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Virtual Beings

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Virtual Beings

NORMAN I. BADLER

As part of an article on travelers' expectations, *USA Today*, September 23, 2000, reported: "The angry woman with children in tow had some

choice words for the theme park marketing director. Where were the live dinosaurs she and her kids saw in the park's TV commercials? She had paid good money, only to view fake ones."

What will virtual humans be like 1,000 years from now? What will real humans be like 1,000 years from now? Will there be any difference? Will

we see, hear, or feel any difference? The short answer is no. Will this process of developing virtual humans indistinguishable from real ones take 1,000 years? Also no. Ours may be the last generation that sees and readily knows the difference between real and virtual things. Moving the time frame in a little closer might help identify some transition points. If Ray Kurzweil's claim that the pace of scientific discovery is accelerating, we can expect 100 years of progress in something like 60 years. So let's start with the 100-year horizon.

Within 100 years, digital media will replace traditional media, leading to simple, convenient, user-



oriented modification and creation of content. Digital cameras, high-resolution TV, video-editing software, MPEG-4 (and beyond), human figure modeling, and animation standards will promote efficient model distribution with client-side rendering, image generation, and compositing.

Visual portrayals of human figures will achieve uncanny accuracy in skin, muscle, bone, hair, and exterior physiology. Humanlike models will allow the seamless transition between virtual and real images. For animated figures, accurate muscle, skin action, and clothing constraints depend mostly on computational collision detection and physics-based response.

tinguishes a virtual human clone from one patterned after no specific flesh-and-blood person? We will create characters to specifications. They may be more beautiful, stronger, or skillful than real actors or performers. Already, game characters portray sports figures and adopt some of their body language, as well as their performance statistics. Identity theft will take on new meaning. It will therefore be impossible to readily determine the authenticity of the content of any image.

Movement fluidity and naturalness will be automatic as we gain a deeper understanding of the physiological and neurological processes we allow to control the physical actions of the virtual humans.

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The best-looking virtual humans today are painstakingly modeled and animated for movie special effects. Such off-line animation techniques may be contrasted with real-time animations for interactive simulations, training, and games. But the time lag between off-line and online animation techniques is shrinking; it will essentially shrink to zero within 10 years, even without postulating any further technological breakthroughs. Business incentives drive production, which in turn drives software development.

As computation gets closer and closer to being essentially cost-free, the algorithms for 3D collision detection and response will be viable in real time for highly complex, that is, orders of millions of polygons, data sets. We'll be able to do this with future haptics interfaces, too, turning our images into warm, tactile, supple sensations.

We'll be able to insert (or delete) ourselves from practically any interactive content. We'll view ourselves and others in customized guises—as we are, as we were, as we wish to be, and likewise with other people—prompting a multitude of copyright and privacy issues. Who might be visually cloned and why? What controls can and should be exercised by the individual, by society, by government? What dis-

Fast dynamic simulation and physical coordination will be feasible, but understanding an action's motivators is more important and depends on an agent's internal models of personality, mood, emotion, situation, and goals. Actions will accommodate and comply with the local spatial context. Virtual humans will see with synthetic vision, sense our (and each others') movements, know us and our actions, and respond in a coordinated and context-appropriate manner.

We will communicate with as we communicate with people, interacting through natural virtual humans language and speech, and use them as information sources, conversational partners, clerks, and complaint departments. They will understand instructions, know how to acquire knowledge, and have memory and personal histories. Who will educate them? Who or what will they trust? The Internet will be their encyclopedia, almanac, map, and dictionary. They will in turn assist in educating us. Embedding history and vicarious experiences will be necessary so they can relate to our personal histories, cultures, and real lives. We will train our agents to be ourselves, be unique, or be like specific people. We'll be able to re-create our ancestors and loved ones and even our favorite pets.



Since the appearance and movement of virtual beings will be as humanlike as we wish, we must think about what we really want them to be. Philosophers and religious leaders will have to adapt today's science fiction to technological fact. What limits should be programmed into virtual beings? Should we exceed or ignore human capabilities? How much initiative should we impart to them? Will they lie deliberately? Who will determine their ethics and morals? Will they do our bidding? Will they be able to reject antisocial requests, even from real humans?

Who will be accountable for their actions if they are able to make their own decisions? Will they be

subject to punishment? Will they demand emancipation? Will they be an outlet for our baser drives or desensitize us through violence and pornography? Will they accommodate to our demands and interests? Will we accommodate to theirs? Will they need beliefs and dogma? Will we be their gods? Will they be ours? ■

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