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ComputerGraphics World

January 2005 • Volume 28 Number 1

Also see www.cgw.com for computer graphics news, special surveys and reports, and the online gallery.

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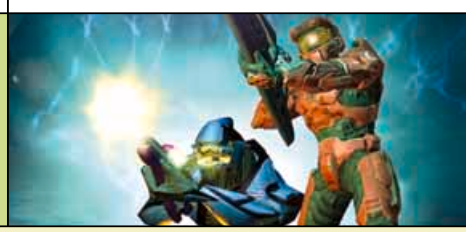
Departments

Features

On the cover:
Master Chief and a Blue Elite appear ready for battle in the blockbuster sequel from Bungie Studios, *Halo 2*. For more information, see pg. 16.



editor's note

Phil
LoPiccolo
Editor-in-Chief

Under the Top

Looking at effects films over the past few years, one could say that visual effects are following a kind of Moore's Law, doubling in quality and quantity nearly every year. One example that would support this notion is the *Lord of the Rings* trilogy. While the first film, *The Fellowship of the Ring*, contained roughly 480 effects shots, the second, *The Two Towers*, included nearly twice that many (920), and the third, *The Return of the King*, doubled the number again, featuring some 1800 effects shots in all. Moreover, the effects grew more complex in each release. Comparing the battle scenes in the films, for example, we find that the armies in the first one featured 70,000 digital warriors, while by the third they had nearly quadrupled to more than 250,000.

Where do we go from here? Will directors and special effects artists be compelled to populate crowd scenes with millions of characters instead of merely hundreds of thousands in an attempt to one-up their predecessors and satisfy the moviegoing public? Have we already passed the point of diminishing returns in such uses of visual effects? I hope not. But in some cases, less could certainly be more.

Consider the final battle in *The Return of the King*, in which hundreds of thousands of Orcs, Wargs, Rohans on horseback, and huge Mumakils clash on the plain of Minas Tirith. Scenes like these may be convincingly photorealistic and much like the author JRR Tolkien envisioned when he wrote the tale back in the mid 1950s, since the story was, after all, a fantasy—and perhaps the greatest one ever told. But even so, film audiences were likely forced to make a conscious effort to suppress disbelief, which can take some of the magic out of an experience rather than add more to it.

Of course, not all filmmakers are in a visual effects arms race. For example, take visual effects producer Rob Legato, who won an Academy Award for his work on the film *Titanic*, and whose latest work is featured in the new Sony Pictures Imageworks film *The Aviator*, about flyer/filmmaker Howard Hughes. Legato, a cinematographer by training, decided to shoot as much of the movie in camera to go "under the top" rather than "over to top" in terms of effects, he says, "and try to do something that your brain believes is real."

Some filmmakers are dropping out of the visual effects arms race and taking a less-is-more approach.

To that end, Legato used 25-foot scale model planes, that actually flew, and photographed them from a helicopter. For some scenes, Legato used computer-generated planes and camera moves, but with the same the goal of re-creating how Hughes would have been able to photograph a particular scene. "I wanted to get at the heart of what really happened without putting my signature on it or embellishing it," he says.

"Remember in the 1960s and '70s when the zoom lens came out?" Legato asks. "It became so overused that it lost much of its appeal." But now after we've all grown up with it, it's being applied so effectively you often don't even know when it's being used, he says. "Likewise, in the CG world, we sometimes see a film that will use technology to get down to the basics of just telling a good story and not try to impress people with the tools they are using to tell it."

Legato says he doesn't know if audiences will like *The Aviator* or not, since the effects are not intended to be more elaborate than those in, say, the last big aircraft effects movie from the same era, *Pearl Harbor*. But it will be interesting to see if by taking a step back he can move the art of filmmaking forward.

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The Magazine for Digital Content Professionals

PHIL LOPICCOLO: Editor-in-Chief
phill@pennwell.com

COURTNEY HOWARD: Senior Technical Editor
courtney@pennwell.com

KAREN MOLTENBREY: Senior Technical Editor
karenm@pennwell.com

CONTRIBUTING EDITORS:
Jenny Donelan, Audrey Doyle, Evan Marc Hirsch, Doug King, George Maestri, Martin McEachern, Stephen Porter, Barbara Robertson

SUZANNE HEISER: Art Director
suzanneh@pennwell.com

DAN RODD: Senior Illustrator
danro@pennwell.com

BARBARA ANN BURGESS: Production Manager
barbarab@pennwell.com

MACHELE GALLOWAY: Ad Traffic Manager
MacheleG@pennwell.com

KATHLEEN GREAVES: Reader Service Manager
greaves@pennwell.com
(843)705-9243

SUSAN HUGHES: Marketing Communications Manager
shughes@pennwell.com

MICHELLE BLAKE: Circulation Manager
michellb@pennwell

MARK FINKELSTEIN: Group Publisher
mark@pennwell.com

COMPUTER GRAPHICS WORLD
Executive and Editorial Offices:
98 Spit Brook Rd.
Nashua, NH 03062-5737
(603)891-0123; FAX:(603)891-0539

CGW ONLINE: www.cgw.com

For customer service and subscription inquiries only:
cgw@omeda.com TEL: (847) 559-7500 FAX: (847) 291-4816
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ADVANCED TECHNOLOGY DIVISION

ADAM JAPKO
President & COO

GLORIA S. ADAMS
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ATD PUBLISHING DEPARTMENTS

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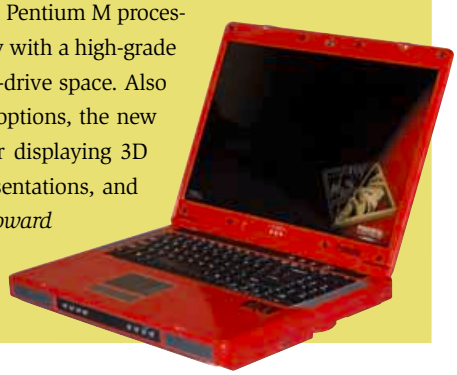
products | notebook computer

Voodoo PC Expands Envy Line

Manufacturer of personalized computer systems, Voodoo PC has extended its Envy product family to include two new models: the m:790 and m:50.

The Voodoo Envy m:790 is the company's first notebook computer to employ the next-generation, upgradable PCI Express graphics module. The new notebook also takes advantage of Intel's Pentium 4 560 processor and DDR-2 memory. A removable PCI Express video module provides users the option of installing gaming- or workstation-based solutions, whereas its Serial ATA RAID feature boosts hard-drive throughput.

A three-pound carbon fiber notebook, the Voodoo Envy m:50 is designed for professionals who require a powerful computer system in a small form factor. The Envy m:50 features a choice of Intel Pentium M processors, built-in Envy-G wireless technology with a high-grade receiver, and a maximum 100GB of hard-drive space. Also available with custom color and tattoo options, the new notebook sports a screen optimized for displaying 3D graphics, intensive presentations, and DVDs. —*Courtney E. Howard*



Voodoo PC; www.voodoopc.com

products | video

Avid Releases HD Versions of Products

Avid Technology has introduced HD versions of its Avid Xpress Pro and Media Composer Adrenaline solutions.

The first HD version of the company's non-linear digital editing software, Avid Xpress Pro HD boasts support for native Panasonic DVCPRO HD acquisition and editing, as well as Avid DNxHD editing and rendering. Multicamera functionality, DV50 capture and output, and 24p and video effects output over IEEE-1394 round out the HD offering. Now shipping worldwide, Avid Xpress Pro HD is priced at $1695 for the full version and $49.95 as an upgrade. Avid Xpress Pro HD customers will be eligible for a free software update, which adds HDV support, scheduled for availability in the middle of the year.

Avid's Media Composer Adrenaline HD 2.0 system has been upgraded to offer HD editing capabilities for the first time. Priced at $25,000, the professional editing solution includes Media Composer Adrenaline HD 2.0 software and the Avid Adrenaline hardware. Its multicamera functionality enables users to combine multiple HD, SD, and DV formats and resolutions in a single timeline. —*CEH*

Avid Technology; www.avid.com

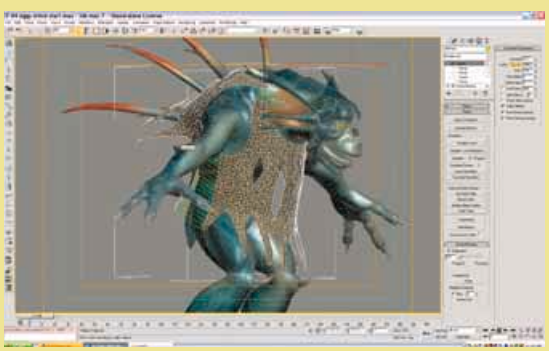
products | plug-in

Discreet Ships Cloth Extension for 3ds max 7

Discreet, a division of Autodesk, has announced the first value-added extension for its 3ds max 7 software.

A 3D modeling plug-in, Cloth Extension provides artists a cloth-simulation system with which to build realistic, film-quality clothing for 3D characters in film, television, game, and other professional projects.

Users have the option of translating modeled geometry into cloth or importing clothing patterns for the creation of characters' garments. In fact, the Cloth Extension enables cloth presets to be saved and shared, thereby ensuring consistency and increasing productivity. Further streamlining and speeding the



products | 3D modeling and animation

Softimage Upgrades XSI to Version 4.2

Softimage, together with its Avid Technology parent company, has announced an upgrade to Softimage XSI.

The latest software update, Version 4.2, is geared toward streamlining the creative process for game, film, broadcast, and postproduction professionals working on complex CG productions.

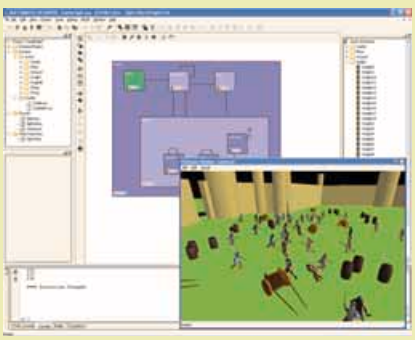
Features new to Version 4.2 are UV unwrapping, the Alienbrain Studio plug-in, XSI rendering and Mental Ray Version 3.3, and GPUSurfaceFX2 technology. Of interest to game developers, Version 4.2 offers normal map generation; whereas film and broadcast professionals will benefit from XSI's newfound support for 10-bit and HD MXF, AAF, and OpenEXR formats.

As part of the new upgrade, XSI Advanced gains Version 2.0 of the company's behavioral crowd-simulation software, Softimage Behavior. Creatives can develop CG crowd scenes using Softimage Behavior software and independently control characters designed in Softimage XSI, creating a complex crowd consisting of greater than 100,000 characters.

At the same time, the XSI Essentials package newly integrates resolution-independent compositing and paint features, which previously had been available exclusively in the XSI Advanced edition. Lastly, XSI Foundation sports improved rendering capabilities and support for the Linux operating system.

Softimage customers having purchased Version 4.0 can download the upgrade to Version 4.2 from the company's Web site. —*CEH*

Softimage; www.softimage.com



production work flow, most cloth functions are accessible with MAXScript; commonly used tools can be scripted for quick and simplified use.

The Cloth Extension ensures that digital clothing responds and moves as it would in the real world by providing the ability to define or select different types of cloth, such as silk, cotton, and wool. Moreover, clothing can be tailored to a character, rather than appearing as loose-fitting or as draped cloth. This new innovation also supports inner seam lines for incorporating pleats and vents.

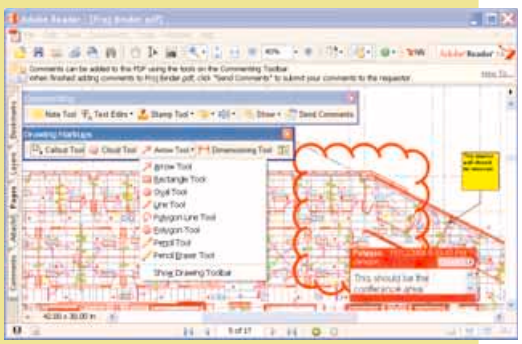
The company's new cloth-creation technology, based on Size8 Software's ClothFX product, will now be integrated directly into 3ds max 7 software and will be delivered in January at no additional cost to valid Discreet Subscription customers. Other 3ds max users are able to purchase the new release for $595. —*CEH*

Discreet; www.discreet.com

products | PDF

Adobe Unveils Acrobat 7

Adobe Systems has unveiled an upgraded version of its Acrobat Professional software. With the release of Version 7.0, Adobe expands the functionality of Acrobat beyond the conversion of various document formats to PDF. The latest version boasts performance enhancements, especially in the areas of application launch and PDF creation. Acrobat 7.0 Professional also now provides users with PDF correction tools for solving common problems, and an output preview feature is useful for spotting potential errors on screen. The upgrade offers enhanced control over 3D content, and adds support for JDF and PDF/X files. Improving collaboration and review processes, Acrobat 7.0 Professional enables users to grant colleagues access to commenting tools from within the free Adobe Reader 7.0 software.



Adobe Acrobat 7.0 Professional carries a price of $449. Registered users of Versions 4.0, 5.0, and 6.0 Standard and Professional can upgrade to Acrobat 7.0 Professional for $159. The company also has integrated Acrobat 7.0 Professional software in Adobe Creative Suite Premium 1.3, the full version of which is priced at $1229. Adobe Photoshop users can upgrade to Creative Suite Premium 1.3 at a cost of $749, whereas Creative Suite Premium users can upgrade to Version 1.3 for $159. —*CEH*

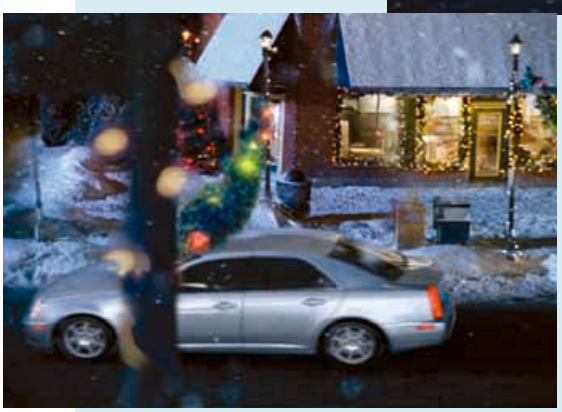
Adobe Systems; www.adobe.com

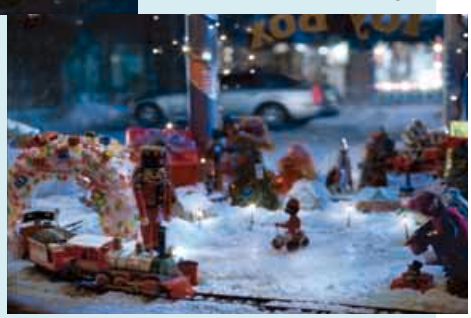
user focus | broadcast

Replacement Vehicles

Last year, New York City visual effects studio RhinoFX helped Cadillac create some holiday magic, turning a summertime setting into a winter wonderland for a television commercial in which Cadillac vehicles navigate through an idyllic small town decorated for the Christmas season. This year, RhinoFX reworked the live-action spot, only this time the artist transformed the vehicles while the scene remained unchanged.

The commercial was, indeed, a true test for photoreal computer-generated graphics. The project required artists to replace the 2004 Cadillac DeVille live-action cars shot on location for the original commercial with a computer-generated replica of a CTS from Cadillac's newly introduced 2005 line.





Artists at RhinoFX created digital effects for a Cadillac commercial not once but twice. Last year, the group created a winter wonderland setting for the live-action spot. This year, the team replaced the real 2004 car with a CG version from the 2005 line.

For the 2003 spot, titled "Magic," RhinoFX brothers Ronen and Vico Sharabani altered the summertime film shoot by turning day into night, creating digital matte paintings, adding snow and lighting effects, and placing an entirely new night sky into the scene. To achieve this, the artists used Discreet's Inferno compositing system, integrating elements such as snow and bells, which were created as separate objects in Alias's Maya. The artists also spruced up the scene by removing unwanted objects, shrinking trees as to not obscure the audience's view of the vehicles, and inserting CG models such as doorways, windows, and seasonal decorations.

This year, Cadillac wanted to revisit "Magic," but there was one problem: The commercial needed to feature new vehicle models for the coming year. In the past, this has meant reshooting the spot, but the folks at RhinoFX offered another, less-costly solution.

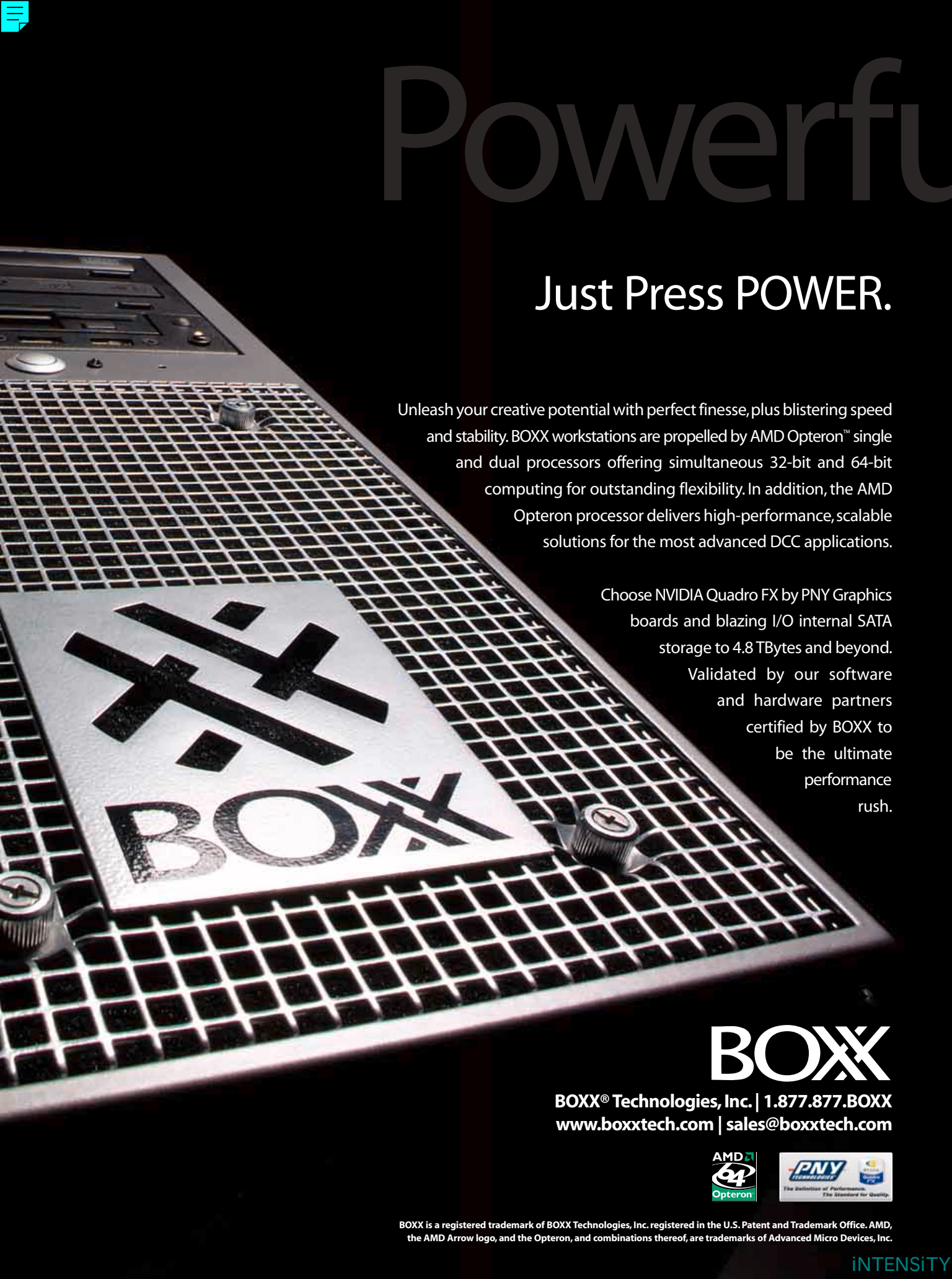
"We have had great success in creating CG cars," says Camille Geier, RhinoFX senior executive producer. "So we explored the possibility of painting out the live-action cars and replacing them with a single vehicle that was entirely CG."

To create the car virtually, the artists digitized individual pieces of an actual new Cadillac CTS. After the artists assembled the 3D parts, they created textures and built shaders in Maya 5 to simulate various surfaces—car-paint shaders, headlight refractions and reflections, tire rubber, hubcap chrome, and more. The artists then reopened "Magic," and painted the cars out of four scenes to make space for the new model. So that the new car looked like it belonged in the shots, the group hand-tracked and animated it using Maya, matching the initial cars' movements as well as those of the camera.

"What makes the car look real is its movements," says CG director Natasha Saenko. "All the subtleties of a moving car were taken into consideration: how heavy the car is, how its suspension works, how fast it travels, how its wheels revolve, and how it tilts when it turns. This was even more challenging because we had a live-action reference car from the previous commercial that we had to match."

Once this was done, the team studied the previous live film plates and then used Maya and Mental Images' Mental Ray to light the car so it would perfectly match the partially synthetic environment.

"We knew that for the new car to fit into the scenes, it had to reflect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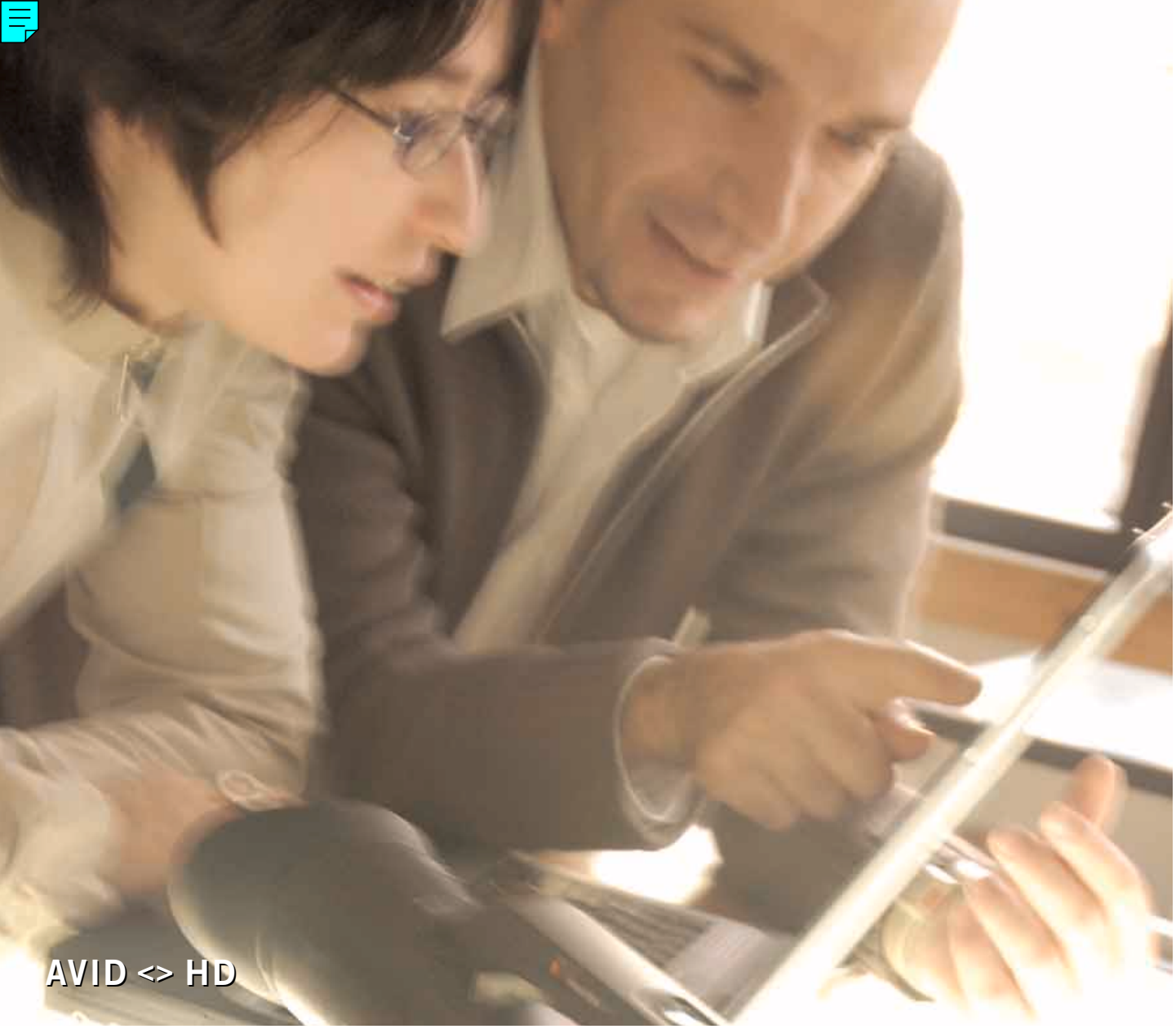
them," says Saenko. "So to achieve realistic lighting, we reconstructed the entire environment by creating large background panoramas and 3D buildings in Maya, through which the new car travels. This gave us realistic reflections and environment colors." The artists also added subtle nuances like Christmas lights that turn on as the car passes by, which helped tie the vehicle into its background, as did the use of accurate shaders and global illumination.

To ensure that the digital vehicle blended seamlessly into the live action, the artists tracked the CG model and animated it by hand in Maya, matching the movements of the original car and camera.

Lastly, the group used Inferno to blend the CG car into the live-action plate. In some instances, the artists applied layers of atmosphere, snowflakes, glows, and shadows to the composite, to make it look even more believable.

According to Saenko, it was an unusual experience for the group to do major effects on a project not just once, but twice. "There is always a chance for something like this to look unnatural and overly processed," she says. "But this experience solidifies my belief that technology has come a long way and that we have the tools that can make anything we can imagine into a reality."

In the end, the spot looks seamless, without a hint of CGI. "If you think about what it would have taken to reshoot those scenes, the value we brought to the table was enormous," says RhinoFX partner Rick Wagonheim. "I'm not saying CG cars will ultimately replace real cars, but there are situations where CG makes more sense, whether it's due to dollars, control, or feasibility. More and more, directors are recommending CG solutions. Its time has arrived." —*Karen Moltenbrey*



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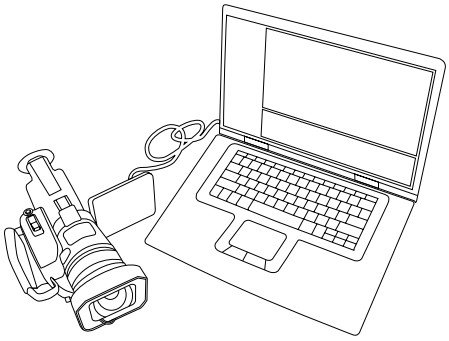

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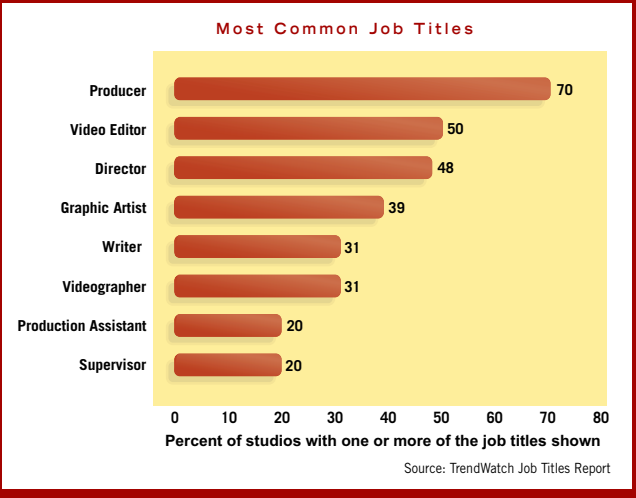
market outlook

What's in a Title?

In most visual effects studios, a person's job title can change quickly depending on the type of work that is being performed. This is particularly true in the six out of 10 facilities that are considered small businesses—that is, with fewer than 10 employees—and even more so for the growing freelance community. As such, most people in the effects industry must be comfortable wearing several hats and, more important, must have the skills to perform the tasks required.

In large and midsize companies, job titles do not change as often. That's because larger facilities tend to work on bigger projects and many more of them at one time compared to smaller studios. As a result, larger studios tend to have several producers, video editors, directors, graphic artists, and the like. But on the other hand, larger facilities may have more management positions that also require expertise in several areas.



In any case, studios need to provide training to help employees move between jobs as project workloads change. And knowing how titles change according to the size of the studio can help determine the training that may be needed.

Overall, the top three job titles in the industry are producer, video editor, and director. For larger studios, with more than 20 employees, the most common job titles are producer, graphic artist, and video editor. Overall, the average number of producers per studio/facility in the US is two. For studios with more than 20 employees, the average number of producers is four. Freelancers typically have a total of between three and four job titles apiece.

The accompanying chart provides a snapshot of the top job titles and the percentage of US studios/facilities that report having one or more of the titles shown in their operations. *—Jim Whittington, principal of market research firm TrendWatch, Inc. in Mill Valley, California. All data is from TrendWatch's "Job Titles" Report.*

news

In Brief

For its visual effects work on *Farscape: The Peacekeeper Wars*, a four-hour miniseries for the SciFi Channel, digital production company **Animal Logic** (Sydney, Australia) received an award in the TV series category at the Australian Effects & Animation Festival. The award-winning Animal Logic team includes 3D animators—who employed Discreet's 3ds max and Alias's Maya, as well as Inferno, Combustion, and Digital Fusion for 3D compositing—and 2D artists using Inferno, Flame, Combusion, Shake, and Henry. **Midway Games** (Chicago), following its recent acquisitions of **Surreal Software** (Seattle) and **Inevitable Entertainment** (Austin), has acquired **Paradox Development** (Moorpark, CA), which already is working on the next *Mortal Kombat* game. Mobile games publisher **Sorrent** (San Mateo, CA) has acquired European rival Macrospace (London), one of the largest players in the mobile games business. **Electronic Arts** (EA; Redwood City, CA) has signed a five-year exclusivity deal with the **National Football League** (NFL) and **Players Inc.**, a subsidiary of the **NFL Players Association**. According to the agreement, **EA Sports** retains the exclusive rights to all the NFL teams, stadiums, brands, and player names and likenesses for use in its football-based video games throughout the next five years. No other game publishers are permitted to include these NFL elements in games during this period; however, the agreement does not apply to Web-based and wireless games. **Adobe Systems** (San Jose) has issued a call for entries for the 2005 Adobe Design Achievement Awards. Now in its fifth year and encompassing 10 countries and nine art categories, the competition is open to student graphic designers, photographers, illustrators, animators, digital filmmakers, and computer artists attending design, film, and broadcast institutions worldwide. Entries will be accepted from March 14 to April 29 and judged in May. Maker of facial synthesis and animation middleware technology, **Genemation** (Manchester, England) has completed a seven-figure funding round, aiding the company in accelerating the development of embedded run-time technology for next-generation hardware platforms.

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Grand Unification

By Jeff Sauer

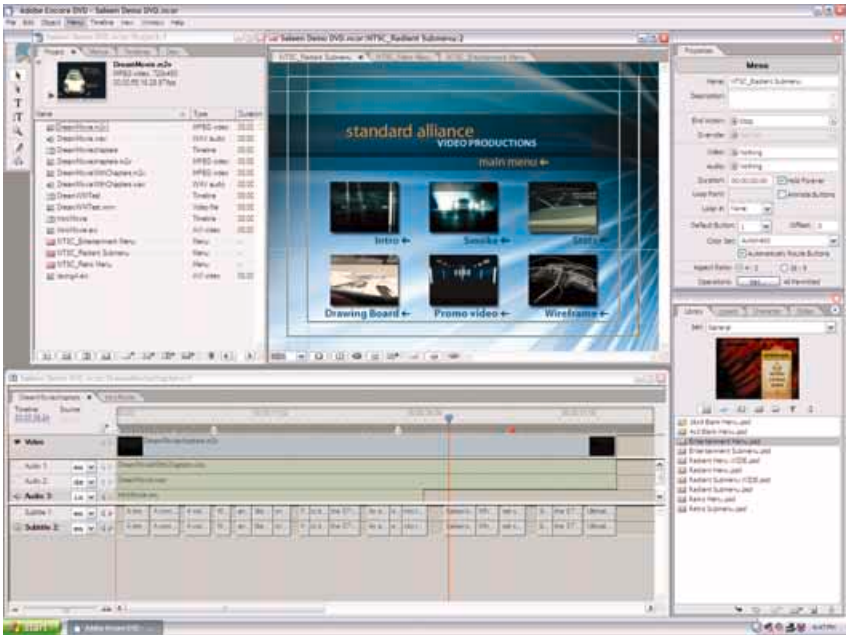
Broad feature integration has been a clear trend among non-linear video editing vendors during the past several years. Effects generation and multi-track compositing have become regular, expected parts of any professional non-linear editing interface, as have other functions like audio editing and EQ, color correction, 3D, and even DVD authoring.

Jeff Sauer
is a contributing editor of *Computer Graphics World* and director of the Digital Video Group, an independent research and testing organization for digital media.
He can be reached at jeff@dtvgroup.com.

Vendors are finding new ways to make their products work better together.

That's not news, nor is it surprising. Adding features is the unabating push in any product revision or upgrade. And for the most part, added functionality has made editors more efficient and productive as they try to remain competitive. Smaller or do-it-yourself video producers working on commercial/industrial/event videos or independent films rarely have a budget line item for motion graphics, compositing, or audio mixing, yet they still must meet client expectations for increasingly high production quality.

Moreover, it's hard to argue with most integration that has given users more features and options with which to work. Yet, in the process, "editing" applications have grown increasingly complex, and



Adobe's Encore DVD has much of Photoshop's actual code working behind it, allowing users to move seamlessly between the two applications when creating DVD menus.

a linear video-editing timeline interface does have limits in terms of how effectively and fluidly it can perform other creative tasks.

The quest for the best of both worlds has now yielded something of a countertrend that looks at integration a little differently and, thankfully, less myopically. After all, efficient work flow can be a highly subjective goal that varies between professionals and their respective needs.

Obviously, some feature integration makes perfect sense. For example, it's hard to imagine a non-linear video editing interface without a titling or character-generation utility, although the lack of those features was very much the norm a decade ago. Dedicated software, like Inscriber CG and Comet CG, were common additions to Windows-based non-linear workstations. The best integration you might have hoped for in those days was for an editing system vendor to bundle the CG software as a free perk.

However, more complicated disciplines, like compositing, audio mixing, and even motion graphics, aren't as clearly well served by a video editing timeline that is inherently designed to trim and arrange media clips. Built-in functionality may be sufficient for many tasks, but the advanced needs of the more meticulous among us have created a new integration trend.

Integration vs. Unification

Instead of stuffing as many functions into a single interface in order to make one product more appealing to prospective users, the industry is now finding ways to have individual products work more efficiently together.

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Most notably, Adobe Systems has been working for several years to create a unified "look and feel" to all its creative applications, from Photoshop and Illustrator to Premiere Pro and After Effects. The company has been motivated in part by straight marketing: getting users comfortable with one product so it will be easier for them to learn another and, thus, more likely that they will purchase it than a competitive product. With Adobe's enormous Photoshop market share, the strategy is solid.

"Adobe has set something of a standard in the way applications work together."

Yet, there's more to Adobe's efforts than simply putting its best face on things. Adobe now bundles several products together in genre-specific suites; including the Creative Suite for digital imaging and Video Collection for video and audio creation. While Adobe is not the first company to bundle a couple of applications together under shrink-wrap, Adobe has set something of a standard in the way the products function together.

For video, Adobe's Premiere Pro and After Effects can share project files as easily as Photoshop and Illustrator have done for years, preserving the project metadata to allow "round trip" edits and updates to the media back and forth between programs. Audition, the audio editing piece of the Video Collection, can also open a Premiere video timeline, and even show a video preview as you make audio changes. After mixing in Audition, changes are seamlessly updated in Premiere. You never have to exit one application in favor of another, nor do you ever need to import or export in any traditional way. It's a more fluid work flow that doesn't compromise on tools for any piece of the creative process.

EncoreDVD can similarly maintain Premiere and After Effects project metadata through the DVD authoring process and allow you to launch After Effects directly, make alterations, and have Encore automatically accept the changes. Yet, perhaps the tightest integration is between Photoshop and Encore. With a substantial piece of the Photoshop engine running behind Encore, you can retain Photoshop layers, text, and filters information. You can make minor updates directly from within the Encore interface, or, if the more detailed brushes, palettes, and other design tools of Photoshop are needed, Photoshop can edit Encore menus directly, thereby saving changes and automatically updating them back in Encore.

Avid FX is shown working atop the main Xpress editing interface. This level of data sharing illustrates Avid's integration strategy with other applications in Xpress Studio.

Avid has followed the same integration model with its XPress Studio, announced last April. Studio bundles five different applications in one shrink-wrapped boxed set. Admittedly, the first version of Studio has interaction only between some of the applications—specifically, you can launch some applications like Pro Tools LE from within the Xpress Pro video editing interface, but others require old-fashioned, less efficient importing and exporting. However, the clear implication in the release of the Studio bundle is that Avid is embracing a similar integration vision and will augment that with future releases.

Apple's QuickTime yields smooth file transfer between Final Cut Pro, Shake, Motion, and DVD Studio Pro, although there is inherently less metadata shared, and that limits the ability to go back and forth seamlessly. As a whole, the industry is more aggressively supporting metadata "wrappers," most notably AAF and MXF, as methods of retaining project data among products from several companies.

This past spring, after many years of advocacy, manufacturers as diverse as Avid, Microsoft, Quantel, Tektronix, Adobe, and others offered a demonstration of AAF's potential that involved each company opening the same project file one after another. Each made and saved unique changes, then passed the edited file on to the next vendor, which opened it and made more changes.

That type of integration is the ideal creative solution for larger collaboration. It would allow individuals to work on the equipment of their choice for any given creative task without compromising their ability to move and share digital files. Still, for individual users working on a single desktop, companies like Adobe, Avid, and Apple are establishing some impressive benchmarks for what integration ought to mean.

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The highly anticipated sequel Halo 2 sets the stage for a new era of graphics in games

THE HALO EFFECT

By Martin McEachern

On Tuesday, November 9, 2004, the video game *Halo 2* made entertainment history when it logged a first-day sales record of $125 million. The game's opening-day revenues even trounced the reigning opening-weekend ruler at the box office, 2002's *Spider-Man*, which raked in $115 million during a three-day period. Without question, this event signaled to the world that the video game industry has become a cultural and economic force that rivals, if not surpasses, the film industry. Grossing $10 billion last year, the video game sector eclipsed Hollywood's $9 billion at the box office, and when *Halo 2*'s glow dims, it could even sink *Titanic*'s billion-dollar record.

If previous gaming blockbusters sent ripples through pop culture's mainstream, *Halo 2* sent a tidal wave, splashing on the covers of newspapers and magazines and flooding evening newscasts. Arriving amid this media frenzy, *Halo 2* quickly established itself as the flagship game for Microsoft's Xbox game console, but in the process it may also have become the standard-bearer for the entire game industry.

At the close of the original game, the cybernetically enhanced super-soldier Master Chief defeated the alien race known as the Covenant on its home world of Halo. But the victory was only temporary, as the sequel, set in the year 2552, finds the Covenant renewing its mission to conquer humanity by destroying all human colony worlds and beginning its conquest of Earth. Guided by AI advisor Cortana and aided by marine allies, the player assumes the role of Master Chief and leads the resistance against the aliens' campaign of elimination, eventually taking the fight back to Halo in hopes of ending the conflict once and for all.

The Covenant comprises several alien races, including the Elites (the founders of the alien alliance) and the Prophets (the spiritual leaders of the Covenant). *Halo 2* also introduces the Brutes, a gorilla-like alien species that is hostile to both humans and the Covenant. Though their true identity is unknown, the Brutes may actually be related to the Forerunners, the race responsible for building Halo.

Like most first-person shooter games, *Halo 2*'s combat-intensive gameplay imposes some limitations on the number of paths available to the player and, therefore, restricts much of its interactivity to a localized level. "There are hundreds of ways to take out an individual enemy," says Jaime Griesemer, design lead for Bungie, the developer of the *Halo* phenomenon. "That makes it a little easier to lead the player through a mission, but makes it much harder to construct each battle."

Bungie 3D artist Robert McLees addresses the challenge of leading the player through an interactive experience in metaphoric terms: "Every game that has a beginning and an end has two things in common: blinders and a leash. The challenge lies in maintaining the illusion of freedom, which is wholly dependent on the beauty of the blinders and the comfort of the leash."

Model Soldiers

Bungie designed *Halo 2* to push the Xbox to its absolute limit—so far, in fact, that players with older Xbox consoles may see artifacts, like level-of-detail (LOD) popping or blurred texturing, because of their slightly slower hard drives. Following this mandate to surpass the quality of the previous title, the artists had two main goals for *Halo 2*: make it better and make it run faster. This required the team to build all the new and returning characters with lighter geometry.

Despite the lower polygon counts, the new models outshine their predecessors in detail, thanks to an increased reliance on normal mapping, a form of texture mapping that greatly enhances the realism and lighting of a surface by encoding details using three vectors of information instead of the usual two vectors designated by bump maps.

In *Halo 2*, the spotlight is on Master Chief, which 3D artist Eric Arroyo built vertex by vertex within Discreet's 3ds max. While modeling the cyber-soldier's smoothly curving metallic surfaces, with their sharp ridges, and beveled edges, Arroyo and the rest of the team paid special attention to the Master Chief's joints, to ensure that the complex structural design of the highly detailed battle suit would deform realistically.

In particular, the group was concerned with the character's extreme poses. So on difficult areas, like the shoulders and other T junctions, the artists made sure they had proper edge looping at the seams. But with no special tools for handling real-time problem joint deformation, they ran into a number of joint-rotation pinching problems that could not be solved. Instead, artists hid the problematic seams by constraining the rotation of the joints or positioning the camera to conceal them from the player's view.

To accommodate users of older Xbox consoles, Bungie maintained conservative polygon counts not only for the main character, but for the others as well, so the many characters, vehicles, weapons, and huge environments could appear on the screen at the same time without the player encountering rendering delays. For instance, Master Chief and the principal aliens were outfitted with five levels of detail, with a meager 3000 polygons comprising the highest LOD and each successive model representing a 50 percent reduction in density. However, most of the aliens, as well as the vehicles and

The character Master Chief returns in *Halo 2*, this time with fewer polygons but a higher level of detail, thanks to normal mapping, a texturing technique that enhances a model's realism.

weapons, feature only three LODs, so their geometric complexity drops off sooner as they recede into the distance. This allows the engine to draw more of them on screen at once and animate them much faster.

For generic, homogeneous characters such as the marines, Bungie built a male and female base model for the body and variant heads that individualized all the characters. The modelers divided the characters into regions—head, arms, torso, legs, and attachments—and created multiple permutations for each. These body parts could then be assembled into one conglomerate model.

"Through our tag system, we could define variables for each of these regions to create custom characters, or let the system randomly choose certain parts for various regions," says art director Marcus Lehto. To further personalize the marines, the artists varied such add-ons as backpacks, pouches, and the like. As distinct as the marines are from one another, Bungie learned from the original *Halo* that gamers, assaulted by the constant barrage of on-screen action, remained oblivious to most of the differences between members of any given alien species. Therefore, save for multiple color variations to help the player identify aliens from a distance, little was done to differentiate a particular alien race.

For *Halo 2*, Bungie relied heavily on normal mapping to add details to the models. "Instead of creating elaborate, super high-res models, we figured it would be easier to tweak normal maps rather than thousands of vertices," says Shi Kai Wang, lead 3D and effects artist. "This proved true when we had to make changes to characters because of design characteristics or limitations imposed by the game engine." In fact, Bungie extols the power of normal mapping as its only saving grace in meeting the challenge of upgrading characters such as Master Chief under the constraints of the aging Xbox hardware, which precluded any drastic increase in polygon counts.

In addition to the normal mapping, Bungie developed a proprietary shader system that uses templates to define the fundamental output of the desired material. For instance, artists could choose transparent, opaque, illuminated, or other basic shader types, then choose environment mapping for reflections and specify whether or not the reflection mapping respected the bump map or ignored it. For example, the Master Chief uses a three-pass shader: the base diffuse, bump, and detail maps were the first; the reflection mapping was the second; and the surface lighting was the third. In addition, the artists created a shader for Master Chief's armor and visor that gave the applied surface the characteristics of shiny metal, and offered controls for adjusting such attributes as color, shine, and bloom.

The team also defined the eyes, hair, skin, and other organic features using custom-shader templates. Strapped for texture memory, the artists furnished the characters with only a single 128x128 map for facial resolution, though some cinematic characters had 256x256 maps.

Land, Sea, and Air

If the rolling thunder of the previous *Halo*'s massive array of armored assault vehicles weren't enough for gamers, the battlefields of *Halo 2* rumble with twice as many. After modeling and

To achieve dual firearm activity, the team created separate movements that blend with and play over a base animation.

Each character, including the alien Elites, contains a unique skeletal system with as many as 60 bones for a range of movements.

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UV-mapping all the different modes of transportation in 3ds max, the artists exported them to the game engine, and then used Adobe's Photoshop to hand-author bump maps, texture maps, and specular maps. Moreover, the near-indestructibility of all the vehicles demanded they be modeled in various stages of damage.

"Object damage was the most strategic and time-consuming aspect of their creation," says Lehto. "Before introducing destructible vehicles, you first have to think about what's underneath the bodywork. In *Halo*, without seeing the technology under the hood, gamers just took for granted that the Warthog ground vehicle could drive and that the Ghost [the Covenant's standard battle vehicle] could hover. Well, now that you can blow off the outer panels, the underlying technology needs to exist." Therefore, the artists had to design parts that could sustain damage and fall off, and then model the various degrees of deterioration in three to five LODs, in addition to the machinery beneath.

To create scorched and battle-worn metal and rubber, mirrored cockpit glass, and so forth, artists used shader templates to define a surface's light-reflecting properties, and a combination of texture maps to define areas as either shiny or dingy. For example, the metal of the Warthog includes a bump map for chiseling out fine detail and scratches; a texture map for supplying a basic color scheme and adding details like dirt, scuff, subtle light, and shadow; a specular map for defining areas that are bright or dull; a detail map for providing fine detail and noise at close viewing; and a metal shader for giving the surface a reflective shine, with a hint of the mirrored environment that adds depth.

The group embedded Havok's physics technology within the vehicle models to realistically simulate friction, torque, and more.

Making Halo Shine

One glimpse at the sun-baked beach, the glittering waves, the dappled light beneath trees, or the shadows playing against the rocky outcrops in the game's African island location of Zanzibar, and it becomes clear that *Halo 2*'s lighting greatly outshines its predecessor.

From underwater to outer space environments, the game's diverse lighting conditions required a collection of techniques that work in concert. Since the artists were most familiar with the proprietary Light-mapper tool set developed for the original *Halo*, Bungie used it as the springboard for creating a new and more robust lighting system with which to craft the sequel. Instead of using radiosity, the system employs a distributed photon-mapping solution to generate light maps for the environments. This establishes a base diffuse layer of lighting and shadows for all the environments, and automatically captures global-illumination effects such as bounced lights and inter-reflections.

With the exception of the directional lights used for the sun and sky, almost all the prerendered light maps were made from surface lights. Artists also relied on the newly constructed photon mapper to generate virtual high-dynamic range light probes for the image-based lighting, which was effective for large, moving objects and worked in harmony with the light maps.

Also, the artists added dynamic lighting for weapons effects and flashlights, and for enhancing, highlighting, and accenting the base lighting layers. Bloom lighting, for hot, flaring surfaces, was achieved by blurring the bright parts of a rendered image and compositing it with the original. Point lights and spotlights were reserved for correcting subtle lighting problems, not for the predominant lighting.

Although Bungie experimented with real-time reflection mapping in the *Halo 2* trailer, it proved too memory intensive for the gameplay. Alternatively, the crew found that the combination of a good environment cube map and well-balanced lighting better served the fast-paced game, in which 10 to 15 characters can be active on screen at any given time. "It all boils down to what's more important: having one or two really fantastic-looking characters on the screen, or running around like mad with 10 to 15 active, intelligent bad guys hunting you down," says art director Marcus Lehto. "I'm an artist, so I naturally lean toward the first option, but anyone who has played *Halo* will choose otherwise."

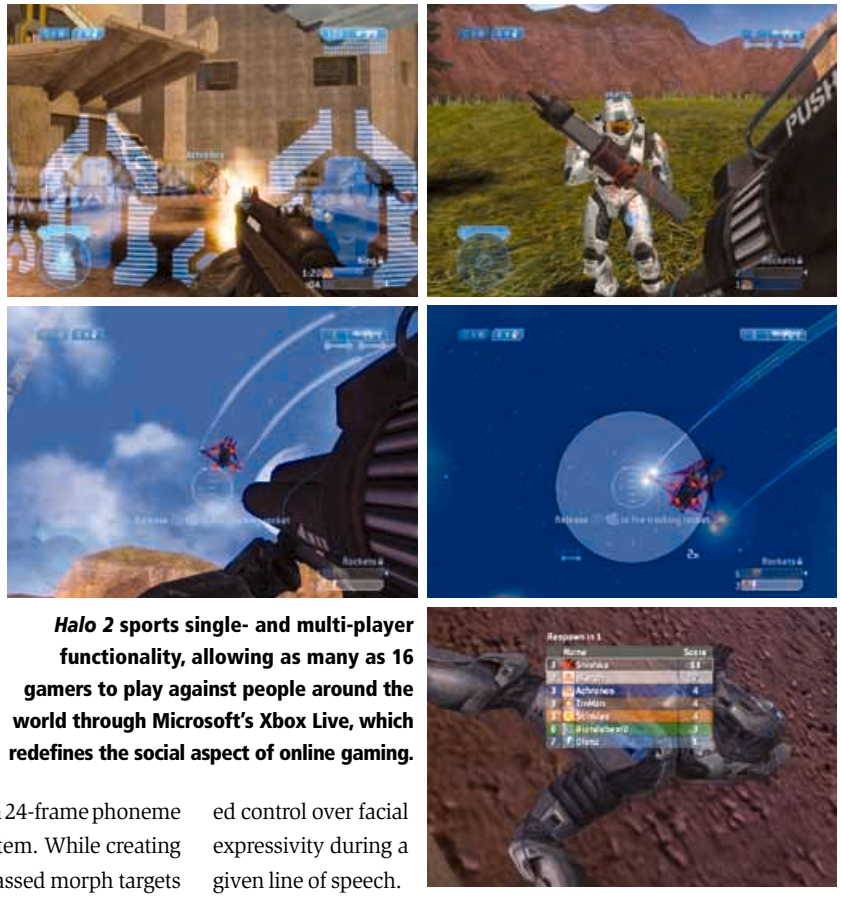
Troop Movements

The mandate of speeding up the gameplay extended to Halo 2's character animations as well as the modeling. For the first time, Master Chief can holster his weapon and break into a powerful sprint, effectively doubling his running speed. In addition, the character can now combine melee attacks; execute "jacking" animations to board vehicles; peer around corners; dodge, leap, and jump; fire two weapons in tandem; and perform myriad close combat and evasive maneuvers. For each character, the team built a unique skeleton in Alias's Maya that contained approximately 40 bones for the simplest characters, such as the humans, and up to 60 bones for some of the more complex aliens, such as the Elites, which feature a Z-shaped leg like that of a horse, four articulate fingers on each hand, and four articulate mandibles (mouth appendages).

The Master Chief, even with his rigid armor and steel exterior, had some malleable soft spots, like the shoulders and the groin area, that were often frustrating to animate, notes Lehto. Whenever possible, the team addressed these deformation issues by adjusting point weighting and bone placement, and limiting the freedom of the bones driving the deformation. Moreover, to ensure that the malleable and rigid regions of

the Chief's body received the proper binding and deformed correctly, the artists used the material type of the regions to define the binding. Then, by correlating the weighting of a region with its assigned material type, Bungie efficiently weighted a character without accumulating superfluous data.

For seamlessly transitioning through Master Chief and the other characters' run and walk cycles, Bungie developed a sophisticated blending system that could overlay these cycles to produce intermediary rates of speed, such as a fast or a slow jog. Bungie also "bookended" the cycles with transition animations, which bridged these cycles by providing more natural starting and stopping momentum that is most apparent when a character shifts its weight to start a run or skids to a stop. These bridging animations overcome the "floaty" interpolation and hard pops often seen in games when a string of animations play consecutively.



***Halo 2* sports single- and multi-player functionality, allowing as many as 16 gamers to play against people around the world through Microsoft's Xbox Live, which redefines the social aspect of online gaming.**

The characters' lip syncing and facial animation, meanwhile, was created by combining a 24-frame phoneme animation system with a 14-frame emotion system. While creating the facial poses for each system, the artists bypassed morph targets and direct-mesh animation in favor of traditional skinning of a set of bones to an overlying mesh. Then, for running real-time lip sync on the characters, Bungie used Impersonator Studio by OC3 Entertainment, which allowed the team to run pre-recorded audio to *Halo 2*'s characters and have them talk in real time using the 24 individual phoneme poses for the mouth, brow, eyelid, and head. Once the lip sync was accomplished, the animators could overlay an additional set of 14 facial bone poses for emotional expressions—from amorous to shocked to angry—that could be mixed and matched independently of the lip-sync animation to achieve almost unlimited control over facial expressivity during a given line of speech.

The popular game also supports cooperative play, allowing a person to team up with a friend, and together, save mankind.

Gaze tracking was also achieved through simple bone manipulation. "We reserved two bones in the face to direct the eyes at a given target," says engineer Greg Snook. "During the game, either the artificial-intelligence system or direct scripted commands can specify a point in space for the eyes to focus on. The game engine then aims the eye bones at these points in each frame, while simple rotation limits prevent the eyes from rolling too far back into the head when focused on points to the side or behind the actor."

Hallowed Halo

Halo 2's record-breaking sales have been touted as the gaming industry's triumph in the entertainment world, and Hollywood moguls may henceforth view the hours and money invested in gaming as a threat to their movies and DVDs. Nevertheless, the two mediums still offer very different types of experiences that may never converge, simply because the promise of interactive storytelling has yet to be realized.

Despite these differences, *Halo 2* has proven that the two art forms are now, at the very least, on equal footing. In fact, rumors abound of Hollywood's interest in acquiring *Halo* as a film property. But with the game's towering success, Bungie is likely to keep Master Chief fighting right where he is—at the controls of millions of gamers around the world. ❖

***Martin McEachern**, a contributing editor for* Computer Graphics World*, can be reached at martin@globility.com.*

Lemony Aid

By Barbara Robertson

A baby performs impossible acts in extremely close-up scenes thanks to a digital double created at ILM for Lemony Snicket

The film *Lemony Snicket's A Series of Unfortunate Events* may be about a series of mishaps, but happily the creation of its 505 visual effects shots at Industrial Light & Magic occurred under a more fortuitous set of circumstances. Directed by Brad Silberling, the Paramount Pictures release stars one of the most compelling digital doubles yet created—a toddler named Sunny—who was so ready for her close-up that the camera came within inches of her face.

Based on the popular children's storybook of the same name, the fantastic tale about the three rich and unusual Baudelaire orphans stars actors Jim Carrey as evil Uncle Count Olaf, who is determined to get the children's money, Emily Browning and Liam Aiken as the orphans Violet and Klaus, and twin toddlers Kara and Shelby Hoffman as Sunny, a baby with a mighty bite.

In fact, in one scene, Sunny grabs onto the edge of a wooden table with her teeth and hangs off the ground, swinging her feet; in another, she catches a spindle of yarn in her mouth—feats beyond the capabilities of the tiny human stars. In these shots, and others impossible for the real babies to accomplish, a digital Sunny created at ILM under Stefan Fangmeier's supervision toddled in front of the camera. Fangmeier, who boasts three visual effects Oscar nominations, for *Twister*, *The Perfect Storm*, and *Master and Commander*, describes this film as "Fellini for the family."

"The hardest effect to do was Sunny," says Fangmeier. "She had to be cute, she had to be endearing, and she had to be on model." That is, she had to match the real baby exactly.

Fortunately, one of the real babies turned out to be a better actress than expected, which reduced the load on the digital crew from an anticipated 50 shots of the wee double to less than 20. "We had just the key moments," says Fangmeier. "And that allowed us to get it right. We had time to finesse."

The Perfect Match

To create the baby's body, the modelers started working before the twins were cast by using director Silberling's one-and-a-half year old daughter as reference. And, as modelers often do for digital doubles, they began with a scan. But, working with a baby wasn't as easy as working with an adult actor.

"The baby wouldn't sit still," says lead creature modeler Martin Murphy, "so the R&D guys here developed a way to do a scan in seconds." He expects that the split-second accuracy of the new technology could also be helpful in modeling animals.

Thus, starting with scan data made possible by the new technology and with Silberling's home movies as reference, the crew created a viable baby body using B-splines in Alias's Maya. "We spent several weeks on the body, and then we found out that she would wear one long dress for the whole movie," Murphy says, which meant the body model hadn't needed as much detail as they had created. The dress, however, did require careful fabrication.

The crew built Sunny's elaborate dress from individual pieces and long lengths of ribbons. "We started with flat surfaces that were wrinkled during cloth simulation," Murphy says, "but the wrinkles had to be so small, we ended up sculpting them and using displacement maps for even finer detail."

Once the twins were cast, the digital model was refined to match. "We did a photo session with the baby that took an entire day," Murphy says. "We had to know how thick her eyelids were, how to shape the inside of her mouth, and how many wrinkles to put in her forehead. If it was off just a bit, she wasn't believable."

To simulate the soft curls in the Hoffman babies' fine hair, the crew used a complex design that included several levels of guide splines, each having different parameters that controlled the geometry and simulation for her full head of hair.

Baby On Board

To form Sunny's head and face, Murphy used ILM's I-sculpt software to manipulate the geometry and create facial expressions. For the latter, he sculpted nearly a thousand shapes for animating her face, including special sets for scenes in which the baby talks. "Some were one-offs," he says. "Others, like the one that

Left: By using blue for the specular highlight map, ILM's CG supervisors discovered they could closely match the real baby's skin. Right: The digital double for Sunny was rendered with subsurface scattering, which added translucency by bouncing digital light beneath the model's mathematical skin.

All images courtesy Industrial Light & Magic.

was used to lower her chin down, were used all the time."

The shapes were so important, in fact, that Murphy, who spent 13 years in the theater before switching careers to digital modeling, became a facial animator as well as a sculptor. "It was just easier," he says. "If I needed another shape for the animation, I could sculpt it right then." Simple shapes could be fashioned quickly, but some took entire days to mold.

For Sunny's facial performance, Murphy used photo references of the twins. For her body, animators started with data captured from babies wearing tiny motion-capture suits.

"First, we used the director's baby," says Philippe Rebours, CG supervisor. "Then we used a bunch of ILM kids. But, even though we had the motion capture data, we did a lot of shape work to be dead-on." In one scene, for example, a digital Sunny jumps up and turns to the camera only seconds after the real baby was on screen. "Her shape had to be perfect," says Rebours.

To fit the baby into such scenes as this, the crew took photographs on the sound stages using Panoscan's high-dynamic range MK-3, a rotating camera that scans 360-degree images in a single pass, swiveling the camera from one point and then another to capture the complete set. Next, they modeled a matching digital set based on the photographs and measurements taken on location, projected textures onto the rough geometry, and match moved the camera. Animators then placed the double in the resulting digital set, which matched the real set precisely. Thus, they could, for example, put the baby's mouth around a table edge.

Right: Animators placed a proxy in the matchmoved digital set. Below left: Fine wrinkles in the simulated cloth were sculpted and created with displacement maps. Below right: Guide hairs controlled the baby's fine hair. Notice how lighting adds expression. Bottom: The final image.

Lighting

In addition to capturing objects in the set, the Panoscan photographs provided information about the huge area lights used to create diffuse lighting for the film. One key to slipping the CG baby into the scenes was having her skin look as if it were reacting to the real lights.

Christophe Hery, who won an Academy Award for technical achievement for his work on subsurface scattering equations, led the R&D effort. Hery collaborated at first with CG supervisor Gerald Gutschmidt, and then as Gutschmidt began working on location, with Rebours. View painter Terry Molatore led a team of photo processors and texture painters. Rebours, working with Hery and Molatore, took charge of shader writing, with Jeff Hatchell helping craft the baby's hair. For image manipulation, the artists used Adobe's PhotoShop 7 running on Apple's Macintosh computers; for rendering, they used Pixar's RenderMan.

For subsurface scattering, Hery started with two sets of photographs of one Hoffman twin: unaltered photographs for reference and photographs taken with polarizing filters on the camera so there were no reflections on the skin. Of the latter, Hery says, "This gave us a pure base with diffuse lighting." These "diffuse" photos were converted to texture maps, stitched together, and put onto the digital model. They became the input for Hery's subsurface scattering equation.

"When I want to render with the subsurface scattering equation," Hery says, "I need to give it scattering coefficients, the scattering depth." Therefore, to calculate the scattering depth, Hery makes the assumption that the diffuse color map made from photographs taken with the polarizing lens is the result of uniform lighting on the character. Thus, the skin color is the result of subsurface scattering. So, Hery simplifies the subsurface scattering equation using the assumption that it

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will be working only with uniform lighting, and runs it in reverse.

"I run the equation backwards, so that instead of giving me color, it gives me the coefficients to get the color," Hery says. When he has derived the varying scattering depth over the surface from the input images, he's done with the images.

"Once I have the coefficients, I can run the equation forward in new lighting to calculate the color for the shots," Hery says.

To further make the digital Sunny convincing, Hery combined the subsurface equations with global illumination, something he had not done before. "With the old method of subsurface scattering, we had to light the characters with direct lighting because we needed the Z buffer," Hery says. "Now, we can use lighting that is physically modeled from the environment."

First, Sunny's digital model was lit using ILM's lighting tools, but rather than rendering the image, her face was rendered as a point cloud. Because each particle in the point cloud was illuminated, information about how much light each particle received was used as input for the subsurface scattering calculations.

Next, after placing Sunny's model in a digital set, the crew calculated the global illumination by bouncing light around the set and again rendering the result as a point cloud. The digital set matched the real set and was created by projecting photographic textures onto simplified geometry.

"Global illumination is slow because you're bouncing light, so we decoupled it, simplified the model, and used fewer points for this point cloud," Hery says. Also to speed the process, the illumination was calculated using one bounce. The data that resulted was fed into the higher resolution point cloud as one component of the lighting used for subsurface scattering on Sunny's skin.

Lastly, to match the effect of the six huge 8-foot by 10-foot area lights shining down onto the actors from the top of the set, exact measurements of the lights were given to ILM technical directors who placed digital replicas in the digital sets. As a result, the area lights put specular highlights on the digital baby's skin and tiny rectangles of light in her eyes just as on the real baby.

With this process, the lighting behaves properly up close or far away. "We were lucky to get one picture of the baby that wasn't blurry," Hery says. "If you can't capture the actor or if you want full control over the lighting, this is the way to go."

ILM rendered the model of the digital baby in neutral light to check her against reference photos before rendering her with shot-specific lighting conditions.

Details

To create texture maps that added details to Sunny's skin, view painter Molatore worked with seven photographs of one of the twins. "First we sharpened the images and then, bit by bit, processed the photos in Photoshop," she says. "We didn't want to paint them because that would soften the images, but we needed to remove all the shadows and highlights. Also, we needed to keep the tiny veins, and if we started painting, we'd lose them."

In addition, Molatore created some 40 texture maps that controlled the density of Sunny's hair, the wetness of her skin, and the placement of subsurfacing scattering and specular highlights. She painted Sunny's eyebrows, but created the lashes with geometry. Bump maps helped replicate the pore structure on the baby's skin. "In some shots, we replaced only the lower part of her face, so it had to be seamless," Molatore says. "There couldn't be any difference in the quality of her skin." She worked with Rebours, who wrote the shaders, tweaking the colors to match the baby's pearlescent skin tone.

To render the baby's hair, Rebours, working with Hatchell, calculated the difference in colors between the polarized and non-polarized images of the Hoffman baby. "The difference is the reflection," he says. "I discovered that the specular highlights were blue on her skin, and where there was less specular, it was redder. But with her hair, the specular value was yellow." By assigning different colors to the diffuse and specular lighting in various groups of digital hairs, he simulated the layers of soft, fine, wavy hair on the Hoffman baby's head.

Creating the digital baby involved a lot of handwork by the ILM crew at great expense—both in terms of people time and render time—but the crew felt it was worth it. And, luckily, the reduction of shots during production—because one Hoffman twin was a better actress than expected—gave them more time than they anticipated. As a result, even though Sunny appears in only a handful of shots, if she weren't doing things no baby can do, it would be nearly impossible to tell when she's digital—even when she's right in front of the camera.

"Sunny is in only a few shots, but she's really great," says Fangmeier. "Like we did with the dinosaurs in *Jurassic Park*, it was wise to get our feet wet before trying a full movie with digital humans. The next question is how to scale what we've learned."

The answer seems to be: one baby step at a time.

***Barbara Robertson** is an award-winning journalist and a contributing editor for* Computer Graphics World.

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Between the Lines

A unique storybook blends traditional reading with a virtual adventure

HIT Lab NZ intern Claudia Nelles, who animated the 3D models for the virtual eyeMagic book, uses a glasses-like display to make the story come to life. A camera inside the display tracks the natural features on the pages of the regular book, and then software re-creates the illustrations in stereo 3D.

By Karen Moltenbrey

Books have changed little since papyrus scrolls began replacing clay tablets some four millennia ago. A few milestones, such as Johannes Gutenberg's printing press, have influenced the bookmaking process in the interim, but none has radically altered a book's basic form—that is, until now.

Through an innovative application of CG technologies, the University of Canterbury's Human Interface Technology Laboratory New Zealand (HIT Lab NZ) has transformed reading with what it calls an eyeMagic book. This revolutionary publication blends reality and virtual reality by superimposing animated 3D content over the pages of a children's storybook. The end result is a unique, interactive reading experience that may forever change the way people read.

One of the first publications created with the eyeMagic technology is an eight-page fairy tale titled *Giant Jimmy Jones*, written by renowned New Zealand children's author and illustrator Gavin Bishop. Using a handheld display, readers are able to transform this seemingly typical storybook into a virtual adventure in which the characters rise from the flat pages and spring to life in stereoscopic 3D.

The eyeMagic project was funded with a New Zealand government grant through an initiative that encourages collaboration between the arts and sciences, with the HIT Lab providing the engineering and science expertise, and Bishop the artistic component. Because the technology is government funded, the project, in essence, is an open book: An open source version of the setup's vision tracking system is available on the HIT Lab's Web site (www.hitlabnz.org). Moreover, the eyeMagic book is available for public reading at the South Christchurch City Library in New Zealand.

Artists at 3D modeling facility One Glass Eye re-created the storybook's characters and objects in 3D using Discreet's 3ds max software, matching the CGI to the 2D drawings. The scenes were later animated at the HIT Lab NZ.

Illustrating the Concept

Books have always had the ability to deliver magical experiences to readers. And yet, for this project, a bit of magic—the type of digital wizardry used in some Hollywood films—was needed to deliver the eyeMagic book. Until Bishop became involved in the project, he had never worked with 3D imagery. But because his art would appear in both the real and virtual worlds, the author/illustrator became a quick study, having to adapt both his overall vision and his sketches to meet the technology requirements in this groundbreaking project.

Foremost, Bishop decided to keep his story short and simple, suspecting that the virtual portion of the book would take some time to complete. He then began sketching out rough storyboards as he normally would do, to determine what would be shown on each page of his book—which characters would appear in each scene, where they would be placed, and so forth. He then painted the full-sized pictures for the regular book.

"I showed the finished pages to the group at the HIT Lab, but they told me I needed to show more detail so the [3D] artists could create their models," Bishop explains. "I had to redo all my drawings, and all the characters and figures in the book had to be drawn three to four times from all angles so they could be re-created three dimensionally on the computers. I didn't realize that everything—every item, every image, every character—in my illustration would have to be made again as a 3D model for the eyeMagic book."

After the regular book's drawings were finished, Bishop worked closely with the modelers from One Glass Eye, who used

Renowned children's author Gavin Bishop took his first step into the world of CGI when he collaborated with modelers who transformed his traditionally illustrated tale *Giant Jimmy Jones* into a 3D adventure.

Discreet's 3ds max to re-create the illustrator's scenes, adding dimensionality to the characters and environments. To match the CGI versions to Bishop's drawings, the team at One Glass Eye scanned portions of the pictures and applied the surfaces as textures on the virtual images using Adobe's Photoshop.

But it was at the HIT Lab where the book came alive. There, intern Claudia Nelles animated the characters (about a minute of animation per page) after discussing with Bishop the types of movements he envisioned for each one. "I will never forget the first day I saw the animation," Bishop recalls. "I dropped by the lab, and Nelles asked me how I wanted the giant to walk. I told her that I had never thought about that, so she showed me what she had done up to that point, which was for the opening sequence. With a mouse click, the giant stood on the page of the book in three dimensions and walked—or rather, sort of lumbered—across the page. Then he knelt on one knee, then the other, and waved to me. He then sat back on his haunches, and the title of the book rose out of the ground and formed a big arc around the giant. I was just blown away. It was amazing."

Digital Bookmaking

The 3D animation was possible thanks to a number of technological innovations in object tracking and real-time rendering that when used with standard hardware—a Web camera, a see-through handheld display resembling a pair of opera glasses, and a PC—takes reading to a new level.

Unlike in Bishop's demonstration, the actual eyeMagic book animations are triggered by the reader. When people look at the book through a handheld display/camera unit, they see 3D images leaping from the pages of the regular book. The book itself is not magic; the magic occurs inside a computer, linked to the glasses-like display, running special tracking software that recognizes the pages of the book. So when a person moves around and looks at the book from different positions, the camera in the glasses will track certain features in the illustrations, and the software will re-create the 3D objects so that they will appear to be attached to the pages.

According to HIT Lab director Mark Billinghurst, when the camera "sees" the book pages, the software, based on a program developed by lab partner Dr. Hirokazu Kato of the University of Osaka in Japan, searches for parts of the picture that are most different from others—the edge of a building or the shape of the giant's head, for example. Once the software recognizes these so-called natural features, it projects 3D animated pictures onto the pages. "Because the real camera's viewpoint and the virtual camera's viewpoint are aligned," he says, "it looks like the 3D models are popping out of the regular storybook pages."

What differentiates this tracking software from commercial products, for example, is that it works in real time. "By knowing what the features are, we can calculate in real time exactly

Innovative real-time tracking software not only recognizes the specific features of the drawings but also renders the 3D graphics above the regular book's 2D illustrations.

CG artists scanned a number of characters from the book *Giant Jimmy Jones* and applied the scanned data as textures on the virtual images, thereby ensuring that the CGI versions looked like the printed illustrations. As a result, the transition to the virtual world is smooth and seamless.

where the actual camera is relative to the page of the book, allowing us to build the virtual scene from that same viewpoint," Billinghurst explains.

The real-time camera tracking was the biggest technological achievement for this project, contends Billinghurst. "We worked with Kato, who had been developing this technology for a number of years, and we just kept requesting improvements until we got the robust performance we needed," he explains. Because the visual quality of the imagery was extremely important for the image recognition, the group coupled it with a high-quality USB camera, a Logitech 4000, which fit comfortably into the lightweight glasses-like display.

The tracking software also serves as the graphics rendering solution. "It's one thing to know where the camera is, but another to be able to draw the graphics over live video of the real world," says Billinghurst. To accomplish this, the group wrote its own model-loading script using the OpenGL graphics library, which preserved the animations, lighting, and textures, and provided the option of loading the models without the keyframes, all in real time. It also rendered the imagery in real time, taking the live video feed and compositing the OpenGL graphics above it.

"Most film-quality compositing programs don't work in real time because they have to produce higher-resolution physical output, but we don't need a high-res output because the handheld display we use has the resolution of about 800x600 pixels," says Billinghurst. "So for us, the emphasis is on real-time performance rather than broadcast- or film-quality output."

Book Report

Without question, this unique project is expanding the art of reading into a unique, new dimension. But what kind of effect has it had on the author's overall style of writing and illustrating? "I don't dwell on the process too much because I don't want it to influence what I do next," says Bishop. "Yet I want to keep my 'vision' open and embrace new things that may pop up."

At the HIT Lab, meanwhile, Billinghurst and his group are already planning another eyeMagic book or two that will include improvements to the current technologies. For instance, they are working on making the graphics immersive and interactive. "I'd like users to be able fly inside a virtual scene and see virtual characters as life-sized, and then interact with them in some way, just like in a first-person computer game," explains Billinghurst.

For his work on the eyeMagic book and other projects, Billinghurst received a nomination in the education category of the World Technology Network awards, presented in October, for his contribution of innovation in the field of education.

Looking at the bigger picture, Billinghurst says the eyeMagic technology has a number of possible applications in education, architecture, medicine, entertainment, and other disciplines. "I'm not really sure where this will become a mainstream technology, but I am sure it will be one somewhere," he says.

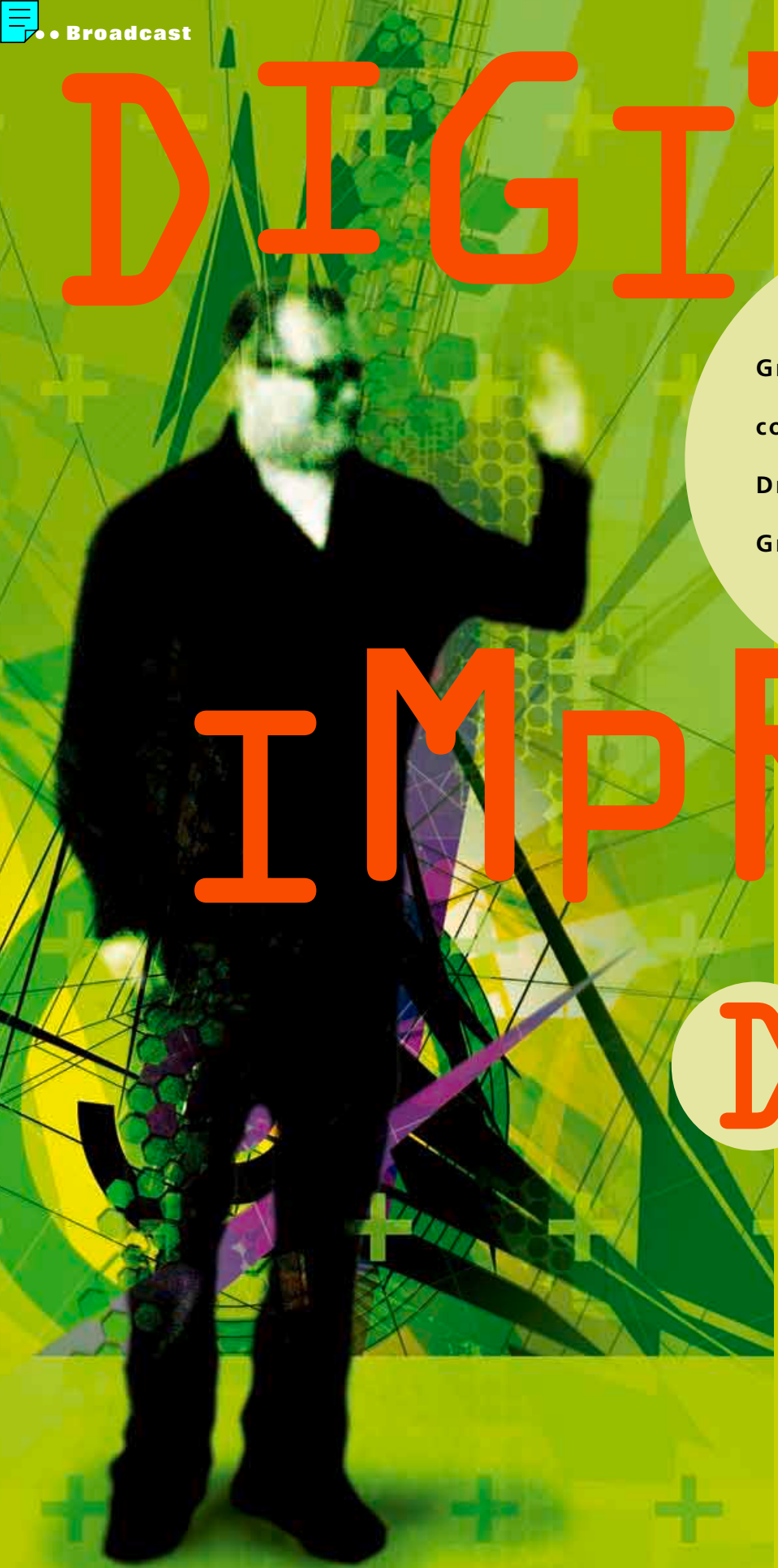
In fact, museums are ripe for this technology, Billinghurst notes. Technology is advancing rapidly in the mobile arena, with phones that have good-quality color displays and cameras, and Nvidia's newly announced graphics chip that will provide a robust graphics solution by midyear, he says. So there is good reason to optimize the technology to work with mobile phones. "People carry their phones around all the time, and they could point them at objects in the real world, such as museum pieces, and have virtual content popping out from the objects."

But for now, the readers at South Christchurch Library are focused on how the technology works with books. Says 10-year-old Lucas Keane from Somerfield School, who explored the *Giant Jimmy Jones*: "It's great. I can't wait until I'm 15, when there will be millions of these books around." ⌘

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

DIGITAL IMPROV

Graphics share the comedy spotlight in Drew Carey's new Green Screen Show



By Karen Moltenbrey

Drew Carey, known for his comedic edge, is introducing prime-time audiences to the amusing side of animation. For the past few television seasons, Carey has garnered additional laughs from his studio audiences by incorporating humorous CG-augmented moments into selective segments of his live-action comedy *The Drew Carey Show* (see "Computer Crash," April 2003, pg. 6). This season, he has created an entirely new type of comedy show in which digital imagery is a main part of every act.

Called *Drew Carey's Green Screen Show*, the new program blends "improv" animation with the same type of improv comedy found in Carey's *Whose Line Is It Anyway?*, during which comedians perform an improvised comedy skit centered around a topic that's suggested by an audience mem-

ber. But for the *Green Screen Show*, instead of performing the sketches on a regular stage, the dozen or so comics get their laughs on a greenscreen set, sans props and backgrounds. But that accounts for only half the show's fun.

After the program's performance-comedy segments were filmed and edited this past spring, animation directors were let in on the jokes. First, executive producer Ron Diamond, head of animation company Acme Filmworks, posted QuickTime videos of the skits on a site accessible to invited production facilities. If directors wanted to bid on a certain sketch, they would submit a proposal describing their animation style and creative vision. Carey and the show's others producers would then review the submissions and choose one that they believed brought out the most humor in the piece, explains Harold Moss, creative director at New York City-based FlickerLab, which so far has done two animated segments for the series.

"In the proposal, you merely have to commit to a visual style, or image treatment, and you just see where you can go with it," says Moss.

The animation, like the comedy, is improvised, in the sense that the producers stay clear of the visual and conceptual processes at this stage. As a result, there is no particular animation style associated with the show—sometimes it contains 3D CGI, while other times it features 2D imagery and even photo montages, all of which are composited into the live action.

Likewise, the concepts are original, improvised by the various facilities. This, in turn, gives each routine a novel feel in addition to an individualized look. "Our intention is to find directors across the globe who can provide unique animations, both stylistically and artistically, and who will elaborate on Drew's form of audience-suggested improv," explains Diamond.

Animation Connection

While the comedians perform under pressure, their roles are done in approximately five minutes, the average length of a skit. Conversely, the animators have six weeks to finish their portion. "Once we get into the process, there is a lot of interaction between us, the producers at Acme Filmworks, and Drew Carey," says Moss. "But it remains the [animation studio] director's job to carry out the facility's original vision. And once that vision is committed to, there's no turning back and no second-guessing."

Acme Filmworks begins the postproduction process by pulling the greenscreen chroma keys on all the segments inside Discreet's Flame before sending the live footage to the animation facilities. This produces uniform color channels, enabling the facility to achieve one of the few "consistent" looks of the show.

At FlickerLab, the team generates a QuickTime version of the file and imports it into Macromedia's Flash, a format that is expanding beyond its previous Web-only medium boundaries, Moss points out. This version serves as the group's reference track for building its animation. Meanwhile, the artists create storyboards, working out the visual jokes with Carey and company. "One of the challenges is that we want the animation to look good and be funny," Moss says. "But the stars of the show are the actors, so we must be careful not to overwhelm or undercut the improv comedy with animated gags."

Animation with an Edge

One of FlickerLab's segments, called "Catch That Knife," is a prop-filled routine created with Flash animation. Carey came up with the concept of a game show, and someone from the audience suggested the cutlery angle, resulting in the so-called contestants competing in a knife-catching contest. "The idea was already funny, so our challenge was to keep it in good taste, without it being too bloody or gory," says Moss, "yet 'bad' enough to still be funny."

The digital characters were developed on paper, then inked and painted in Flash before they were approved. The team created the rough animation keyframes for the characters—in this instance, sexy nurses—using Flash running on Apple Power Mac G5s with Wacom tablets. Then, after crafting backgrounds in Flash and Adobe's Photoshop, the group pulled the digital imagery together, compositing it in Adobe's After Effects, and filled out the backdrops and added props, including various knives.

Because this is an improvised show, the actors on stage are not blocked during filming, so the cameraperson must try to frame them in the shot as they pace and bounce around the stage, just like comedians often do during their routines. "They aren't thinking about us poor animators and what this will be like when we try to composite the imagery into the scene,"

CG has a starring role in Drew Carey's unique improv comedy TV program. First, comedians are filmed on a greenscreen stage (top), then CG is added to complete the skits (second) appearing on the show.

jokes Moss, who, like other directors, is used to manipulating the smallest detail on a typical greenscreen set. Because the cameras rarely remain stationary during the performances, the team had to stabilize the video, which FlickerLab achieved in After Effects, "right up to the last render," Moss says.

The rapid movement of the actors also made it difficult to animate the props, often requiring the group to complete the process on a frame-by-frame basis. In "Catch That Knife," for instance, Carey decided that he

would be bound by handcuffs with an attached digital ball and chain. "So for the three minutes Carey appeared in the sketch, we had to hand track the handcuffs in Flash," notes Moss. Conversely, the artists used After Effects to place some of the other props in the hands of the various actors.

"We had to do this so the animation and the props would be convincing, as opposed to merely realistic," notes Moss. "Often this is more difficult. Realistic means tracking exactly to the motion. But with animated props, we tried to capture the level of expression in the live action. In this case, the use and expressiveness of cartoon-like props needed to be tracked back to the realistic motion of the actors, who were really doing slapstick comedy."

For the "Toaster" skit, FlickerLab created a range of digital backdrops by stitching together numerous photographs within After Effects.

Later, the group used an After Effects plug-in set, Pinnacle Systems' Composite Wizard (published by Red Giant Software), as well as After Effects' built-in plug-ins to optimize the colors before delivering the complete rendered version of the skit that aired.

A Virtual Toast

In contrast to the traditional animated look of "Catch That Knife," FlickerLab's other segment, "Toaster," uses photo montages to recreate "Hollywood clichés" within the area of set designs. The improv started with a concept suggested by the audience of a "terrible accident." In the middle of the sequences, a voice prompt instructs the actors to go for a "Hollywood moment." Taking an opportunity for the extreme ad-lib, Carey laments to his stage wife, "Sometimes I am mentally ill," and then wonders where his breakfast is—hence, the focus turns to a broken toaster and accidents that can happen in the kitchen. At this point in the routine, the actors break into a dramatic silver screen scene in a kitchen setting of yesteryear.

Visually, FlickerLab settled on the concept for quick-change settings, all with a different take on a kitchen. "Moss pounced on the Hollywood moment and Broadway moment, and took the story out of the realm of what most people would imagine," says Diamond. The team achieved this by accentuating extreme movie moments and creating a contrasting visual genre for each one. "The *Green Screen Show* is about augmenting the humor with details that make it funnier," he adds. "Moss's Dickensian world was very theatrical, and it sold the idea."

Artists constructed the kitchen settings in "Toaster," including this one, to resemble those found in memorable Hollywood films.

The diverse backdrops include a surreal display of cooking areas based on dramatic scenes in Hollywood movies. For example, Moss evoked a filmic reference from *Days of Wine and Roses* for an everyday black-and-white household kitchen; another set is fraught with the melodrama from *Splendor in the Grass*; a mental ward reflects the vibe of *One Flew Over the Cuckoo's Nest*; and the Gothic castle drums up visions of old Vincent Price films such as *The Pit and The Pendulum*. "We tried to make it feel as if you were watching one of these old films, and just visually amplified what the actors were doing," explains Moss.

The team achieved that look using what Moss describes as a photographic illustrated style, achieved by stitching together 30 or so photographs in Photoshop and compositing them in After Effects to create each of the seven diverse, artificial locations that exist only virtually. Then, the artists used painting, light, and color to nail down a specific yet edgy "psycho-killer" mood in reference to Carey's "mental illness" comment.

Most of the props also originated from photos—including drinking mugs, bandages, and the Grim Reaper's scythe—while others were crafted in After Effects.

The *Green Screen Show*, in fact, is the first comedy show that has incorporated animation with improvisation, resulting in a unique collaborative process between comedians and artists. "The concept and format of the *Green Screen Show* is so open and allows for many different styles of animation and levels of creativity," says Moss. "And we get to do something unique every time, which challenges the animators and the directors to keep the ideas fresh."

Currently, the completed sketches are airing in half-hour shows during Thursday evenings on the WB Network. Meanwhile, Moss is already looking ahead to the challenges of a second season, mulling around various styles—possibly 3D animation with composited video. Either way, he knows that the work will have to generate far more than a laugh a minute.

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

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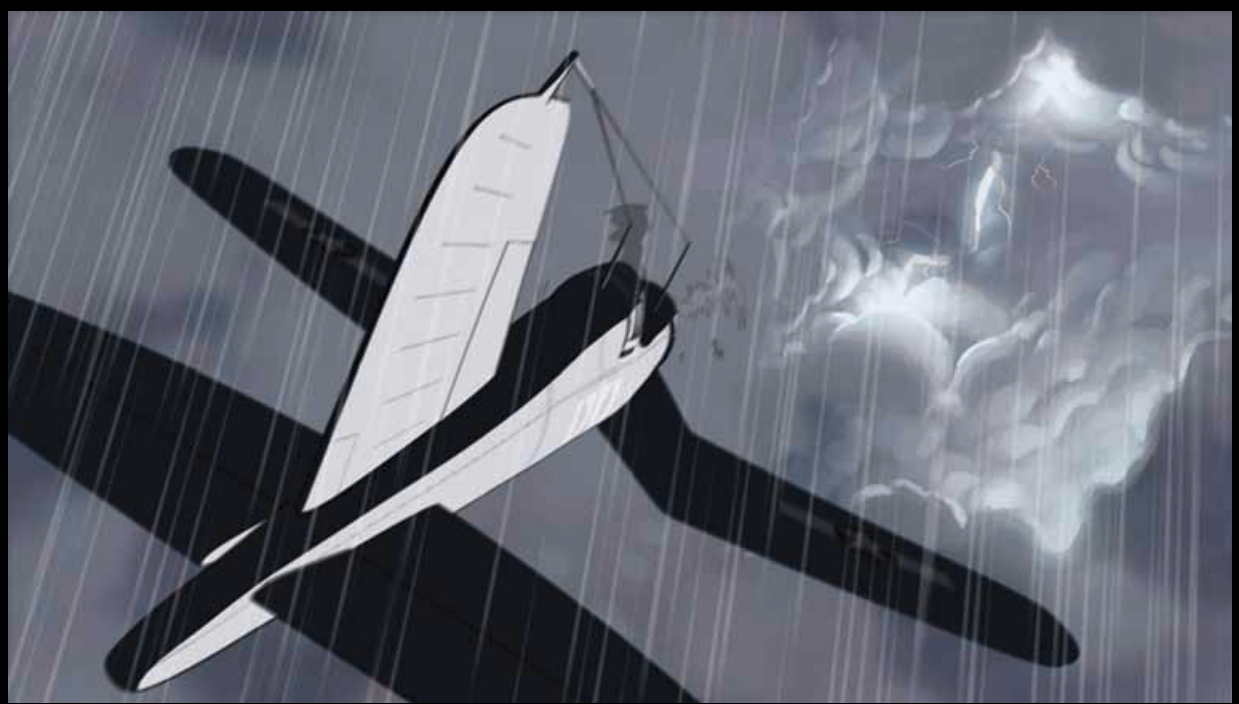


From top to bottom:
Divya Siddharth Achrekar from the Savannah College of Art and Design created this project, which was runner-up in the Student Film-Animation category and winner of the best SCAD Student Film, for his graduate thesis. Based on evidence of advanced technology from ancient times and its similarities to modern science, the film was crafted in Maya, while the textures were created in Photoshop. Compositing was done using After Effects and Shake.

Rex Steele: Nazi Smasher Winner of the best Student Film-Animation, this project by Alexander Woo from New York University is a "flyback" to World War II, with flying ace Rex Steele attempting to foil the plans of his German counterpart. The artist created the imagery in Maya and TomCat Toon Shader. He also used After Effects for compositing, and Animo for the digital painting. Final editing was done in Final Cut Pro.

Student and professional filmmakers from across the globe showcased a wide selection of juried works to approximately 25,000 attendees at the 2004 Savannah Film Festival, hosted by the Savannah College of Art and Design (SCAD) this past fall. In addition to workshops, lectures, and special events, the eight-day event featured more than 50 films, selected from 500 entries in various categories, including student, feature, short, animation, and documentary works.

The student entries included both live-action productions and animated shorts. In fact, this year marked the first time since the festival began in 1998 that an award category was created just for student animations. "We were very impressed by this year's animated films, particularly by the strong selection of stu-

dent animation work," comments Len Cripe, managing director of the festival.

Siddharth Achrekar took top honors in the SCAD-only Student Film category and was runner-up in the overall Student Film-Animation competition with "Divya," a high-flying adventure in which an ancient pilot teaches his modern counterpart some new tricks. Capturing first place in the Student Film-Animation category was Alexander Woo from New York University with "Rex Steele: Nazi Smasher," an animated adventure featuring the hero Rex Steele as he attempts to dismantle another Nazi plan.

A selection of student animated works from the festival appears on these two pages. *—Karen Moltenbrey*

Clockwise from left:

The War Inside Created by Jahmad Rollins from the California Institute of the Arts, this short is a personal project about an illustrator struggling to give life to his ideas and characters (see lower inset). Most of the art was hand-drawn, color-enhanced in Photoshop, and edited in After Effects and Premiere.

Le Vieil Homme et les Poissons This animated tale by David Bokser from the Savannah College of Art and Design is about an old man whose desire to become a fish drives him to create a device so he can fulfill his dream. The film was created using Maya, Photoshop, and Shake.

Woman in the Attic This film, created by Chansoo Kim from the University of Southern California, explores aging and mortality when a woman confronts her younger self in the attic. Shot with an Olympus E-10 digital camera, the film was composited in After Effects and Commotion, and output to film.

Sun Java W2100z

Sun Microsystems introduces a powerful graphics workstation

By George Maestri

The new Sun Java Workstation W2100z is well suited to applications involving large amounts of data.

Sun Microsystems invented the desktop graphics workstation, and built its first fortune in the 1980s with Unix-based graphics workstations. Its latest release, the Sun Java Workstation W2100z, takes advantage of AMD's 64-bit Opteron processors and superior graphics from Nvidia to produce a capable system with strong software support.

The workstation itself is housed in an attractive midsize tower case with plenty of ventilation. The front offers two bays for CD or DVD drives, as well as a panel with audio, USB, and FireWire ports. On the back of the case are standard serial and parallel connectors, along with those for USB, FireWire, and Gigabit Ethernet. Interestingly, this workstation doesn't offer PS2 connectors for the keyboard or mouse—everything is connected via USB.

The W2100z might win the award for the largest number of operating systems supported. The review unit came configured with four operating systems—Sun's Solaris, two versions of Linux, and Windows XP. It's nice to know that Sun offers such a wide array of software options.

The case pops open by removing the side with two thumbscrews. The internal components are nicely arranged, and nearly everything can be serviced without tools. The case supports two internal hard drives even though it looks as if there are five slots. I'm assuming the extra slots are kept open because of heat considerations, but it does not allow enough drives for a true RAID. (Sun reports that it now supports four 146GB hard drives.) Hard drives can be connected to the motherboard as SCSI only, limiting the system to more expensive drives unless a SATA or IDE card is added. The review unit came configured with a fast 10,000 RPM 73GB Ultra320 SCSI drive.

The motherboard is unique in that it can be upgraded using Sun components. The motherboard in the review system held dual 2.4GHZ Opteron processors. AMD's 64-bit Opteron processors can address much more memory than 32-bit processors. This machine came with 4GB of PC3200 RAM, although it can accommodate up to 16GB, which should be more than enough for any current application.

The motherboard sports a robust PCI implementation, containing five separate PCI-X slots on four independent PCI buses. This feature infuses the machine with a large amount of bandwidth. It also makes it ideal for use as a server and applications such as high-end editing and any other task that involves moving considerable data. I definitely can see the W2100z configured as a media server with an extra Gigabit Ethernet card and an external RAID array.

An AGP 8X slot containing a high-end Nvidia Quadro FX3000 board handles the graphics chores. I was hoping to see PCI Express in this workstation, but the technology is still fairly new. Sun has promised that its next-generation workstations will support this critical new graphics technology.

The W2100z boots fairly quickly. During the process, the system fan went into overdrive for 30 seconds, sounding like a jet engine. I'm sure it was just a system test. Once up and running, the system was quiet.

For consistency with my other evaluations, performance testing took place on the Windows platform. (Although the system booted by default to the Windows OS, Sun reports that it does not support Windows at this time. It is WHQL certified.) The numbers came in as expected for a dual-Opteron system. The CPU integer speed was slightly faster than expected at 22021 MIPS, with floating point at 9863 MFLOPS. Opteron-based offerings are well known for exceptional memory bandwidth, and this one was no exception, with a blazing speed of 11076MB/sec. The SCSI drive turned in a respectable 59MB/sec.

Graphics performance was fairly fast, thanks to the high-end Nvidia card. Viewperf 8.01 tests came in at 23.29 for 3ds max, 27.55 for Maya, and 26.29 for Pro/E. These numbers are very good, but slightly below the top speeds for some of the newer PCI Express cards. Although the differences between AGP and PCI Express cards are negligible now, that gap will widen as next-generation PCI Express cards begin to utilize the full power of the new interface.

Of course, a machine is nothing unless it can run applications. I loaded 3ds max 7 and animated a few scenes with no compatibility problems. I also ran Mental Ray renders, and the speeds were quite fast.

Overall, I really like the W2100z. It's more expensive than other systems, but Sun offers volume discounting. Graphics performance was great, while maintaining the fast bandwidth of a server. This machine would be great for applications that require moving a lot of data, graphic or otherwise.

George Maestri *is president of Rubberbug, a Los Angeles-based animation studio specializing in character animation.*

stats

Sun Java W2100z

Price: $8695 (as configured)

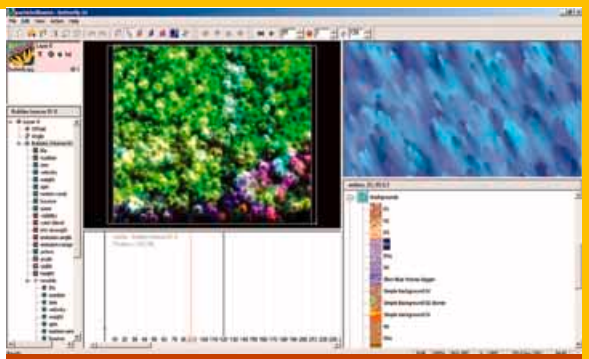
Minimum System Requirements: Not applicable

Sun Microsystems
www.sun.com

ParticleIllusion 3.0

The latest upgrade offers a wealth of preset effects

By Doug King



To edit in ParticleIllusion, simply select a particle attribute in the hierarchy window and adjust it on the graph below.

Wondertouch recently updated its particle effects tool, ParticleIllusion, to Version 3.0. A powerful, stand-alone particle effects generator, it offers more than just standard particles; you also can create modern logo effects and motion graphics.

ParticleIllusion 3.0 includes 28 libraries containing more than 900 individual preset effects in the areas of nature, explosions, cartoons, smoke, space, logos, gunfire, and water. Additional emitter libraries (more than 1200 emitters total, in fact) can be downloaded from the company's Web site. Before adding particles to your scene, you can view, modify, or create custom presets or preset libraries in the Library Manager window. If you like the glow of an effect and wish to apply it to another, simply drag and drop that glow attribute onto the other particle. It doesn't get any simpler to create stunning effects in seconds, and you haven't even started modifying on a particle level yet.

ParticleIllusion's interface is straightforward and well laid out. A large Preview window runs real-time examples of a particle selected in the Library window. And the Hierarchy window is a common sight for anyone working with computers.

All particle editing is accomplished by selecting the attribute you wish to modify in the Hierarchy window, and then adjusting it in the Graph window at the bottom of the screen. Adjustments can be made in real time while your particle effect plays back in the Stage window, enabling you to see the modification instantly.

Editing in this manner is simple. It is easy to understand what I am affecting as I add points to the graph line and raise or lower the value. I prefer this method over using esoterically labeled spinners. For one, it is visually clear what I am changing. Second, because I am making adjustments directly on the timeline of the animation, I can place edit points precisely on the frame I desire without having to switch to another window or interface. Right-clicking on an edit point presents the option to change from straight lines to curves for smoother effects and the ability to ease in and out.

You also can edit Emitter Properties—such as color, shape, and orientation—by right-clicking in the Stage window and selecting Properties. Doing so opens the Emitter Properties dialogue, which includes Hierarchy, Graph, and Preview windows. Closely resembling the main screen, this dialogue is where you'll create most of your custom particles. Unfortunately, the Undo function does not work in this one area. Considering this is where you'll do most of your work, some sort of Undo capability is expected, and desired.

ParticleIllusion provides Deflectors, Blockers, and Forces for adding to a project and for affecting particles. It lends to better integration of particles into projects.

The program uses Layers to better organize a project and to ease the integration of particles into background footage. Loading background images is a simple matter of right-clicking on a layer and selecting Background Image from the menu. You can load AVIs and such standard image formats as JPEG, PNG, PSD, SGI, TIF, and TGA. You can save out to these formats for rendering as well.

Rendering output is quick and simple. Rendering does support motion blur and alpha channel output, but I wish the Shockwave format was supported.

Another feature I would like to see is a camera. Although promoted as a 2D particle effects application, many of the particle effects appear to be 3D. And it would be nice to be able to move around and through the particles. In this world of 3D proliferation, it might make sense to enhance the program in future versions.

Version 3.0 includes interface and work flow enhancements. Unlike previous versions, where you had to have your time slider set to the keyframe you wanted to edit, 3.0 enables you to adjust emitter position and handles at any time, lending to a faster work flow and easier effects manipulation. It's now easier to adjust layer positions and duplication in the Hierarchy window, as well as to move to keyframes and jump frames in the modified Playback toolbar. I could also display the background image in the Preview window. This proves especially useful with emitters that use the new "Get color from layer" function.

Although a few areas could be improved upon, ParticleIllusion is a powerful tool worthy of consideration by anyone developing effects or motion graphics. Its 960 preset effects can get you up and running with professional-looking results much quicker than most other plug-in particle programs. ❖

Doug King, *a contributing editor based in Dallas, develops animated projects for his company, Day III Productions.*

stats

ParticleIllusion 3.0

Price: $399

Minimum System Requirements:
a 500MHz or faster Intel-compatible processor, 128MB of RAM, Windows 98/ME/NT 4/2000/XP, and OpenGL support

Wondertouch
www.wondertouch.com

RENDERING ENGINE

Rtre

A new rendering tool delivers real-time 3D visualization for 3ds max

By Doug King

Rtre helps designers create 3D representations that clients can walk through and view from any angle.

Game developers spend years writing and perfecting code for game engines so players can see the fantastic worlds they create in rich, full detail in a real-time environment. Why shouldn't architects, designers, and film effects producers use the same technology? Most do not have the time or cash that it takes to develop such engines. Cubicspace, in partnership with Turbo Squid, has produced a plug-in engine for Discreet's 3ds max and Autodesk's Viz that could revolutionize how designers work and how they present their creations.

Rtre is a 3D rendering program that enables developers to explore scenes instantly, no matter how complex, in either stylized renderings or with textures and radiosity. Rtre renders millions of polygons per second and supports DirectX and OpenGL. The program launches and works inside Viz and 3ds max (Versions 4 through 6), so there is no need to export files. You can output directly from Rtre as either still images (up to 65,000x65,000 pixels), AVI movies, or real-time presentations with the use of the Rtre Publisher. Rtre also supports Stereographics' CrystalEyes3 glasses for stereoscopic rendering.

The easy installation included Rtre, Rtre Texture Manager (a program that defines the rendering and edge styles by object, rather than by the entire viewport), Rtre Publisher, and Thunder RT (for adding sound to a scene). Most of the tools—Rtre Controls and Rtre Lighting—are located in the Utilities panel.

To use Rtre, you simply open the scene you wish to view, right-click on the View name, and then select Views/Extended/Rtre 3D View, and the view is placed into Rtre's real-time engine control. At first you will only see white, Rtre's default background color. To view your scene, you must access Rtre Controls and click Add All; your scene should appear fully textured and ready for real-time navigation via the mouse or arrow keys.

Vertex lighting and Radiosity are fully supported in Rtre, as are Lightscape setups.

One nice feature is Rtre's ability to create real-time visualizations of stylized renderings. With the Rtre View open, right-clicking on the top area of the View opens a drop-down menu, providing access to rendering and edge styles. Here, you can set the rendering style to shaded, texture, and pencil and the edge rendering style to wireframe, sketch, and silhouette. By combining and experimenting with these rendering styles, you can create some great-looking images.

Rtre Publisher enables you to create your own interface for presentations you send to clients. Rtre Publisher includes in the presentation file a stand-alone player, giving designers and architects a platform for displaying their work and saving their clients from the hassle of purchasing or downloading software. You also can create your own guided tours by mastering the flight controls, recording your movement through a scene in real time, and then delivering an AVI movie with a sound track. In either case, simply burn your file on a disc, and it's showtime.

Designers who need or want to see their creations quickly and from multiple angles without having to wait for lengthy renderings will value Rtre. For designers who want the client to walk through a design, while looking at it from every angle, Rtre is a dream come true. Architects, set and stage lighting designers, filmmakers, and special effects producers will appreciate the previsualization power Rtre provides.

Animated objects not only can be added to scenes, but also can be triggered by events and actions—such as pushing a button—in the real-time environment. You can animate doors, windows, elevators, and vehicles, as well as lighting effects for added realism. Another feature, 3D Positional Sound, generates sound effects relative to the users and the emitting object. Perhaps one of Rtre's greatest features for architects, it offers full support of ArchSoft RPC files.

If there is any one thing about Rtre that I found dissatisfying it is the supporting documentation. The tutorials weren't terribly helpful, and I would have liked more information on applying Triggers and Sounds. Thankfully, the program proved simple enough to figure out; with a little experimentation and mouse-clicking, I'm certain I would be able to work through virtually any challenge.

I have only scratched the surface of what Rtre enables professionals to do. But Rtre is clearly a fantastic tool that designers will find invaluable for creating powerful presentations of their work. ❖

Doug King, *a contributing editor based in Dallas, develops animated projects for his company, Day III Productions.*

stats

Rtre

Price: $1695

Minimum System Requirements: an Intel Pentium III processor, Microsoft Windows 2000 or XP, 512MB of RAM, and a 64MB AGP Graphics card supporting OpenGL

TurboSquid www.turbosquid.com

products

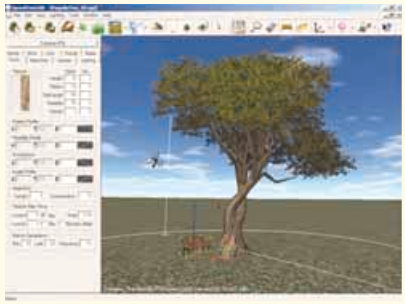
For a direct link to more product information and vendor Web sites, click on: **www.onlinecenter.to/cgw**

SOFTWARE

SIMULATION

Forestry Finding

Win Digimation has started delivering SpeedTree3, the latest version of its software tool for the creation of low- to medium-polygon-count trees. SpeedTree has been upgraded with support for flared trunks, enhanced



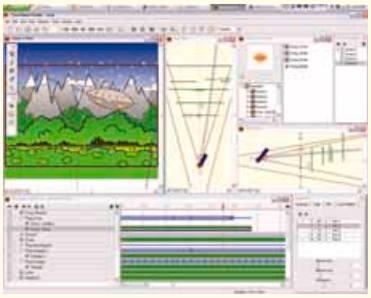
MaxScript support, and a new sample library with higher-quality trees. An advanced wind control, SpeedWind enables uses to define how the wind affects different parts of a tree, whereas the improved foresting tool now supports copies, references, and instances. Priced at $395, SpeedTree3 includes Version 3.4 of the company's SpeedTree CAD Lite program. Upgrades from SpeedTree Versions 1 and 2 are available for $200 and $100, respectively. Digimation also has begun shipping three separate SpeedTree Tree Libraries, each with more than 30 new tree species and 150 SPT files.

Digimation; *www.digimation.com*

3D EFFECTS

Toon Boom Update

Win Toon Boom Animation has released Version 2.5 of its Toon Boom Studio for the PC. This latest upgrade features improved sound scrubbing and support for scanning. Version 2.5 enables users not only to draw in the 3D Sceneplanning space, but also to visu-



alize and manipulate drawings and keyframes in the timeline. Users of Version 1 or 2 can upgrade at a cost of $199 and $99, respectively.

Toon Boom Animation; *www.toonboom.com*

Informatix Info

Mac Informatix Software International has unveiled a Macintosh version of its Piranesi 4 software. Now running on the Mac OS X platform, Piranesi 4 employs 3D painting technology designed to aid designers in adding detail and hand-drawn effects to models and renderings. Version 4 boasts a library of more than 300 new cutout and texture images, an improved user interface, and improved integration with the 3DS, DXF, and SketchUp formats.

Informatix Software; *www.informatix.co.uk*

VIDEO

Fresh from the Farm

Mac • Linux The Pixel Farm has introduced PFPlay 1.0, a software-based digital film production review system. The release enables resolution-independent, uncompressed playback directly from disc, as well as the exportation of movies in any format for client approval. Additional features include editing and color analysis tools, before/after shot comparisons, cross-platform batch processing of image sequences, a 3D Look Up Table manager, and media management utilities. Now available for Mac OS X and Linux, PFPlay is expected to ship for the Windows platform this quarter.

The Pixel Farm; *www.thepixelfarm.co.uk*

HARDWARE

VIDEO

DV Expansion

JVC has added the GY-DV5100 to its professional DV line. The new 3-CCD, Pro-DV camcorder boasts a newly developed 24-bit digital signal processor (DSP), an integral 12-bit analog-to-digital converter (ADC), and a 400-percent dynamic range. Now shipping, the GY-DV5100U sports a 16:9 mode for widescreen programming, a Hi-Res Frame Mode for greater vertical resolution, and expanded customization settings and audio capabilities.

JVC Professional Products; www.jvc.com

events

JANUARY

25–27
Video Forum 2005, held in London. Visit www.videoforum.co.uk.

31–2/4
Animex 2005: The Animex International Festival of Animation, held in Middlesbrough, England. Contact +44-01642-342638, www.animex.net.

FEBRUARY

2–5
Imagina 2005, held in Monte Carlo. Contact +377-93-10-40-54 or www.imagina.mc.

MARCH

7–11
Game Developers Conference (GDC) 2005, held in San Francisco. Visit www.gdconf.com.

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advertising sales offices

Group Publisher
Mark Finkelstein
TEL: 603-891-9133
FAX: 603-891-9297
E-MAIL: mark@pennwell.com

Associate Publisher
Randy Jeter
1150 Lakeway Dr.
Ste. 217
Austin, TX 78734
TEL: 512-261-1998
FAX: 512-261-7915
E-MAIL: randyj@pennwell.com

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United Kingdom
Amanda Loftus
TEL: 44-1793-641571
FAX: 44-1793-610001
E-MAIL: amandal@pennwell.com

France
Luis Matutano
TEL: 33-1-47-91-70-11
FAX: 33-1-55-02-03-85
E-MAIL: luism@pennwell.com

Germany
Holger Gerisch
E-MAIL: holgerg@pennwell.com
and
Johann Bylek
E-MAIL: johannb@pennwell.com
TEL: 49-89-904-80-144
FAX: 49-89-904-80-145

India
Rajan Sharma
TEL: 91-11-2686113/14/26865103/26861758/268617666861113
FAX: 91-11-26861112
E-MAIL: rajan@interadsindia.com

Korea
Paek Kwon
TEL: 82-2-420-1293
FAX: 82-2-420-1294
E-MAIL: keskor@kornet.net

Japan
Akiyoshi Kojima
TEL: 81-3-3261-4591
FAX: 81-3-3261-6126
E-MAIL: kojima@media-jac.co.jp

Taiwan
Teresa Fu
TEL: 886-2-8771-9388
ext. 240
FAX: 886-2-8773-7066
E-MAIL: Teresa_Fu@acertwp.com.tw

Hong Kong & China
Adonis Mak
TEL: 852-2-838-6298
FAX: 852-2-838-2766
E-MAIL: adonism@actintl.com.hk

Singapore
Joanna Wong-Monis
TEL: 65-6836 2272
FAX: 65-6735 9653
E-MAIL: jwong-monis@publicitas.com

Internet Sales
Shaun Shen
TEL: 916-719-1481
FAX: 916-419-1474
E-MAIL: sshen@pennwell.com

Director, Internet Services
Tom Cintorino
TEL: 603-579-9002
FAX: 603-579-9030
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