727-3495.

•• Section 2 TUTORIAL

SoundMorph interpolates digitized audio from a source sound to a destination sound. Creating a morph is as simple as selecting a source and a destination, defining a morph region, setting a few simple parameters and executing the "morph" command.

In the following tutorial, you will select a few source and destination sounds and create morphs between them. Take care to complete each step to your own satisfaction before continuing to the next. When you're finished, you'll have a clear idea of how to use SoundMorph, and an inkling of its power.

1) Locate the SoundMorph file icon on your hard disk drive. Double-click on the icon to start the program.

2) The first step in creating a morph is to select a source sound. This sound provides the beginning of the morph.

From the "File" menu, select "Open Source Sound" (or type command-1). You will be presented with a file selection dialog box. Locate the file called "clarinet" and open it. As the sound loads, SoundMorph draws a graphic overview of the waveform; you can abort the loading procedure by clicking on the button marked "stop."

Once the sound has finished loading and the overview is complete, click on the play icon to hear the clarinet sound file.

3) Next select a destination sound, which provides the morph's end.

From the "File" menu, select "Open Destination Sound" (or

type command-2). Using the file selection dialog, locate and open the file called "trumpet."

Click on the play icon to listen to the trumpet sound file.

4) Having opened both a source and a destination, you must define morph regions, the region in each waveform in which the transition between source and destination will occur. That is, you must determine at what point in the source sound the morph is to begin, over how much time the morph is to take place, and what part of destination sound is to overlap the source.

This is a simple two-part procedure

a) First, click and drag on the source's waveform overview. Select a region the begins approximately 1/3 of the way through the waveform and ends approximately 2/3 of the way through. (The middle third of the waveform should be selected.)

b) When you release the mouse button, notice that a region has been selected automatically in the destination's waveform overview. (Its apparent size may vary with the length of the destination sound file, but it occupies exactly the same amount of time as the region you just selected in the source.)

Click on the destination waveform approximately 1/3 of the way through (don't drag); this becomes the region's new starting point.

5) Now you're ready to morph!

From the "Opers" menu, select "Morph" (or type

command-m). You will be presented with a file save dialog box, allowing you to name your morph and choose the folder into which it will be saved. SoundMorph provides a default name for the morph. Change it if you like and click on the button marked "save."

At this point, SoundMorph has a lot of number-crunching to do. (You might want to turn to another piece of gear,

say a signal processor, and set up a DSP effect for your morph when it arrives.) When SoundMorph is finished, you'll see a window named "Output" containing a waveform overview of the morph "clarinet->trumpet."

5) Before you click on the speaker icon to hear the morphed output, note that the morph you have created, "clarinet->trumpet," is the most basic of morphsa simple, though time-consuming, cross fade. This is nothing you couldn't do with any of a number of audio processing applications, and it does not begin to suggest the extent of SoundMorph's capabilities.

We created this morph only in order to illustrate how easy the program is to operate. To tap the true power of SoundMorph, you must adjust the morph settings. Take a look at them by selecting "Morph Settings" from the "Opers" menu (or by typing command-s); click "OK" to continue.

At this point, feel free to click on the play icon to listen to "clarinet->trumpet."

6) This time, we'll produce a more interesting result.

From the "Opers" menu, select "Morph Settings" (or type

command-s). The dialog that appears provides access to six parameters. Type the following values

Effect Multiplier16
Overall Scaling.8
Low Cutoff0
Hi Cutoff24000

(Leave the "Number of bands" and "Strict Matching" parameters in their default conditions. If you alter the Number of bands at this point, you'll need to reset the morph regions.)

Click "OK" to enter the new values.

7) From the "Opers" menu, select "Morph" (or type command-m) and click on "Save." Choose "Replace" to create a new morph with the name "clarinet-trumpet" and turn your attention for a few minutes, once again, toward some productive activity.

When your morph appears, give it a listen. Now you have an indication of what SoundMorph can really do.

Feel free to experiment by entering other Morph Settings (it's best not to play with the Number of bands this time around). Higher Effect Multiplier values make for more radical effects. Generally, the wider you set the bandwidth (that is, the larger the difference between the Low and Hi Cutoff values), the lower you should set the Overall Scaling to avoid unwanted distortion. For the moment, don't worry about the Number of Bands or Strict Matching parameters.

8) You have just created a morph using a pair of simple aural events. Now let's try two sources that are a bit more complex, a pair of rhythmic loops. We'll repeat the

procedure above, selecting different source and destination waveforms, setting morph regions more precisely, and using even more radical morph settings.

Open "loop 1" as your source, "loop 2" as the destination. You may want to listen to them if your system allows.

9) To select the morph region, click and drag across the source overview, beginning precisely before the fifth peak and continuing through the tail of the waveform. (If SoundMorph tells you, "Sorry, that would go past the end of the destination file," simply click in the left-hand side of the *destination* overview and continue.)

Listen to the selected source region to verify that it begins on a beat and continues for four beats. If not, try selecting the region again.

So that the morph effect takes place over the first four beats, click in the destination overview as far to the left as possible, along the left-hand edge. Listen to the selected destination region to verify that it begins on a beat and continues for four beats. If not, try clicking again along the left-hand edge of the destination overview to place the morph region there.

10) SoundMorph provides a quick way to determine whether you've set up the morph regions in the way you intend (rather than forcing you to wait several minutes while the morph is being computed). In the "Opers" menu, the "Preview" option creates a quick cross fade that can serve as a guide.

Select "Preview" now. (If your Mac is not equipped for audio, this function isn't available.) If the transition between the source and destination sounds is rhythmically awkward, try resetting the morph regions, and select

"Preview" again.

11) Once you're satisfied with the morph regions, enter the following morph settings

Effect Multiplier16
Overall Scaling.3
Low Cutoff100
Hi Cutoff1000

12) Execute the morph and listen to the result.

You now have a basic working knowledge of SoundMorph. Although you may not understand the precise function of every variable, you're ready to experiment with various sources and destinations, morph regions, and morph settings. Check the Reference chapter of this document for a precise description of a given function. With a little practice and imagination, you'll soon be creating extraordinary sounds impossible to produce by any other means.

Section 3 Reference

Notes

1. SoundMorph™ processes monophonic AIFF files on the Macintosh.
2. If you are recording sounds, sometimes you have to manually set the sample rate and resolution parameters before{ you start recording.
3. SoundMorph™ will run in the background, although with the "Number of bands" set to anything higher than 256 you may not wish to.
4. A single click in the Source or Destination displays will immediately move a selected region to start at the click point.
5. A drag in the Source display will resize the morph region.
6. A drag in the Destination display will move its start time.

Menus

File

Open Source
This will display a standard open file dialog showing any AIFF files you may have on your system. Once you select a file, SoundMorph™ will create an overview of the waveform and display it in the Source Overview.

Open Destination
This will display a standard open file dialog showing any AIFF files you may have on your system. Once you select a file,

SoundMorph™ will create an overview of the waveform and display it in the Destination Overview.
Close Source
This will close the Source sound.

Close Destination
This will close the Destination sound.

Quit
Quits SoundMorph™.

Opers

Morph
Starts the morphing process.

Morph Settings
Opens the Morph Settings Window.

Record
Opens the Record Window.

Preview
Will create a cross fade of the currently selected regions and play that back for you. Especially useful for checking timings.

WINDOWS

SoundMorph™

Play icon
If no region is selected, clicking on the Speaker icon will stop or start playback of the sound from the beginning. If a region is selected, clicking will either stop or start playback of the selected region.

Pause icon
Pauses or restarts playback of the sound.

Recorder*(See* **-** "*Record Settings*" *below)*

Record icon
Starts and stops recording of sound to disk. SoundMorph will record at any sample rate your Macintosh is capable. It also records in the background -

so be careful! SoundMorph™ won't record over anything on your hard disk, but if you don't stop recording it will fill it up!

Play icon
Clicking on the Speaker icon will stop or start playback of the sound just recorded.

Save button
Clicking here will stop recording of the current sound, save the file to disk, and open it into either the Source or Destination displays.

Sample Rates pop up menu
Shows the sample rates currently available on your Macintosh.

Resolution pop up menu
Shows the number of bits per sample your Macintosh can use (usually 8 or 16).

OK button
Closes the Record Settings window.

Morph Settings
OK - here we go!

I guess it's about time to explain how SoundMorph™ does what it does. I'll try to be as concise as possible without resorting to obscure theories on the math behind the process. I'm also going to assume that all of you know something about how sounds can contain harmonic and enharmonic (or "noise") components. SoundMorph™ does its thing by trying to separate those two components.

SoundMorph™ begins by taking a fast Fourier transform of the Source and Destination sounds. Once the analysis is done, SoundMorph™ looks at the results and tries to figure out which parts of the sounds are loudest in

relation to the other parts. It labels the loud parts as harmonic, and everything else as noise. This isn't always an accurate description, but for SoundMorph™'s purposes it has worked so far.

SoundMorph™ then begins a process of matching "harmonics" between the two sounds. Starting with the Source, it finds the first harmonic, then looks over in the Destination to find a corresponding harmonic there. It keeps looking until it finds the closest match. This process is repeated until either the Source or Destination has nothing left to match against.

After it has matched two harmonics, SoundMorph™ calculates what the volume and frequency of a new harmonic should be and sticks that in an output file.

Once SoundMorph™ has traversed all the available harmonics, it loads up the output file, and resynthesizes it by running it through a reverse Fourier transform.

In a nutshell that's all SoundMorph™ does. It creates new harmonics based on the old ones, which is why it can sound so radically different than a cross fade.

So with that in mind, let me now explain the Morph Settings Window!

Effect Multiplier
rangeAny *positive* number

This is quite likely the coolest setting in the entire program. Effect Multiplier takes all the new harmonics created by SoundMorph™ and boosts their volume against the background noise by this amount. Essentially, a disturbed harmonic enhancer.

Overall scaling
rangeAny number (generally between *zero* and *one*)

Overall Scaling multiplies the overall level of the morphed region. Usually the higher the Effect Multiplier factor, the lower you will want to set the Overall Scaling.

Low Cutoff
rangeAny *integer* between *zero* and *half the sample rate* of the current sound that is *lower* than the *high cut off.*

This determines the lowest frequency SoundMorph™ will begin searching for harmonic matches between the two sounds. Any components below this number will be cross faded only.

High Cutoff
rangeAny *integer* between *zero* and *half the sample rate* of the current sound that is *higher* than the *low cut off.*

This determines the highest frequency SoundMorph™ will begin searching for harmonic matches between the two sounds. Any components above this number will be cross faded only.

Number of bands pop up menu
This is the number of "frequency bins" SoundMorph™ will calculate during the analysis stages. You can think of it as the number of bands in an extremely fine graphic equalizer.

Strict Matching check box
This sets a flag inside of SoundMorph™ which alters the way it does its analysis. It also makes it harder for something to get labeled as a harmonic, and it lets SoundMorph™ look farther up and down the analysis files to find closer matches.
Presets pop up menu
Displays a list of preset names.

Presets store a full set of parameter values for a SoundMorph™ and just in case you come across the world's most amazing morph setting - you can save your own. Or delete them.

Presets are saved in a file on your hard disk called "SoundMorph™ Presets" You can make copies of this file to either create libraries of presets, or to start a new preset list from scratch.

•• Section 4 Final tips and notes

1) Creating a convincing Sound Morph™ is a delicate process. Just as in visual morphs where you have to carefully select your areas on the screen, in SoundMorph™ you should select your regions and set your parameters carefully. SoundMorph™ is an extremely complex process, and results can vary dramatically depending on the harmonic complexity of your sounds, and how (or if) your sounds are related to each other.

2) For me, the most useful parameters have been the frequency limiters. Limiting morph regions to the 1KHz to 10KHz sounds best. The other parameter that I prefer to play with is the “Effect Multiplier” setting. I generally start at a setting of 9 or 10 for 16 bit sounds. Keep in mind that as you set the Effect Multiplier higher, you will need to lower the Overall Scaling parameter to keep from clipping.

3) To morph speaking voices, you must pay extremely close attention to your timings, frequency limiters, and Effect Multiplier factors - voices are very, very hard to do! For example, I have set the Effect Multiplier factor as high as 100 to process speaking voices. Again, when you do go that high, you have to bring the volume down, otherwise your sounds will clip. Not very pretty.

4) Again, SoundMorph™ was written to morph sounds. It is not an audio editor or recorder, there are many other programs that do that much better, but none of them can do a morph! Therefore, it is recommended that you use one of the other programs to do your recording, trimming, and normalizing of your sounds, then save them as mono AIFF files which can then be opened by SoundMorph™. This way you get the best of both worlds.

5) **PRESET IDEAS**

Single notes on solo instruments or solo singers

For smooth transitions
Effect Multiplier = 9,
Overall Scaling = .8,
Low frequency = 200,
High frequency = 2500
Number of bands = 1024

For bizarre transitions
Effect Multiplier = 9,
Overall Scaling = .8,

Low frequency = 0,

High frequency = 1/2 sample rate

Number of bands = 1024

Broadband material (orchestra, rock bands, etc)

For smooth transitions
Effect Multiplier = 9,
Overall Scaling = .8,
Low frequency = 200,
High frequency = 2500
Number of bands = 1024

For bizarre transitions
Effect Multiplier = 36,
Overall Scaling = .4,
Low frequency = 0,
High frequency = 1/2 sample rate
Number of bands = 1024

Single notes on solo instruments

For smooth transitions
Effect Multiplier = 9,
Overall Scaling = .8,

Low frequency = 200,
High frequency = 2500
Number of bands = 1024

For bizarre transitions
Effect Multiplier = 9,
Overall Scaling = .8,
Low frequency = 0,
High frequency = 1/2 sample rate
Number of bands = 1024

Speaking voices (male -> female)

For smooth transitions
unknown

For bizarre transitions
Effect Multiplier = 100,
Overall Scaling = .2,
Low frequency = 100,
High frequency = 2500
Number of bands = 1024
(You may have to play with the volume setting to avoid distortion.)

I think that should cover everything.

SoundMorph™ does indeed have a future and I'm planning on implementing a bunch of new stuff. Things like

PowerMac native is definitely on the way.

If you have any suggestions as to things you'd like to see, or if anything is unclear in this manual, please send e-mail to *masseyl@panix.com* and I'll be glad to see what can be done.

THANK YOU, THANK YOU, THANK YOU, THANK YOU!!!!!

Credits

SoundMorph™ was conceived, designed, and written by Lance Massey using Prograph CPX and Think C.

Package art by Karen von Oppen.

The Tutorial section of the manual was written by Ted Greenwald.

Known bugs

There are several known redraw bugs. Each is being killed as it is discovered.

Super Boomerang 5.0 is incompatible.

There are intermittent problems with older versions of Digidesign audio cards and software.

Thanks to

Martene @ Bonzai Productions for being the first person to have faith enough to buy SoundMorph™.

RK Productions for letting me use their space as a laboratory and second home.

All my friends for supporting the depth of my obsession in giving birth to SoundMorph™.

and

Lucia, for holding me up when I needed it most.