The Computer Museum

NEWS

Smarter Machines

The Museum will open an enhanced *Smart Machines* gallery February 13. *Smart Machines* is the only full-scale permanent exhibition in the world devoted solely to the intriguing fields of artificial intelligence (AI) and robotics.

Since the gallery's opening in 1987, some 600,000 people have enjoyed its interactive exhibits and robot theater. *Smart Machines* is one of the Museum's most popular galleries because it addresses questions that capture the human imagination: Can machines think like us? Can they move and act like us? The gallery focuses on key aspects of human intelligence in such areas as games, creativity, problem-solving, and communication, as well as sensing and moving in robots.

The renovation features exciting new interactive installations from *Smart Art: The First Artificial Intelligence Based Arts Exhibition*. (See story, pages 4-5.) The enhancement also involves adding other interactive exhibits and upgrading the best existing interactives with faster, new computers and better interfaces. Gems, such as the robot theater—with its early innovative machines—and Eliza, the classic conversational program that emulates a non-directive therapist, will be retained.

In addition, Museum Designer Ted Groves is creating a new floor plan "to make the gallery brighter, more colorful, and inviting." The enhancement is made possible with support from the American Association for Artificial Intelligence (AAAI) and others.

As the *NEWS* went to press, Director of Exhibits Greg Welch and Exhibit Developer David Greschler were investigating several cutting edge AI applications as possible additions. One of them, "Ask the Expert," is being created by Michael Stein, a student of Daniel Siewiorek, Professor of Computer Science and Electrical Engineering at Carnegie-Mellon.

The exhibit will show visitors how a rule-based expert system works and how they can use it to create designs for an efficient kitchen. Visitors are introduced to different rules that constrain the design so it corresponds to reality (for example, the sink must be close to the plumbing or the back of the fridge must be against the wall). The exhibit graphically illustrates that a seemingly mundane task can actually be quite complex. Visitors also learn that the fewer the rules constraining the design, the greater the number of solutions.
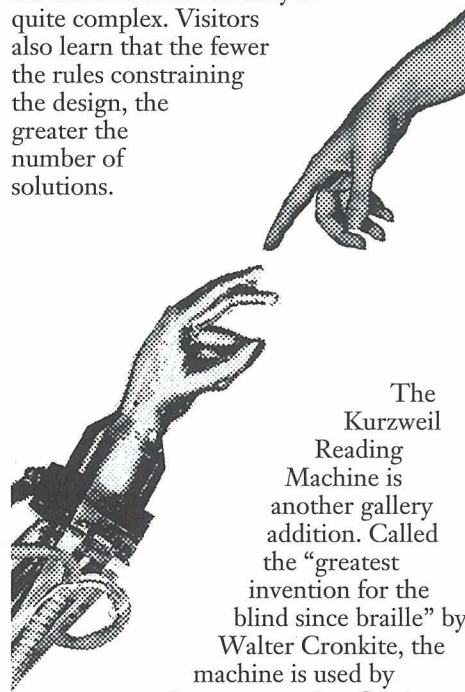
The Kurzweil Reading Machine is another gallery addition. Called the "greatest invention for the blind since braille" by Walter Cronkite, the machine is used by singer-songwriter Stevie Wonder among others. Its character recognition program scans printed material in virtually any type face, converting it into machine-readable text and then voice. The exhibit will be used by Museum staff in a series of new demonstrations.

Another exhibit would use software created by Gensym Corporation to show how an expert system coordinates the baking of 200 loaves of bread per minute. A visitor could see an animated version of the production of the loaves and experiment with changing some of the rules (turning off the slicing machine, for example) to see what happens and what the expert system suggests be done.

Another possible exhibit, SimLife™, would be customized for the Museum by Maxis to introduce visitors to the amazing new field of artificial life. In A-life, computer generated life forms are given rules to simulate aspects of the behavior of living systems. When the rules are tweaked, the artificial creature changes behavior in interesting and unexpected ways. SimLife lets people build artificial life forms, change rules about how they live and then see if they flourish or die.

Many of the gallery's most popular programs — the Height Sensor, Haggle With a Computer Fruit Vendor, and Color the States — have been replicated and sold to museums and science centers worldwide via the Exhibit Kits Program. Others, such as AARON, the Computer Artist, and the Direction Assistant, have delighted families, educators, even film crews, from around the world.

"As computers get ever smarter and know more about the world and the people using them," predicts Museum Executive Director Dr. Oliver Strimpel, "AI and robotics technologies will play an increasing role in defining computer applications and interfaces." AI has already given us cars "smart" enough to stay a safe distance from other cars and a robot that can assist surgeons in hip replacement surgery. "When we think about the next millenium," he says, "AI technologies will determine just how versatile computers will be."

"Consider this first AI based art exhibition as a Zen garden: small, simple, but calmly and intensely representing the larger world of AI based arts to come. AI is crucial to interactive art because the pieces have the artistic knowledge and abilities to respond appropriately to the viewer without the original artist being there."

Joseph Bates, Curator and Research Fellow, Carnegie Mellon University
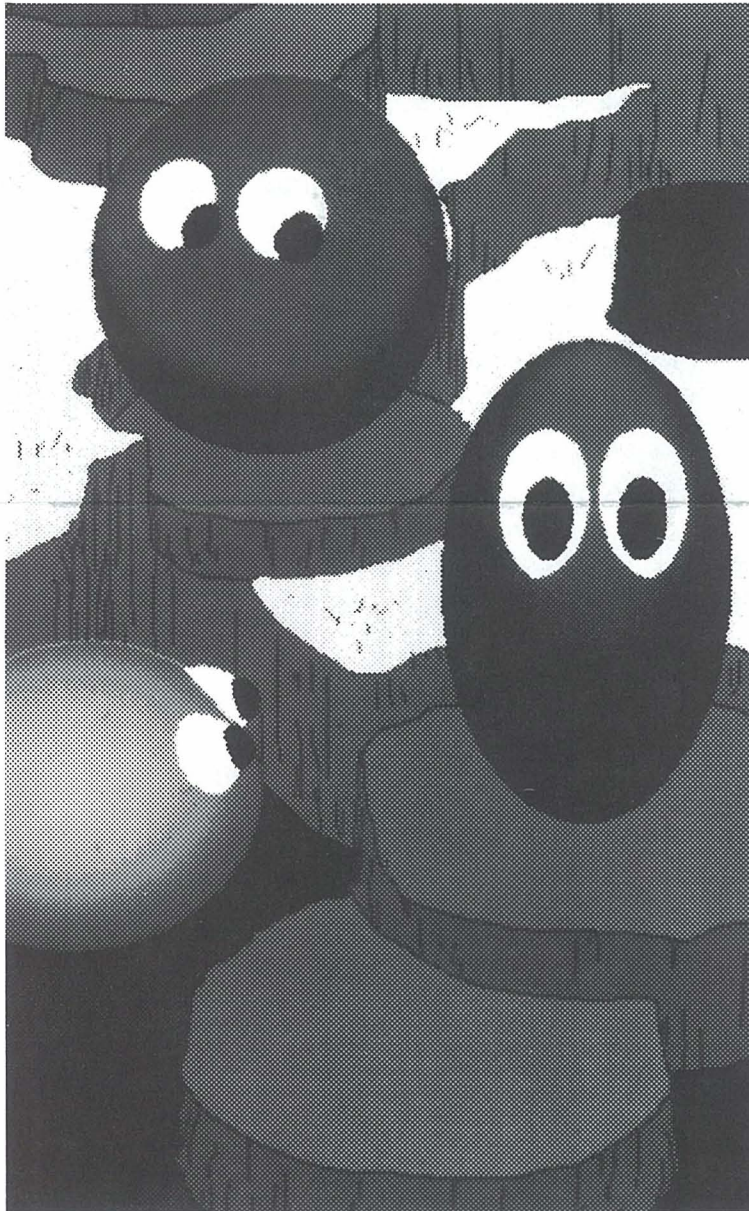
"Edge of Intention" (Woggles). Created by the Oz/Animation group, Carnegie Mellon University (contact Professor Joseph Bates)

The new *Smart Machines* gallery features three interactive installations and a spectacular presentation of images from *Smart Art: The First Artificial Intelligence Based Arts Exhibition.* Illustrating a range of cutting edge AI technologies, the original show was sponsored by the American Association for Artificial Intelligence and arranged with the help of the STUDIO for Creative Inquiry and the School of Computer Science, Carnegie Mellon University.

Edge of Intention

In this installation, a visitor enters a dramatic interactive world, peopled by four bouncing jelly bean creatures called "Woggles." A visitor can move a Woggle around, making it interact with the other Woggles. "Tok," an architecture simulating the mind, integrates the Woggles' reactions, goals, and emotions. For each Woggle, success, failure, prospective failure, and the recognition that other creatures caused these situations lead to happiness, sadness, fear, gratitude or anger. These states in turn affect their choice of reactions.

The installation, which runs on a Silicon Graphics workstation, is the result of collaboration between the Oz project and the Graphics & Animation research group in the School of Computer Science at Carnegie Mellon.

Mozart or Machine?

A computer challenges visitors to guess whether the music they are hearing was composed by Mozart or by a computer program called Experiments in Musical Intelligence (EMI). Composer David Cope, Professor of Music at University of California, Santa Cruz, designed EMI to help break through his "composer's block." EMI is a set of programs that analyzes music, derives rules from that analysis, and then creates "convincing new examples in the style of the original music." EMI can aid composers in creating new works and musicologists in

"Chaos" (left panel of triptych), created by Karl Sims, Peter Schroeder, Thinking Machines Corporation

analyzing musical styles. "It has fooled many experts," reported Cope in the show brochure.

EMI "listens" to a composer's works, breaking them down into frequent motives or signatures. A musical pattern matcher then finds patterns in pitch, rhythm and their combination. Using this information, rule-based composition produces a styleless piece conforming to the original music's patterns. This is then processed by an augmented transition network which reconfigures the material, generating new music.

Say It With Feeling

Visitors can take computer generated speech and give it expression. After they select an excerpt from among a variety of plays, such as Beckett's *Waiting For Godot*, the emotions for each line can be specified.

MIT Media Laboratory Ph.D. student Janet Cahn developed the software program to expand the emotional range and speed of communication for speech handicapped people. She used a DECtalk3 speech synthesizer to generate speech from instructions computed on a Symbolics Lisp Machine.

The program attaches subtle acoustical features to words and phrases, translating them into instructions for the synthesizer. The program also describes the vocal tract settings from calculated synthesizer values. All these synthesizer instructions embody the linguistic and physiological effects of speaking with feeling.

Artificial Evolution

Thinking Machines artist-in-residence Karl Sims created a spectacular series of images called, "Genetic Images," using a Connection Machine and the computer language Lisp. Sims devised a system that lets users interactively "evolve" a wide variety of textures, patterns and shapes.

At each step, the computer randomly mutates a Lisp expression, describing an image by specifying the color of each pixel as a function of pixel coordinates. The user chooses the most aesthetic of the resulting images to survive, reproduce, and create the next generation. Because of the massively parallel computer's power, radically new and complex images emerge.