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Call of the Wild

When you live in the Alaskan wilderness, every day is a test of survival, both physical and mental, and it was within this unforgiving environment that digital artist Timothy Albee challenged his willpower and creative skills. During a six-month period while living alone in a one-room cabin, he produced *Kaze*, *Ghost Warrior*, an impressive 23-minute 3D film, on a budget of only \$5000. In doing so, he rewrote the rules of CG filmmaking, proving that by thinking outside the box, one person, on two home computers, can make a feature-quality animated film. As remarkable as it is, Albee's story is not merely about the making of the film; it's just as much about the making of a filmmaker.

There are those who dream of quitting their 9-to-5 job, selling their home in the suburbs, and moving to an exotic location to fulfill a lifelong goal. There are those who dare to make this a reality. And, then, there is Timothy Albee.



Four years ago, Albee, a digital artist, traded in the bright lights of Los Angeles for the northern lights of Fox, Alaska. Once there, he wrote a book and painted, then he wrote a screenplay, made a CG film, voiced all the parts, and wrote another book documenting his groundbreaking filmmaking process. And he did all these things by himself, with his sled dogs as companions, on the edge of the Northern frontier.

When Albee was a young man, he longed to move from his one-stoplight town in Michigan to Los Angeles and become a Disney animator. So he did that. Then he wanted to form his own animation studio. So he did that, too. "I had and did all the things that defined me as a groovy dude—the car, the house, the job, the lifestyle," he says. "Yet, I still felt hollow inside."

Following a friend's advice, Albee read the self-help book *The Artist's Way* by Julie Cameron, and after performing the suggested exercises, decided to refocus his creativity and time during a year's sabbatical in Alaska. That one year turned into four.

"Alaska has a way of polarizing everything that already has been polarized," Albee says of his new environment. "It's a very rough, challenging, and difficult place to live—you can die just changing a tire when it is 20 below or more."



The concept for *Kaze, Ghost Warrior* had been with digital artist Timothy Albee for many years, though it took a trip to the great white North for it to crystallize into a CG film.

In May 2001, Albee packed limited belongings into a rental truck, and headed north. Since then, Albee's combination home/studio has been a wood-framed cabin that he describes as "ramshackle and run-down," but a bargain, he notes, for \$325 a month in rent. Although it has no running water, the cabin has electricity and Internet service (albeit 19.2k).

The concept for what would become the animated film *Kaze, Ghost Warrior* had been with Albee since he was a teen. Then, during the 3000-mile trek to his new home, that compilation of ideas gelled into an actual story, the details of which the artist recorded on tape as they flowed forth.

At its base level, *Kaze, Ghost Warrior* is straightforward, though it is swathed in complex ideals and emotions. It tells the story of Kaze, a masterless samurai warrior who, driven by honor, transcends mortal life to avenge the murders of a royal family in a distant world's feudal past. After tracking a band of villains to a nearby tavern, Kaze confronts the troublemakers as they harass a helpless "server" offering patrons companionship. Proving to be no match for the warrior, the group flees, but not before revealing the identity of their boss—the feudal lord Soshi, a person Kaze knows well. Later, in a tranquil forest, more of Soshi's henchmen surround Kaze, mistaking him for easy prey. Despite his distaste for killing, Kaze easily eliminates the foes, and when the last attacker fails to relent, Kaze does what he must, albeit compassionately. When the warrior finally locates Soshi, it becomes obvious that the former soldier Soshi has benefitted greatly from the royals' deaths. But rather than kill Soshi, Kaze instructs him to warn "the others" that he is coming for them.

"At first I wondered whether the computer technology evolved to the point where I could make this larger picture happen," Albee recalls, "that of making a feature-quality film on less than a shoestring budget, more like a dental floss budget."

Between writing, painting, and mushing with his sled dogs, Albee began testing this theory, making wildlife art on the computer in such a way that took hours, not days, to render a single frame that was of print-quality resolution. "When you have trees, leaves, and animals with fur, it requires a lot of computer computation," he explains. "As the final crucible to determine whether the rendering was indeed possible, I re-created Maxfield Parrish's *Daybreak* painting, in which I substituted wolves for the girls, and placed Mount McKinley in the background. And, indeed, it worked."

By this time, however, Albee had depleted his savings and couldn't purchase the expensive hardware and software necessary for achieving his vision. Alternatively, he used the Alaskan culture's barter system, trading software reviews and digital artwork for 3D software licenses. He also supplemented his AMD Athlon 1GHz PC with a 2GHz dual Intel machine containing 2GB of RAM by making a television commercial. Additional review work for a computer show on the Alaska Public Radio Network netted an Nvidia Quadro FX card, and a book deal with 3D and video software vendor NewTek provided a Video Toaster 3.



Albee created this seemingly complex forest by generating over two billion instanced polygons from a single modeled stalk of bamboo using Happy Digital's HD Instance renderer.

"Some people look at my numbers and say this project was impossible to do for only \$5000. And yes, they're correct, if you are looking at doing it by using traditional means," Albee contends.

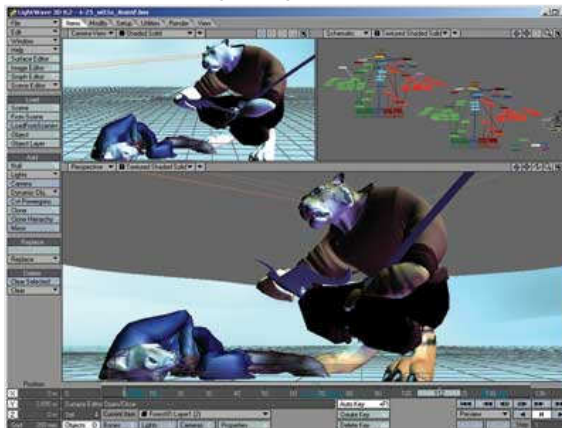
Like Albee did for his render test, rather than using humans in the film's roles, he opted for animals. He did this for a number of reasons, foremost to eliminate prejudices or race association with the characters. Moreover, he believes that audiences disconnect with realistic CG humans, and that the closer an artist gets to achieving photorealism with virtual humans, the more focused the audience becomes on the look of the characters rather than the story.

"I also didn't want to re-create reality because we live in reality all the time," Albee adds. "I had already accomplished that a few years ago when I worked on the movie *Dinosaur*, and I wanted to try something more artistic and challenging." Although creating realistic CG humans is extremely difficult, crafting *Ghost Warrior's* animal characters was hardly a walk in the Denali Park: Because the animals walked on their toes, this type of animation (called digigrade) presented a series of complicated balance and weight issues.

Perhaps a subconscious factor that swayed the artist to use anthropomorphic animal characters was his love of nature—the way animals move and think. “I see great artistry in their physical forms, as well as in their behaviors,” Albee says.

During this pre-production stage, as Albee refers to it, he also finessed the story line, first by rearranging Post-its on the walls of his cabin until the sea of yellow squares told the story of Kaze in the way that Albee wanted it told: respectfully, and with the characters upholding their integrity. This became especially important to him after incurring a personal loss in Alaska. When one of Albee’s beloved dogs was killed in his yard, the artist infused his emotions into the final death scene as Kaze exacts his revenge. “I don’t know if I would have dealt with that incident if I weren’t able to channel that pain and sorrow into those scenes and, in a sense, give my dog Joe the death I wish he would have had rather than having him suffer as he did.”

Furthermore, pacing past the walls and viewing the Post-its enabled Albee to see the holes that needed to be filled and the bridges that needed to be created between the main story points. “I could also picture each scene in my mind, and in doing so, was able to create the first ‘screening’ of my film,” he says. Later, Albee traded in the Post-its for scanned drawings, cut together on the Video Toaster, which he used to create the animatic.



LightWave’s IK system, when coupled with Albee’s unique character riggings, virtually eliminated the flipping issues that commonly occur during character animation and in poses such as this.

Once Albee knew how the piece would be told, he focused on how it would look, choosing a style that infuses neo-romanticism’s naturalist focus with techniques from present-day Japanese animé in which complete features are produced on what would be the budget of a single, animated episode in the US (see “Breaking the Mold,” pg. 40). “I wanted the film to resemble a painting as opposed to the typical CGI movie,” he explains. “Yet, there are many close-ups and shots where the held background is slightly out of focus, reminiscent of traditional animé.”

Then, taking his cue from Disney classics, Albee used color to convey emotion: As the story intensifies, more blood reds are present; to cool things down, teals and blues are added. “You are conducting the feelings of the audience as if it were an orchestra,” he says of the process.

Even though detailed visions of *Ghost Warrior* danced through his head, Albee still had to pay the rent and eat. So, although he deems pre-production the most important phase of filmmaking, the artist could devote only two hours each day to this task.

Then, not long after he began preproduction, near-tragedy struck, when Albee found himself caught in the middle of what seemed like a real-life action film as his cabin was almost destroyed by raging silt-laden floodwaters. Though his computers and files were not damaged, the harrowing experience—which forced Albee to find a temporary home—taught the artist the value of maintaining current backups of his work.

Immediately after the incident, Albee created the movie’s trailer, a test for the production’s pipeline, and began chronicling his filmmaking experience in the book *CGI Filmmaking: The Creation of Ghost Warrior*. He also imposed a six-month deadline for the production phase to prove that given 18 months, it would have been possible to complete a full-length feature film.

To accomplish this ambitious feat, Albee chose NewTek’s LightWave as his 3D software weapon of choice. While creating the *Ghost Warrior* models, the artist used subdivision surfaces, which allowed him to finesse the geometry using a low-resolution mesh, and later render it in high resolution.

For his character riggings, Albee made sure the computer performed the least amount of work possible. “Anything more and I probably would’ve been disappointed, as the computer makes bad decisions about the poses and motions you’re trying to achieve,” he says. Therefore, the artist spent a lot of time creating detailed character rigs and skinning/clothing solutions so that Kaze’s hands, feet, and torso moved in a realistic way. Next, he tested the riggings, putting Kaze through extreme poses to ensure that the positioning looked believable and the “in-betweening” didn’t jitter.

Then Albee used Kaze as a base model for creating all the other rigs for the characters of similar proportions. “By thickening some things here, thinning other things there, and pushing and pulling points in muzzles, ears, and bodies, I was able to build the other 21 characters from Kaze’s base form in less than one and a half weeks,” he notes. “That includes all surfacing as well as the application of each character’s unique fur patterns.”

Similar to the way he moved the characters’ skin, Albee used a bones setup to move the characters’ clothing. However, he augmented the motion with a simulation that affected only the portions of the garments that hung loosely, thereby reducing calculation times. He also “hid” the fact that he wasn’t using full cloth dynamics through his choice of camera angles.

Model texturing was also accomplished in LightWave, mostly with procedural rather than photographic or hand-painted surfaces. This allowed for close-ups of the rich, organic models without degradation or pixelation of the images. And because they were mathematical-based, the procedural textures could be quickly altered to look like something completely different with only a few numerical changes yet retain their original “feel.”

However, for the characters' skins, which defined their fur patterns, Albee did paint textures, laying the hue areas in Kaze's stripes and the patterns on the face of the innkeeper Itsua, for example, using NewTek's Aurora.

"By using only one texture map layout for all the characters, after painting about the third character, I began to know exactly where each bit of paint would be applied on each model's skin," says Albee. "Therefore, painting the maps was much faster than it would have been using a new map layout tailored for each character, since I had to learn only one UV map layout."

To create the animals' pelts, Albee used Worley Labs' Sasquatch hair and fur generator. From his previous film experience, Albee knew that rendering fur meant calculating a large cloud of data, which would be time-consuming, particularly when testing scenes prior to final render. Evolving the technique originally developed in his CGI wildlife art tests, Albee reduced the render time per NTSC-resolution character plate from 20 minutes to less than one minute (see "Fur Real," pg. 21).

During the film's production, Worley Labs released FPrime Interactive, a progressive rendering engine that allowed Albee to stop the render whenever the animation frames reached an acceptable level of quality, and restart the render where it left off if more fur had to be added.

FPrime also creates, in effect, a real-time window into the CG world, rendering high poly-count and high light-count scenes, complete with soft-edged raytraced shadows, reflections, and depth of field instantly, which simplified the setup of the complex lighting environments. In fact, Albee compares the lighting setup for the inside of the tavern, when Kaze begins tracking the villains, to hanging real-world lights that he could grab and move, and instantly see the results of those changes.



Top, left to right: The speed of LightWave's IK and real-time subdivision systems simplified complex character interactions such as these. Above: The use of dynamic parenting and other constraints helped the artist create this shot of Kaze gingerly

Albee then lit the scenes in LightWave, illuminating each environment first without any characters, then adding character-specific lighting rigs optimized for each animal. "I wanted the rich lighting to look more like the backgrounds in *Lady and the Tramp* than those in any modern movie," he adds.

Next, Albee used Eyeon Software's Digital Fusion to composite the characters, backgrounds, and other elements-along with their shadows, specular maps, and Z buffers-into the scenes. To save time, the artist often composited his foreground elements onto a single, static background plate. Even in many of the shots where the camera was moving in perspective, or dollying slightly around a character in the foreground, Albee still was able to use a single background image by utilizing the motion tracking, image warping, and destabilization tools in Digital Fusion.

While rendering the final imagery, Albee was achieving 58 seconds per character plate-fully shadowed and fully furred-at NTSC resolution. He did so by using one of his Intel dual processor machines as a render node, and the other for animating. "I was always trying to keep up with the rendering. Typically I would wake up in the morning and composite what I had rendered the night before," Albee says. "And when the composite was running, I would take care of the dogs, come back, edit the scene, and see if there were any changes that had to be made. Then I would animate from noon until about 7:00 pm. That's when I would kick back with a good movie or book. And on weekends, I would mush."

With Albee so immersed in the Alaskan culture, could he have pulled off this filmmaking feat from his home in California? Probably not, he says. "I am too sensitive to my surroundings and would have had a difficult time with all the distractions and sensory overload of Los Angeles," the artist explains. "In Alaska, I can choose where I focus, and it allows me to choose what enters into my world for the most part."

Presently, *Ghost Warrior* is garnering attention at film festivals, including this month's Annecy. But Kaze's, and Albee's, adventures are just beginning. In fact, the artist's decision to edit the film down to 23 minutes was not happenstance, nor was the cliffhanger ending. Rather, Kaze's tale is part of a planned story arc that includes a TV series and a prequel feature film that Albee hopes to begin soon from his new home in Poland. Indeed, just a few weeks ago, the artist, his dogs, and Kaze began a new adventure that includes the formation of an animation studio that will be a training ground for new artists who will take up Kaze's cause as well as a host of others.

Whatever the property, Albee promises to deliver films that are as distant in form and style from the cookie-cutter CGI films produced in the US as, say, California is to Alaska, or even to Poland.

Karen Moltenbrey is a senior technical editor at *Computer Graphics World*.

Because *Ghost Warrior* is such an emotional tale, told through the powerful performances of the characters, facial animation was paramount. Unfortunately, it was also time-consuming-particularly for a one-person production team. With necessity being the mother of invention, digital artist/filmmaker Timothy Albee developed new techniques that enabled him to achieve detailed facial motions for his characters in a fraction of the time that it would have taken using the traditional method of applying morph sliders.

First, Albee isolated parts of the facial mask: the inner ears, outer ears, eyebrows, eyelids, eyeline, cheekbones, lower jaw, upper jaw, lower lips, upper lips, teeth, gums, and tongue. Then, in NewTek's LightWave, he chose facial mask sets to add to, or remove parts from, thereby quickly isolating the segments of the face that he wanted his tools to affect. Having isolated a region of the face where he could adjust specific points without

touching other areas, he then built shapes that would serve as morph targets for the facial animation.

"I needed to get my facial expressions done quickly, and I also needed them to have a wide range of flexibility and diversity," Albee explains. "So I built some 'large' predefined expressions like smiles and frowns, which affect the lips, muzzle, cheekbones, and lower eyelids. I also built specific morph targets to affect the individual facial parts, such as the corners of the mouth (bringing them forward or stretching them tightly backward) and the brows, and to swing the ears in specific directions."



The artist devised a new process for generating expressions and morphs, thus streamlining the complex process of animating faces, including those of the innkeeper Itsua and the "server" Yasashii.

Discovering that his favorite but little-known tool for facial animation, Lip Service, was discontinued and unsupported, Albee approached programmer Mac Reiter to create a new breed of software for doing facial animation. Now called Timothy Albee's Facial Animation (TAFa), the program uses OpenGL to display real-time sub-patching of UV textured models at interaction rates of over 100 frames per second (Kaze's head model, for example, yielded 118 fps on average). Dragging and dropping phonetic morphs from the OpenGL-based Morph File onto an exposure sheet, similar to the way it has been done in traditional, hand-drawn animation for more than 100 years, Albee used the tool to "scrub" through the animation, achieving the desired synchronization between the audio and the animation while simply moving the mouse. The artist then adjusted the strength and the left/right position of the morph from the exposure sheet.

Once the character was speaking, Albee chose from palettes in which morph targets had been assigned to each quadrant of the main window. He then used the mouse to record, in real time, the animation created by moving the mouse; this affected the blending of those morphs as applied to the existing animation. "Even in pre-pre-alpha, I was able to do the lip sync for the entire 55-second prologue in about two hours," he notes. -KM

Fur was a major part of the texturing process, given that all the characters had pelts. Using Worley Labs' Sasquatch fur-simulation software, digital artist Timothy Albee controlled the length, density, clumping, and curling of the hair, as well as the direction of the fur flow over the skin.

To more efficiently render the hairs, Albee derived the shading for the fur from the rendering results for the skin. Because there are so many individual hairs in a pelt, calculating self-shadowing and shadow casting would have made a render ten times longer. So, he theorized that by figuring out which kinds of shading were affecting the skin that was "growing" the fur, those colors could be extrapolated into the fur itself and yield good-looking shadowing effects without the fur simulation having to calculate the shadows from each individual strand of hair. Because NewTek's LightWave (the 3D modeling/rendering program that was used) can bake the shading into a UV texture map, Albee pre-baked the shading information. Therefore, the fur simulation did not have to calculate any lighting, just the geometry of the fibers, rendered through instancing, so it could be handled quickly. To do this, the artist created a special UV map of the character's skin that represented each polygon, then ran a surface baking plug-in within LightWave that generated on a frame-by-frame basis the way that surface would look. He then directed the fur simulation to pull all its color information from that pre-baked image. The end result was a reduction in render time from about 18 minutes to under 1 minute.



With off-the-shelf software and a unique rendering solution, Albee created fur for the characters, including barmaid Naosa.

"All the information was there, as were all the shadows," Albee points out. "And while it is not 100 percent correct as far as a simulation goes, it looked good and was efficient." -KM

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