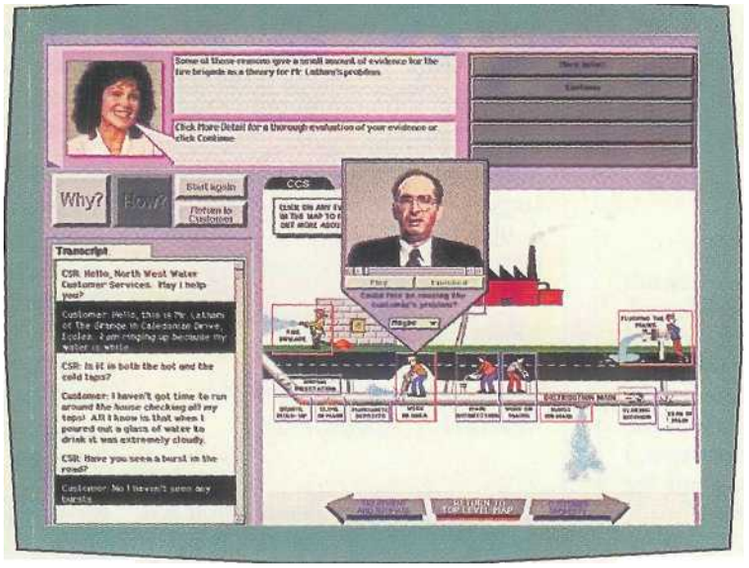
Trends

AI as Training Tool



An AI-based simulation created to train service representatives at a water utility engages users in realistic dialogues with virtual customers. A mentor (top left) helps trainees query customers, experts, maps, or other documentation to solve problems.

You are on your first day of your new job as a customer service representative for North West Water, one of Great Britain's largest private utilities, when a worried customer calls. There are little "bits in the water," she says. So you ask what you think is a logical question: "Are they swimming?" The caller excitedly answers, "Yes, they're swimming all around." You know that little swimming things might be microorganisms, so you tell the customer the water is contaminated, warning, "Whatever you do, don't drink it!"

The customer hangs up and calls the health department to complain and possibly blemish the company's record. Unfortunately, if you had just asked a few more questions of a few more people, you would have learned that a water crew had been working in the neighborhood and that the things "swimming" in the water weren't contamination at all, but rust and dirt particles kicked up in the pipes when the crew flushed a nearby line. You would also have known to advise the caller that they would disappear if she would simply run the water for a minute or two.

Luckily for you, this phone call is only a simulation. Everything from the ring of the phone to the spoken voice of the caller takes place on your Macintosh computer. Instead of speaking to the computer, you use the mouse to select the questions you want to ask. The computer responds by selecting and playing an appropriate response from a library of video clips from the customer or other sources, mainly former North West Water service representatives, each with a story designed to help you learn your way around your new position. When you do your job correctly, on-screen mentors encourage you; when you make a mistake, they explain what you did wrong by telling you about a time when they did exactly the same thing.

Welcome to the future of corporate training, as envisioned by the Institute for the Learning Sciences (ILS) at Northwestern University. Software designers at the institute have been developing simulations that merge the fields of artificial intelligence (AI) and multimedia technology to create learning environments to help companies save costs while improving the quality of their employee training.

Because people learn better from making mistakes than from being told the right things to do, says Roger Schank, long-time AI researcher and founder of ILS, his software immerses the users in a believable simulation, allows them to make mistakes, and uses AI to respond accordingly. All of the simulated characters have a wealth of information that they want to convey as well as emotions that can heat up if provoked by the user.

This is not what AI was originally supposed to do. The characters in the simulations can't solve problems and they can't understand spoken words, nor can they do symbolic math, solve logic problems, or even play chess.

But the traditional view of AI has never been translated into commercial success, as Schank well knows. In the late 1970s, he and his graduate students at Yale University built a computer program called FRUMP (Fast Reading and Understanding Memory Program), which integrated the information from the daily newswires into a large knowledge bank. If you asked FRUMP if Secretary of State Cyrus Vance's wife ever met the wife of Israeli Prime Minister Menachem Begin, the program would assume, correctly in this case, that she had, since both Vance and Begin had attended a state dinner and had probably taken their wives.

As potentially useful as such a program might seem, problems started for Schank when, like many AI researchers around the country, he tried to turn AI into big business. In 1981, Schank created Cognitive Systems to develop a commercial version of his program. "I had this technology that could do FRUMP, but I didn't understand the word 'product,'" he says. "I thought businesses would come in and tell us what to do with it. This was a total fantasy."

The following year, however, Schank started a second company called Compu-Teach. His children were having problems in school—they were bored, just like he had been. So when a friend suggested that he try to help them by writing educational software, he created a number of basic packages designed to help kids learn to read and do arithmetic.

While developing the Compu-Teach software, which contained none of his AI programming techniques, Schank

PHOTO: INSTITUTE TOR THE LEARNING SCIENCES

nonetheless realized that some of the AI theories he had pursued could be applied to education. Instead of teaching a computer how to learn, he reasoned, he would use computers to teach people how to learn. Thus when an opportunity to develop educational AI software arose one day in 1989 during a chance meeting between Schank and some high-placed executives at the Arthur Andersen Worldwide Organization, the world's largest computer consulting company, Schank went for it.

Schank learned that Andersen, a graduate of Northwestern University and a member of its board of directors, sought to accomplish two goals. He desperately wanted to bolster Northwestern's lackluster reputation in computer science as well as improve his company's employee training methods, which were costing some $200 million per year. Aiming to kill both birds with one stone, Schank proposed that Andersen fund a long-term project at Northwestern that would use AI to create computerized training systems, and then save money by deploying the results of the research within Andersen itself.

Andersen bought the plan, and within the space of a few months the Institute for the Learning Sciences was born. With more than $3.5 million a year in corporate funding, including a 10-year, $20 million grant from Andersen's consulting division, ILS employs more than 150 researchers to develop AI-based computer simulations.

ILS simulation designers use a technique pioneered by Schank called case-based reasoning. This approach to AI represents a radical departure from the more familiar rule-based systems. In these, a computer is given a series of "if-then" rules that it applies to a given set of conditions to reach a logical conclusion. For example, a medical diagnostic program might use such rules to deduce a patient's illness from a given combination of symptoms: if a person has the signs of an upper respiratory infection, he computer would sort through all possible illnesses that cause these symptoms and reach that diagnosis.

Conversely, rather than asking the computer to solve a problem, case-based reasoning gives users the information they need at the time they need it to reach their own conclusions, an approach that Schank believes is vital to effective learning. In ILS simulations, such information is in the form of hundreds if not thousands of video clips of experts telling stories about the numerous aspects of a particular subject. A program developer, or "knowledge engineer," goes through the clips, or "cases," and classifies their content—sort of like looking for the moral of each story—and indexes them accordingly in a huge database.

The trick is to label the expert's experience in terms of the novice's task and likely vocabulary so that the appropriate clip or clips will pop up at the right point in the simulation. That way, in a program to help medical students learn the art of diagnosis, for example, the computer could interrupt the doctor-patient interview when the student fails to ask a vital question about a cough. The expert might pop up and tell a story about the time he or she did the same thing and failed to recognize that the patient had an allergic condition.

Learning from Experience

One of the ILS's first such case-based systems was TransAsk, a database designed to teach novice military officers the principles of transportation planning and execution. To build the system, ILS researchers filmed 33 military transportation experts describing what they knew about moving equipment and personnel around the army and throughout the world. The researchers then distilled this database down to 21 hours of concrete advice. "We worked on it for about a year and a half," says Ray Bareiss, ILS's assistant director of research.

Other systems include the North West Water Customer Service Application, developed to help North West Water train its new employees, and ASK North West Water, an information kiosk that lets customers ask executives of the private utility questions ranging from "What does the water utility do?" to more thorny ones such as "Why isn't water free?" and "Why are the utility's director's paid so much money?"

Museum-goers in the United States can get their hands on an ILS system in an exhibit about sickle cell anemia at Chicago's Museum of Science and Industry. Walk by the exhibit, and the computer might call out, "Help me out here, will you?" When you sit down, you'll be confronted by an African-American couple. The husband, LeRon (played by a professional actor), has sickle cell anemia, and the couple wants to know if their children will suffer from the disease. Playing the role of genetics counselor, you can ask the couple questions, order laboratory tests, and then inform the pair of the results. Tell LeRon something that doesn't make sense, and he gets argumentative and upset. The only way to repair your relationship with him is to consult a few experts and tell him the facts.

Sickle Cell Counselor has three different sets of couples, each with a unique family genetic history, and not just the simulated families but also the exhibit's visitors want to know if the children will have the disease. "People are very interested in finishing the exhibit because they are curious about the outcome," says Barry Aprison, project director at the museum. "That's quite a feat since most science museums are so crowded with neat stuff, that visitors rarely linger over an exhibit for more than a few seconds."

Most of the institute's work, though, is in building systems that will be used by its corporate sponsors. Ameritech, one of the seven regional telephone companies, asked ILS to build a system that teaches its employees how to sell advertisements in the Yellow Pages. In on scenario, the computer simulates selling an ad to a roofer and his wife. It includes clips that reveal their emotional state, and shows how convinced or annoyed they are by your sales presentation. During the simulation, the roofer asks most of the questions, but every now and then the wife asks something that seems to come out of the blue. Ameritech trainees quickly learn that it's bad business to ignore family members: in this family, as in many, most of the financial decisions are made jointly.

"Teaming with researchers at ILS has led us to a new approach for educating professionals," says Lawrence Silvey, managing director for Andersen Consulting Education. "When employees learn by doing, they learn faster and retain more, and we are able to develop more advanced professional skills in our people." But perhaps what's most compelling about all these systems is that they let people learn from the computer the same way that we learn from each other: by listening to stories. It's th same way that people have been exchanging information for thousands of years.—*SIMSON GARFINKEL*

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