Medical Education Takes Leap With Virtual Reality
by Jan Cottingham
Posted 7/3/2017 12:00 am
Updated 11 months ago

Some readers of a certain age surely remember “Fantastic Voyage,” the 1966 movie that starred Raquel Welch and Stephen Boyd as miniaturized submariners injected inside a scientist to operate on a blood clot and save his life.

Welch, Boyd and their colleagues, in form-fitting diving suits, travel through the scientist’s body, into his heart, inner ear and lungs — “actually entering inside the human body!” and “going where no man or camera has ventured before!”

Well, they’re doing something like that at the University of Arkansas at Little Rock, with the help of a well-known figure from the University of Arkansas for Medical Sciences (and without the miniature submarine).

Instead, scientists at these schools have created a virtual reality tool, “Anatomical Eyes,” to bring observers inside the human body to teach anatomy to medical residents and other health care professionals, as well as middle school, high school and other students.

As part of the effort, Carolina Cruz-Neira and Dr. T. Glenn Pait have partnered to create a “virtual cadaver” to be used to train doctors, and they’re hoping to commercialize the prototype to sell to medical schools, other educational institutions and health care providers.

Cruz-Neira is director of the Emerging Analytics Center at UA Little Rock and an internationally recognized innovator in virtual reality. She’s the inventor of the Cave Automatic Virtual Environment, a room that puts visitors wearing special glasses into a three-dimensional environment achieved by projecting 3-D images onto walls. The experience is even cooler than it sounds.

Pait, a surgeon, is the director of the T. Glenn Pait Spine Clinic in the Jackson T. Stephens Spine Institute at the UAMS. His voice is likely a familiar one: He delivers the “Here’s to Your Health” segments heard on local public radio stations.

Pait described what the scientists have achieved as “a huge leap in medical education,” and a reporter visiting the CAVE last week had to agree. Pait and Tom Coffin, senior operations manager of the Emerging Analytics Center, led a reporter inside the human spine, where she journeyed through the vertebrae. “You’re seeing a spine the way the spinal cord does,” Pait said. “Isn’t that incredible?” And it is. It’s a revelation.
Cruz-Neira joined the EAC in 2014, and she and Pait teamed up about two years ago to explore the ways virtual reality might aid anatomical education. The CAVE system is expensive and complicated, so the two focused on three options, beginning with a virtual cadaver, a table-centered device that lets medical students — wearing special glasses and wielding computer controls — perform dissections. They’re virtual dissections, of course, but the virtual cadavers are anatomically correct, and the experience of peeling off layers of skin and muscles, picking out bones and blood vessels is riveting.

Cruz-Neira and her EAC colleagues also worked to scale down the CAVE, developing a simpler and cheaper version that they call “CAVE in a box.” It’s targeted at businesses whose employees could benefit from immersion in virtual reality — architectural firms, construction companies, manufacturers — but it could also be used by health care providers to immerse themselves in a particularly difficult case.

In addition, they have developed a large, touchable panel designed for classrooms. On this day, the panel featured the human body. With a touch, a teacher can pluck out muscles, bones, or the heart, presenting anatomy dynamically.

**Commercializing a Cadaver**

As for the virtual cadaver — our focus this day — it’s still in development. UA Little Rock and UAMS hope to commercialize the product, and the inventors are in the middle of applying for patents, Cruz-Neira said.

She says that a couple of groups are interested in acquiring the rights for distribution.

Some funding is “in the pipeline,” she said, “and if it comes through, then we’ll be doing some beta deployment in some sites, especially military sites.”

“We are cautiously optimistic about getting this funding,” she added.

Military sites would be used as a testing ground “because medical training is critical for both civilian and military personnel,” Cruz-Neira said. In the military, time for training is shorter, and training — especially trauma care — is directed at both medical professionals and “any military personnel who go to the battlefield.”

“They want to educate our soldiers whether they’re entrance level or surgeons,” Pait said. The military also finds that combining military and civilian trauma environments is a better way to teach. “Whether we like it or not, in this day and age all of us may find ourselves in a situation where there’s a mass spree killing, there’s a terrorist environment.”

He referred to the Stop the Bleed campaign, initiated by the White House in 2015, and, according to the U.S. Department of Homeland Security website, “intended to
cultivate grassroots efforts that encourage bystanders to become trained, equipped, and empowered to help in a bleeding emergency.”

“Today, to educate about trauma, how to take care of a traumatic environment is more important than probably it has been previously, because all of us could potentially be called upon to take care of these things,” Pait said.

And virtual reality, he said, is the best way to do it. “You can put people in given situations, have them respond; plus you can judge how well they did.”

**Medical Schools Interested**

Her team has had many years of experience deploying virtual reality in a variety of industrial and commercial settings, Cruz-Neira said. “And today, the expectations of virtual reality technology, because of the really inexpensive consumer entertainment systems that are out there — that puts a lot of constraints on what we do.”

People aren’t eager to pay $3 million for a professional system.

Cruz-Neira and her team are looking to develop, instead, a virtual cadaver that costs $15,000 to $20,000. They want to generate a revenue stream that would permit future development of the system.

“We’re in the process of trying to figure out a good balance of what the tool can do, the quality of the experience that we can provide, and not only the cost of acquisition, but the cost of maintaining it and operating it on a daily basis,” she said.

“This system, when it gets deployed, is not going to be any more complicated to maintain than your workstation at your desk,” Cruz-Neira said.

“The commercialization is a way to reach a larger audience and have a larger distribution, and also have a venue for the tools to continue evolving.”

She said three major American medical schools have shown support for the system, indicating that if it’s placed on the market, they want to be the first to buy the technology.

Pait emphasized that the system can help a number of audiences, not just medical students. Potential users could be nurses, physical therapists and occupational therapists. “The bottom line is, you can’t get away from our anatomy,” he said.

Pait envisions the day when surgeons — using haptic devices allowing users to “feel” virtual reality — can upload a particular pathology from an MRI or CAT scan into a virtual cadaver or similar device and practice an operation beforehand.

“If somebody’s going to get involved in a PGA golf tournament, I can tell you, they practice before they go,” he said.
Making the virtual cadaver fully deployable will require an investment of $1.5 million to $2 million, Cruz-Neira estimated. Most of that money would be used for marketing and refining the technology.

If the product goes to market, those sharing in the royalties would be UA Little Rock and the inventors, which, in addition to Cruz-Neira and Pait, include Dirk Reiners, an associate professor in the Department of Information Science at UA Little Rock (and Cruz-Neira’s husband), and Carsten Neumann, a senior research scientist in the Emerging Analytics Center.

Other entities are working on similar anatomy-training technology, Cruz-Neira said, but “a lot of the groups are focusing on very specific, narrow aspects of the educational process” — for example, just entry-level medical students or nursing students. “We are trying to have a more holistic view,” one that includes a wide range of potential users, from high school students to medical residents to military personnel.

To Pait, the technology is a means to an end: “The more medical knowledge, the better health. That’s the bottom line.”

Arkansas Business