MSU team's research focuses on 'augmented' reality

STARKVILLE -- If you want to know about his research, Edward Swan, a computer scientist and professor at Mississippi State, first points to a piece of equipment.

It is called a haploscope. It is an optical device which through a series of angled lenses and mirrors, projects a separate image to each eye.

"It's a standard instrument to study visual perception," Swan explains, "except ours is an augmented reality haploscope, perhaps the only one of its kind."

Swan and his colleagues built the haploscope three years ago. Since then, they have been studying what Swan says only four other entities in the United States are studying.

"Most other places that are looking at this technology are using it for video games," he says.

The video game industry may be the most lucrative way to capitalize on augmented reality research, but Swan's team hopes to use their findings a little differently.

Imagine a surgeon telling his patient that the surgery equipment he will be using is actually made with the same technology television networks use to produce the yellow first-down line during football games.

Implementing the familiar "yellow-line" technology in the medical field is something Swan and his researchers see as a logical next step. By improving depth perception in augmented reality, the team is focusing on mixing virtual objects and the real world.
"We are looking at applications where you want to physically see the patient in front of you, and you want to see the graphical information at the same time," Swan says.

With the advances in x-ray and other scanned data results, Swan said the issue is no longer seeing inside the body: It's making sure the physician's procedure adheres to the data from these scans precisely.

"The problem with these techniques is, you have gathered this data, but you can't look at the data aligned with the body," Sawn says. "Radiologists get used to looking at the data on documents or digital monitors, but there are still certain things that are easier to do if you could effectively see into their body, actually see the data."

Swan visited a lab in Munich, Germany, where he says there has been an extensive amount of work on the topic.

"So for example, if you have a metal rod put into your bone because you broke it bad enough, you are supposed to put the rod in the bone, put it together and then put a screw through the bone and through each end of the rod," he explains. "So they take an X-ray and the metal rod shows up great, but you want to make sure you get it right the first time.

"They have developed a system where they project an X-ray onto the actual patient, and then the doctor can look and see the hole exactly where it would be on the bone."

The technology has yet to be perfected, however. Like the yellow line, the virtual object can often be inaccurate in the real world, even if it is only by a matter of millimeters.

But if Swan's research is accepted and implemented in the medical field, those millimeters could be the difference between life and death, something Swan's team is completely aware of. Gurjot Singh, a graduate student and member of Swan's team, says the experiment they are using now has subjects measure how far away an object projected through the haploscope is, by pushing a pole to the estimated distance.

"You see this object, but there is no number in your brain that you can look at," Singh says. "We have our participants do something that we can measure."

"This is just one thing we have tried, because it's really more of a research question: What should we be measuring?"

Even if the measurements were perfect, Swan says physicians will have to adapt to working with augmented reality, which could be discouraging to begin with.

"It's like buying new glasses," he says. "At first, things look distorted, but after a while you stop having to think about that distortion, and it becomes normal."

"Someone who habitually takes off and puts on glasses gets used to the constant change in distortions and can quickly adjust either way."

After being featured by both PBS and the National Science Foundation for their work, Swan's team may be more encouraged than ever, as the smiles and laughs that fill their laboratory attest.

Swan's team has reached the proverbial first down. Even the yellow-line confirms it. It's nice, but the drive must go on.
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