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## The Simpsons Enters a New Dimension

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Homer and Bart experience 3D life in a special episode of the animated sitcom

Diana Phillips Mahoney

As two-dimensional cartoon characters, Homer and Bart Simpson are fairly simple-looking: long faces, high foreheads, bug eyes--not much detail. Transforming them into 3D models, however, was anything but simple, says Ken Bielenberg, senior animator for Pacific Data Images, the Sunnyvale, California-based production facility whose job it was to add a new dimension to the popular weekly sitcom. In fact, says Bielenberg, "the simplicity of the characters made it more difficult, because it made any imperfections in 3D really obvious."

The Simpsons producers commissioned PDI to create 3D computer-generated scenes for a special Halloween episode of the show, called "Treehouse of Horror VI," which parodies an episode of The Twilight Zone in which a young girl passes through a wall and is trapped in the fourth dimension. In The Simpsons version, Homer becomes trapped in the third dimension when he tries to avoid his sisters-in-law. While exploring his new surroundings, he unintentionally creates a black hole that threatens to engulf the universe, at which point Bart enters the third dimension in an attempt to save his father. In addition to creating 3D versions of the characters, PDI created computer-generated backgrounds filled with such things as mathematical equations, a bright-green infinite grid plane, and a replica of the temple from the CD-ROM game Myst.

In elaborating on the challenges faced in the transformations of Homer and Bart, Bielenberg notes that many things that looked OK in 2D "just didn't look right in 3D." For example, he says, while the characters' bulging eyes look fine in two dimensions, "they looked like these huge spheres protruding from their heads [when they were brought into 3D]." Additionally, Bart's trademark spiky hair "looked like a bunch of cones attached to the top of his head."

Bielenberg notes that it was particularly important to get the details right because the 2D characters are so familiar to people. "We were dealing with very recognizable characters. We didn't want there to be anything that would make it seem like it really wasn't Homer or Bart in 3D."

For some of the 3D models, PDI used the model-creation services of Viewpoint DataLabs (Orem, UT). "We went through a number of go-arounds with Viewpoint. Then we started setting up the characters," says Bielenberg.

To plan the shots, the animators started with layouts for each scene, provided by the show's producers. Using the key poses as references, they blocked out their animation, did the in-betweening, and put the characters into the scene, says Bielenberg. For the two scenes in which the characters went from 2D to 3D, he notes, "we actually got on the D1 and scanned the shots into the computer. We exactly matched their motion during a transition point, then did special-effects work for the transition through the mystery wall."

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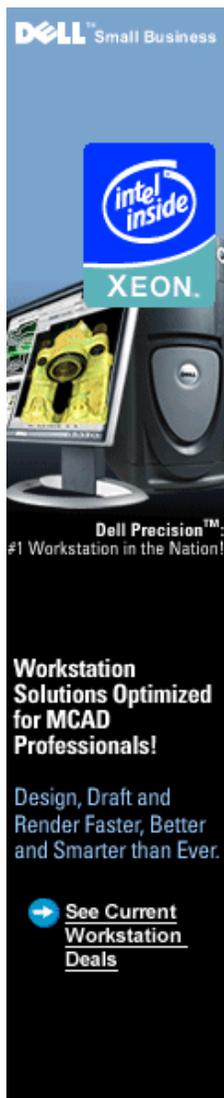
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Once the animators had created 3D versions of the characters, they realized that a whole new set of movements would be needed, including several small hand gestures and nervous ticks that would be essential to communicating the signature personalities of the two characters, even when they were standing still.

Creating the system for developing facial gestures and for synchronizing lip movements to the voice track was probably the greatest technical challenge faced by the animators, says Bielenberg. As a reference for modeling the mouth shapes, the animators used the model sheet provided by the producers. "This is something they normally write up for the [cel] animators who are drawing the characters. It shows the characters in different positions and the `oooh` and `aaah` shapes and such. We were able to directly translate this into 3D models for each of the positions."

For blocking out the scenes, the animators used another resource provided by the producers, called an X sheet. "The Simpsons people had already broken out each frame as to what the characters were saying, so we could plug that in for the first pass to give the rough facial motion, like `it goes from shape A to shape B to shape D,` and so forth," says Bielenberg. To customize the facial motion, the animators developed a system that enabled them to ascribe a little more personality to the characters, he says. "It would let us change, say, the `oooh` shape to be a little wider, narrower, or whatever."

For the facial animation as well as for most of the modeling and animation tasks, PDI used proprietary tools (the animators did use Softimage to model some of the objects). In fact, says Bielenberg, "I don't think we could have done the facial aspect of the project using commercial software. We just have more flexibility and control using our own software."

In addition to the 3D modeling, PDI created a number of special effects for the episode, including the "sizzling" line used for the transition from 2D to 3D; the menacing black hole; a pool of simulated water with fish; simulated drool from Homer's mouth when he gets excited watching the fish; and the transition for Homer's ultimate entrance into the live-action world.

In total, PDI created about 3 1/2 minutes of CG character animation for the show, earning the company the distinction of being the first to re-create a 2D character in 3D form for television.

A Santa Monica production company's animations are displayed via a one-of-a-kind medium

Bau Struye is the first to admit that the computer animations his company is creating are "very simple and conventional" by computer graphics standards. Nonetheless, the creative director of See3, a computer graphics and animation facility located in Santa Monica, California, has no doubt the work will attract a lot of attention. That's because the "canvas" on which it will be displayed is unlike any other. It's a vaulted canopy stretching over four blocks of downtown Las Vegas. The inner surface of the canopy is set with more than 2 million lights, each of which is individually controlled to form a pixel. "The light information is fed directly from a computer, so it basically acts like a giant Jumbotron," says Struye.

By day, the vaulted surface of The Fremont Street Experience, which is 90 feet above street level, will provide shade to people walking on the promenade below it; by night, the lighted inner surface will serve as a giant animated marquee displaying "a visual storm" of thematic images. Under the direction of design company Railton & Associates, See3 has been commissioned to produce 2D and 3D animation for the display, which will be synched to symphonic sound from the installation's 208 speakers.

The unique display medium presented See3 with formidable challenges. The first step, says Struye, was to figure out how to take advantage of the odd size and format. "The size in pixels is roughly 190x2600, so it's very narrow and long. Obviously, it's a format that does not work in the video world, so all of the visual information has to be digital. In a sense, it's your ultimate digital display format in that it's completely non-standard," he says.

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To make the most of the unusual format, the designers had to invent a new visual language, says Struye. "You can't really have images of people up there, because it's so long and odd they would be completely distorted." And a landscape scene would be almost as difficult, he notes, "because you're looking at it from underneath. It's a strange point of view."

Consequently, See3 decided to create what Struye calls a "visual tempest," a constant display of color and movement linked to a specific theme. In the Christmas display, for example, the show opens with a snow storm, with the snow flakes assembling themselves into snowballs and, ultimately, into snowmen. "Then the other elements start dancing up to the screen, such as the hat, the carrot for the nose, the mittens, shoes--all landing on the right places to create the fully formed snowman," says Struye. Once assembled, the snowmen (created using Adobe's After Effects) come to life with the help of traditional cel animation. "When they start doing this little two-step dance, it becomes more of a character animation thing. For this, the cel animator took the shape of the snowman and started to make the little feet dance and so forth." The displays also incorporate 3D computer animation, created with Electric Image software.

The decision to combine various types of animation in what Struye refers to as the ultimate multimedia experience was based strictly on aesthetics, he says. "Some elements just could not be done with anything but a 3D package; others were perfectly suited for 2D animation with After Effects. We used whatever we needed to in order to get the right look," he notes. Once composited, the various elements were transferred to a digital disk recorder, which enabled the producers to play back the images and soundtrack in real time.

In addition to the Christmas-themed show, See3 is working on one with a rodeo focus to coincide with an actual rodeo taking place in the city. Additionally, there will likely be shows linked to various holidays, such as Chinese New Year and the Fourth of July, and for major events taking place in Las Vegas.

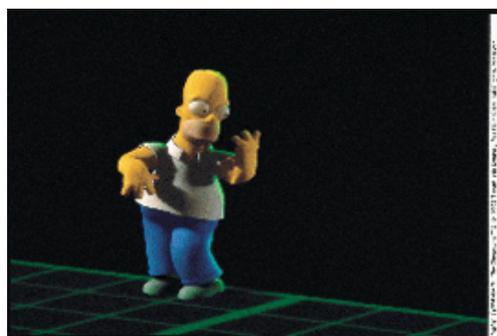
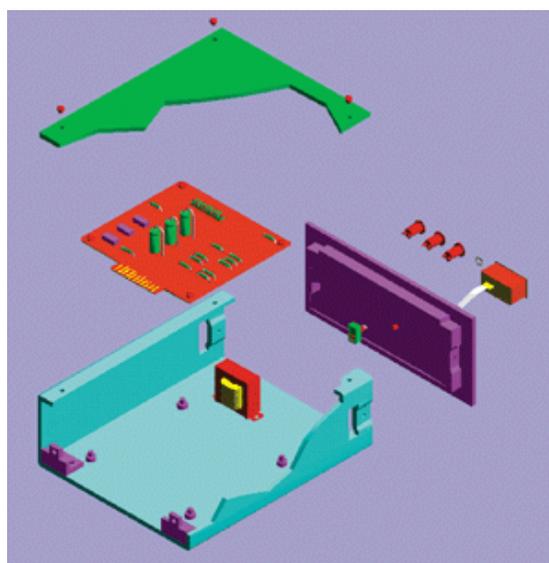
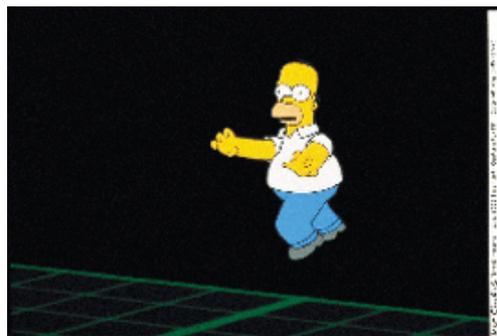
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To adapt to the unique display format, the See3 designers split the 2600-pixel image area into four segments. "We had four bands on a single monitor, top to bottom, so we had the first 1/4 of the image at the top of the screen, the second 1/4 a little lower, and so forth. This way, the picture wraps sort of like a word-wrap on a word processor." The cropped versions of the animated segments were assembled and synched to key sound elements using the digital disk recorder. To test the speed and look of the entire animation show, the animators built a three-dimensional "spectator's perspective" model of the vaulted marquee. They apply the four animated segments to the model as texture maps.

In addition to the challenge of creating a visual display in a full digital format that doesn't fit on a traditional delivery medium, the designers have to deal with a quick turnaround requirement. "Basically, these are seven-minute films that we have to produce in a span of six to eight weeks. Relative to the amount of information that's involved, the time period is very short," says Struye.

In discussing the graphical content for the exhibit, Struye stresses, "This is not Jurassic Park. We're not going to break any ground in terms of computer animation." But, he adds, "because it's such a unique medium, there's still a lot of discovery going on."

The Fremont Street Experience, which is scheduled to open this month, is intended to be a permanent installation, with the visual shows changing roughly every six to eight weeks.



The series at right illustrates Homer Simpson`s transformation from a 2D cel-animated character into a 3D CGI model.

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US Army Battles Budget Woes With VR

In the face of ever-dwindling budgets, the US Army is fighting back with virtual reality. In conjunction with GDE Systems, the US Army Armament Research Development and Engineering Center (ARDEC) is using virtual reality to meet the Department of Defense's mandate for efficient and cost-effective weapon systems designs. The researchers are using a turnkey VR system, including Division's dVS virtual-world operating system running on a Silicon Graphics Onyx workstation, a head-mounted display, a motion tracker, and a 3D input device, to perform optimization studies for engineering design and system effectiveness.

The researchers create virtual prototypes of specific weapons based on 3D solid models imported from Pro/Engineer CAD/CAM software, which have been integrated into virtual environments created with Division's dVISE virtual-world authoring software (the environments are based on actual satellite and reconnaissance data).

An example of the technology at work is its use in evaluating the Objective Individual Combat Weapon (OICW). The OICW simulation allows a user to interact with an urban scenario using a stereolithography model of the weapon. The user is able to evaluate the weapon systems' effectiveness and detect any design flaws that might be present. I

#### Blue Sky "Faces" New Terrain

To help demonstrate the flexibility of a new Braun razor, animators at Blue Sky Productions Inc. in Ossining, New York, modeled a three-dimensional topographical map to the "terrain" of an actor's face. The 30-second commercial opens on a close-up of an actor in sepia tones whose face bears topographical markings. As the CGI model of the razor moves in and touches down on the "map," the entire image becomes computer-generated. Light reflects off the blades as they move along the shape of the face, accommodating the curves before rising to the final product shot.

According to Blue Sky director Jan Carlée, "A cyberscan was made of the actor's head so that the CGI map elements could be tracked to his face." Additionally, he says, "There was a large amount of paintbox work to match the sepia tones of the live action. To add a little contrasting color to the opening and closing sequences, we tinted the actor's eyes a cool blue." The spot was animated in Softimage and rendered with Blue Sky's proprietary software, CGI Studio. I

#### Curious Pixels Gathers a Crowd for Cap`N Crunch

For a recent commercial for Cap`N Crunch cereal, animators with Curious Pixels (the new computer animation division of Curious Pictures) faced a number of challenges, including the composition of hundreds of layers to combine live-action, CGI, and cel animation and filling a computer-generated auditorium with thousands of live-action kids when they had only a few kids to work with.

The ad focuses on the winner of a school essay contest who is struck by stage fright before he reads his work to an auditorium full of classmates. A cel-animated Cap`N "crunches up" his courage, thus dispelling the embodiment of his fear, a cel-animated character called "freakout." Ultimately, the boy and the audience break into peals of laughter, with the boy's trophy coming to life to join the fun.

According to Curious Pictures' Steve Oakes, who directed the 30-second spot, filling the auditorium was especially challenging. "Since we only had a small cast to work with, we paraded them in front of a green screen with a variety of hair, make-up, and wardrobe changes, then composited layer after layer in our digital room to create a crowd of 5000 or more." In total, more than 400 layers were used in the spot to combine the audience, the CGI elements, the cel-animated Cap'n and freakout, and the live-action actors.

The animators used a number of commercial products for the spot, including Adobe After Effects on the Macintosh for compositing, Alias software on a Silicon Graphics workstation for modeling and animation, and Toonz software on an SGI for digital ink and paint work.--DPM

Vegas Adds New Lights to Its Neon Landscape

Diana Phillips Mahoney is a senior associate editor of CGW.

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See3's animations will be displayed on the inner surface of The Fremont Street Experience vaulted canopy in Las Vegas, which is set with more than 2 million computer-controlled lights.

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