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Old Actors Never Die; They Just Get Digitized

For better or for worse, advances in animation technology promise to bring forth virtual thespians—screen creatures that can walk, talk, emote, react—everything but complain about the size of their dressing room.

By KAREN KAPLAN, Times Staff Writer

John Travolta made a comeback. So did Donny Osmond, Drew Barrymore and Burt Reynolds. But silver-screen legend Marlene Dietrich is attempting the most unlikely Hollywood comeback of all.

Dietrich's resurgence, should it come to pass, won't be based on a breakthrough role, a studio's marketing genius or a stint in drug rehab. Rather, the sultry actress—who died in 1992—would owe her cinematic rebirth to computer graphics technology.

Barnabas Takacs, Virtual Celebrity's research director, is helping to create digital human actors that are credible to the eye even in close-ups.
CLARENCE WILLIAMS/Los Angeles Times

At **Virtual Celebrity Productions** in West Los Angeles, a state-of-the-art system for tracking the facial movements of a live actor is being used to animate a 3-D "digital clone" of the German-born star. A stylized version of the actress will be dispatched this year to Germany, where she will greet visitors at a film museum. The company plans to follow up with a realistic-looking digital Dietrich that can star in movies, television shows and commercials.

"Within the next 10 years, she will be fully brought back to life," said Dietrich's grandson, Peter Riva, who licensed the actress' image to Virtual Celebrity Productions. "Dietrich's career is going to be here for 300 years."

For better or for worse, a new generation of digital actors—some brand-new, others resurrected—is making its way to Hollywood, thanks to advances in animation modeling techniques. The technologies will be showcased this week at Siggraph 99, the annual conference of the Assn. for Computing Machinery's subgroup for graphics, which is taking place at the Los Angeles Convention Center.

Though the technology to create convincing digital actors still lies in the future, it's not too early for Hollywood to project—and hype—the possibilities. "I see in the future a digital actor being nominated for an Academy Award," said Tim Sarnoff, executive vice president and general manager of **Sony Pictures Imageworks** in Culver City. "Twenty years from now, five years from now—who knows? It might create a stir that the best-actor nomination would go to a computer."

Virtual Celebrity Productions is bringing silver-screen legend Marlene Dietrich back to life by using the movements of a live actress to animate a digital look-alike. A customized projection-and-sensor system tracks the actress' facial movements in hundreds of places so that the digital Dietrich looks convincing.
CLARENCE WILLIAMS/Los Angeles Times

Sony, **Pixar**, **Industrial Light & Magic** and others have already produced digital actors with key roles in feature films. Among the best examples are the mouse that stars in the forthcoming "Stuart Little," the insects of "A Bug's Life" and Jar Jar Binks, the Gungan sidekick from "Star Wars: Episode I The Phantom Menace."

Creating digital ***human*** actors is exponentially more difficult. While they have been used in crowds and as virtual stunt doubles, none has played a role requiring an extreme close-up because it wouldn't stand up to close scrutiny.

"Everybody looks at [humans] every single day, and even the untrained eye can tell when it's not right," said Derald Hunt, computer graphics supervisor for **Kleiser Walczak Construction** Co., a North Adams, Mass., special-effects firm that is a pioneer in the digital-actor field. "You can't get away with anything."

The textures of hair and clothing are still difficult to reduce to zeros and ones—the building blocks of digital data. But perhaps the hardest thing to fake is muscle movement. Computer graphics specialists around the country are trying to develop models with anatomically correct motion built in. For instance, a digital actor's arm muscles would flex automatically when an animator moves its hand.

Faces present a similar challenge, since their muscle movements are extremely precise. Even shading an eyeball so that it reflects the proper amount of light is a challenge yet to be solved, said Kleiser Walczak co-founder Jeff Walczak, who coined the term "synthespian" in 1988 to describe his firm's digital actors.

But the situation is improving with the help of faster microprocessors and new computer graphics tricks.

Engineers at Virtual Celebrity Productions have customized a projection-and-sensor system made by the Belgian firm **Eyetronics** that can record an actor's face on film and translate it into a three-dimensional model in a computer. The system takes as many as 5,000 measurements for each frame of film—an impressive feat considering there are 30 frames of film per second.

That system is combined with technology to keep track of facial features—such as the tip of the nose and the corners of the mouth—from frame to frame. With tracking, the number of measurements needed is reduced by a factor of 10 or more. Then those movements are used to animate a virtual actor, such as Marlene Dietrich, said Barnabas Takacs, Virtual Celebrity's director of research and development.

When Dietrich or one of her fellow "digital clones" is ready to debut on film, a live actor would play the clone's role on the movie set. The animation would be rendered and substituted afterward, Takacs said.

Other computer graphics experts are focusing on how digital actors behave. In **Intel**'s Graphics

Research Group in Santa Clara, research scientist John Funge developed Cognitive Modeling Language, a programming language that allows animators to tell their characters what to do without having to animate every frame of film by hand. Funge and fellow research scientist Xioyuan Tu created several short films to demonstrate CML's capabilities.

For instance, to make a film of a ***Tyrannosaurus rex*** chasing a herd of raptors out of a valley, Funge and Tu used CML to tell their cast of dinosaurs that the raptors were "afraid" of the ***T. rex*** —that is, that the raptors would move in the opposite direction if the fierce creature got within a certain distance.

"We tell the ***T. rex*** the goal is to take over the territory," Funge said. "We don't tell the ***T. rex*** how to do it. It just figures it out."

Daniel Robichaud, left, and CEO Jeff Lotman led the company's Marlene Dietrich project. The result debuts this year at a German film museum.
CLARENCE WILLIAMS/Los Angeles Times

Funge and Tu also used CML to make a film of a merman (the male equivalent of a mermaid) trying to escape from a shark. The shark was told to follow the merman, but the merman understood that it could hide by swimming behind a rock. Those directions were all that were needed to create a chase scene in which the merman ultimately prevails. (The short films can be viewed online at ***http://www.dgp.toronto.edu/~funge/ anim/index.html*** .

In Funge's view, realistic behavior is more important than a realistic appearance.

"Stick-figure animations often look better than fully rendered animations because the imagination fills them in," he said. "But if it behaves strangely, people will notice." He acknowledges, however, that it is much more complicated to model human behavior than to mimic the thinking of a dinosaur or a shark.

Bruce Blumberg, head of the Synthetic Characters Group at the MIT Media Lab in Cambridge, Mass., is creating animated characters that have their own personalities and therefore respond differently to human interaction. Each character's personality is made up of 80 behaviors, plus a hierarchy to determine which of them will prevail when there is a conflict. "These characters have behavior systems—what someone might call a mind or a brain," Blumberg said. "There's no script that's running."

Intel researchers are working on a new computer programming formula—Cognitive Modeling Language—that would let animators give their characters general instructions instead of having to draw every frame of film. In one example, a shark is told to hunt a merman, but the merman hides by swimming behind a rock. Those simple directions were all that were needed to create a chase scene in which the merman ultimately prevails.

Blumberg doesn't think his digital actors will ever perform leading roles on screen. More likely, the technology will be used to make digital versions of real actors that could interact with kids in a video game or TV show. That way, he said, "the character could stay in character, but it would respond to what the child was doing."

Even as computer graphics technology continues to advance, some experts doubt that digital actors will ever rival the real things.

"There's a certain life force that we sense in each other that would be impossible to replicate digitally," said Linda Jacobson, virtual reality "evangelist" with **Silicon Graphics** Inc. in Mountain View. Still, she said, she favors developing synthespians. "It enhances the creative possibilities, and that will make for better entertainment."

Even if a perfect digital replica could be created—and plenty of computer graphics specialists say it's only a matter of time—many question whether it would be worth the trouble.

"It's so easy to actually film actors. Why would anyone want to make a [digital actor] completely human?" asked Juan Buhler, senior effects animator at **Pacific Data Images** in Palo Alto.

"From a cost-effectiveness standpoint, it doesn't make any sense," Kleiser said. "You can spend a tremendous amount of money creating the technology to do it; and once you do, you are no farther ahead than if you just hired an actor."

But they do see roles for digital actors performing feats that are beyond the limits of real actors, such as walking through fire or stepping over a parked car. In movies such as "Contact," "Forrest Gump" and "In the Line of Fire," digital actors have already been put to work in crowd scenes in which logistical and financial constraints precluded the use of human extras.

Even with the technology gaining, Screen Actors Guild President Richard Masur said union members aren't worried that they will be replaced by digital replicas.

"What drives the market for film and TV is people with whom other people can connect," he said. "If you take the people out of that equation, you take out a lot of the connection."

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