

Thus, some software programs now offer a second method, a scripted approach, for creating lip sync and facial animation. With this method, also known as shape blending, animators can combine a few shapes in varying percentages. They might, for example, blend 10% of a mouth-open target with 40% of a grimace target, or 50% of the same mouth-open target with 10% of a smile target. "It takes longer to adjust each shape

curve independently," Schafer says, "but the animation has a less mechanical feel to it."

This technique, which could as easily be used for a bicep or a bouncing belly as a smiling mouth, is called Shape Shifter in Alias/Wavefront's PowerAnimator. It is also the basis for three software programs that plug into 3D animation packages: the aforementioned Morph Magic; Smirk from Lambsoft (Minneapolis, MN), which also plugs into 3D Studio Max; and Morph Gizmo which works with Newtek's (Topeka, KS) Lightwave software.

"Until now, you had to morph between heads," says Mark Jensen, software developer and product manager for Lambsoft's Smirk. "So people created mouth-open and mouth-closed Pacman-like characters because otherwise they would have to create hundreds of heads to handle 100 words. Now you can blend lots of little morph targets, or subexpressions, simultaneously, using various percentages. You don't just move from one to another."

With Smirk, you might start with a head you've modeled or one already done, make several copies, and from them, create subexpressions, explains Jensen. Ten subexpressions of your choice are visible at a time in the channel list in 3D Studio Max and can be blended to create one expression-perhaps a sly smile, a broad grin, or something in between.

Similarly, Morph Magic and Morph Gizmo blend between morph targets using varying percentages of each target. An animator selects percentages by moving a slider for each morph target.

This technique was used by Chris Landreth to create the Academy-Award-nominated animated film The End. Landreth used Alias/Wavefront's Shape Shifter tools in Power Animator. To make the characters appear realistic, he created a shape that would correspond to one and only one muscle, as he described in an article for CGW in December 1995. "At the lowest level," he says, "I'm mixing and matching muscle poses. At a higher level, I use global controls to move big sets of muscles."

A third way to create lip-sync animation is with motion capture devices that actually capture mocap the motion of an actor's face. For people doing performance animation, there is no other way. Mocap can also be helpful when animators need to do a lot of lip sync quickly.

One of the difficulties with lip sync created with mocap is that most facial animation systems capture in 2D, not 3D. "They don't get the movement of the lips going forward," says Schafer. Using software developed at Biomechanics (Atlanta, GA), for which Acclaim has exclusive rights in the entertainment industry, Acclaim's system is able to capture the third dimension, according to Schafer. We can capture 80 points in full 3D on a face," he says. In addition, they've added tools to Nichiman software at Acclaim to extend this capability. "Those 80 to 90 points can control other control points, so we would be able to control a face with 1000 to 2000 vertices on it," he explains.

Performance animation software companies such as Quantum Works (Pasadena, CA), SimGraphics (Pasadena, CA), and Protozoa (San Francisco, CA), develop other tricks for creating sophisticated lip sync in real-time. Quantum Works' Geppetto software, for example, allows animators to puppet a character using sliders and gesture recognition. As with the Acclaim system and other facial-animation systems, the actor's motion is captured by cameras videotaping reflective dots placed on the actor's face. Special software turns those dots into coordinates. With this method, the number of markers usually determines the level of quality, according to Steve Tice, founder of Quantum Works. However, with gesture recognition, the markers can activate muscles and phoneme targets on an model, thus allowing a lot of motion to be generated from a small amount of captured data.

But there are even more automatic methods of lip sync. One company working in this area is Haptec (Santa Cruz, CA) which is preparing its People Putty software for the market. Haptec's characters speak in three ways: Their voices are created either by a computer speech program as dialog is typed in, or by data captured with motion-capture equipment or from speech recognition programs.

"Even with perfect motion-capture data, unless you've put markers inside someone's mouth, you don't get the teeth and tongue," points out Chris Shaw, a Haptec founder, "and it requires extra equipment. With computer-generated speech and with speech recognition, you don't need extra equipment. Speech recognition shows promise, but it isn't actualized. So I'd put my money on computer-generated speech," he says. "You can add an emotive personality to computer generated speech." In fact, once you create a character with Haptec software, claims Shaw, the character will automatically speak and emote. "The character has a set of automatic emotional responses," he says, "with autonomous and reactive behavior. If you don't like the emotion, you can change it."

While software tools such as these might be embraced by nonanimators, animators are

for some projects but not when the characters are acting," says Kim Davidson, COO of Side Effects, and an animator himself.

Landreth agrees. "The phoneme-based stuff is good for blocking in animation, but it's really replacing a stage which is already pretty quick. For me, it's an absolutely frivolous thing," he says.

"I personally am not interested in more automation," says Rick May, a freelance animator currently working at Atomix (Hollywood). "I would like tools that assist instead."

One such tool, surprisingly missing from most 3D animation software, is an audio track. "I've just started using Softimage, and I can't have an audio file playing," May says. "In Prisms, I can hear audio as I scrub back and forth." A tool that he's found useful is Magpie, a shareware program, that can be found via his web site www.cinenet.net/user/rickmay. With Magpie, he can see the waveform for an audio file and as he scrubs through the file to find particular sounds, he can enter the frame numbers for those sounds along with a label for a mouth shape. May uses the resulting exposure sheet to determine where to put mouth shapes on a timeline in a 3D animation program.

Programs such as Magpie will become less important as software companies begin integrating audio tools. Softimage, for example, expects to add audio to its software soon after the release of Softimage 3D version 3.7. This will allow animators to cache an entire scene and do a real-time playback of an animation to sync sound and animation, according to Dan Kraus, 3D product manager. "You see a graph of what the sound looks like in terms of amplitude," he says. "This is just an interim solution until we have the correct facial animation and sound in Sumatra." Sumatra is scheduled for release this winter.

Audio is available now with Alias but only in the form of a plug-in called Sound Sync. With Maya, expected to be available this winter, the sound will be integrated. Already Chris Landreth is using and testing that capability as he creates his latest animation, titled Bingo. Bingo, an animation based on a 4 1/2-minute long play, is a story about bad clowns, according to Landreth. "It's about what happens if you tell a lie long enough and loud enough that it becomes truth," he says. Because the sound is integrated within Maya, Landreth can take a pose and drag and drop it onto the timeline and lay down a keyframe. "I can scrub back and forth, lay down keyframes, move back and forth, hear and see loud and soft parts," he says.

Smirk already includes audio, as does Side Effects' Prisms. For Houdini, its latest product, Side Effects, plans to add multiple, bidirectional audio tracks in order to give animators the ability to create lip sync for multiple characters with each having its own audio track. "To tie in with that, we're going to offer a new suite of tools so you can repeat, blend, trim, stretch, and adjust the pitch," says Paul Salvini, director of product development.

Similarly, Houdini will handle multiple layers of motion on a face, and those motion tracks could be moved, copied, and trimmed, as can the audio channel. "Groups of channels for expressions can be made up of many blends that can be stretched and copied to manipulate expressions," says Kim Davidson, COO. "You could have a character talking and see how it would look with a slight yawn. You could do this now, but these tools will significantly reduce the number of steps."

"Blocking sound in is a rapid process," Landreth says. But getting the refinements, that's the finesse part. It's easy enough to get an f, but it's the way you make the lip sync flow together that's important."

Software will always get more sophisticated, but even with such techniques as shape blending and tools for automation, it's always the artist who makes the difference.



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Using Side Effects' Prisms software, animator Mark Mayerson created the puckered lips and expanded cheeks of this trumpet-playing ghost from the TV special Monster By Mistake. Mayerson created 16 mouth targets; the cheeks expanded automatically based on mouth position.



cute little dougn boy or a realistic digital human, shape Shifter in Alias/Animator can help make the 3D character look like it`s talking.





Todd Sheridan of GlyphX Inc. created the expressions for this monk using Morph Magic, a plug-in for 3D Studio Max.



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When fed computer-generated speech, synthesized speech, or performed with motion-capture equipment, these characters, created with Haptek software, can appear to talk and emote automatically.



Creating unique expressions with Smirk, a plug-in for 3D Studio Max, from Lambsoft.



Creating unique expressions with Smirk, a plug-in for 3D Studio Max, from Lambsoft.



By copying and modifying one head, you can easily create many subexpressions that can be blended in varying percentages to create unique expressions with Smirk, a plug-in for 3D Studio Max, from Lambsoft.





Shape Shifter in Power Animator made this odd bird talk.



Shape Shifter in Power Animator made this odd bird talk.



By setting up target shapes that mimic the way a mouth looks as it says phonemes and to create expressions, an animator was able to use Shape Shifter in Power Animator to make this odd bird talk.



As you can see, one mouth shape can suffice for several consonents and vowels if you're creating cartoon characters. Mouth shapes courtesy of LambSoft.







Using sliders, animators can blend an expression by selecting percentages of target shapes, as this screen shot from Morph Gizmo for Lightwave illustrates. In these images, you can see the character's expression change as the sliders for the eyebrows and mouth shapes change position.



In this screenshot from Softimage 3D, the two white null points control the eyebrow clusters; the light blue diamonds are used as skeleton objects to control the weighted, light-blue vertices on each eyelid; the green-colored vertices on each eyelid are controlled by the head; and the red diamond in the center controls the corners of the mouth. The bottom window shows face shapes for different sounds. The small red cubes are connected via simple expressions to the weights of each shape on the final model and can be manipulated directly to mix

shapes or connected to an external device such as a MIDI box.

Barbara Robertson is CGW's West Coast senior editor. Computer Graphics World August, 1997



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