

## Virtual becomes reality at Stanford

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One small, windowless room with cameras. One weird-looking \$25,000 helmet. Two computers.

That's all Stanford University researchers need to transport student subjects into a virtual world that's so real, they bump into walls and feel like they're plummeting down a 30-foot pit.

But far from sensational gaming, it's a serious investigation into how the digital age -- with its online role-playing games and MySpace social sites -- can alter human beings and their interactions.

The implications of Stanford's studies, researchers say, are so far-reaching that they could change everything from police lineups to America's obesity epidemic to political campaigns.

"How does the human identity change now that we're digital?" said Assistant Professor Jeremy Bailenson, director of the Virtual Human Interaction Lab at Stanford.

Virtual reality technology isn't new. Some of the first high-tech virtual reality systems were aircraft simulators before World War II. But Bailenson is one of the pioneers examining how people behave socially when they're immersed in virtual reality. And some of his team's findings are compelling.

Take Bailenson's "virtual police lineup" research, which involves changing the way we think about representing humans. Right now, lineups in roughly 95 percent of the eyewitness cases involve little more than a collection of mug shots. And often witnesses and victims pick the wrong suspect, even though they're positive they're right.

Plausible reasons? Photographs are two-dimensional, and memory encodes people in stereo images. The suspects are dressed differently and have different hairstyles and weights. There's no context for the crime.

"There are a lot of innocent people in jail due to faulty police lineups," Bailenson said. "This is someone you saw once for 10 seconds."

His high-tech helmet can transport victims to a real-seeming police station where five virtual suspects walk into a white room. As in real police lineups, they resemble each other but not enough to be indistinguishable. With a tap on Bailenson's keyboard, the suspects are suddenly the same weight, dressed in khakis and sporting identical buzz cuts. Now the victim can't pick the one person -- perhaps the wrong person -- who has, say, the long hair she remembers from the crime scene.

If a victim recalls looking up at her mugger in a brick alley, Bailenson can make the suspects taller and suddenly turn the virtual world into that alley.

"In virtual reality, you get unlimited information -- you can see someone's face from any distance and any angle," he said. "When you give them unlimited information they can use, they're more likely to be accurate."

One measure of how inaccurate photographic lineups are: all the DNA-based exonerations of individuals convicted of sex crimes with eyewitness testimony. So far, there are more than 154, and that's just a fraction of those researchers believe are wrongly convicted in all kinds of criminal cases because in most instances, there's no DNA evidence to contradict eyewitness testimony, said Gary Wells, a psychology professor at Iowa State University.

In the police lineup studies Bailenson conducts with student volunteers, he stages a crime in which someone steals a metal money

box from the lab. The students, who initially think they've witnessed a real theft, then try to identify the culprit in a virtual lineup.

The helmet that transports them into the virtual world is equipped with an accelerometer (typically used in planes and missiles) that captures the pitch, roll and yaw of the volunteer's head 100 times a second. Four small cameras in the dark windowless room triangulate the position of the helmet, which has a light-emitting diode.

One computer records the information. A second computer continually redraws that world and sends the information back to the helmet.

As the students crouch and walk around the "suspects" in the virtual lineup, observers see them moving seemingly aimlessly in the small empty room. All the "action" is inside the helmet.

The National Science Foundation saw enough promise in the research to give Bailenson a \$500,000 grant in 2002, but the technology is a long way from making it into police stations. More studies need to be done, and law enforcement needs to buy into it, he said.

"My intuition tells me this is the right way to go, but we're far from proving it."

Bailenson got his start with virtual reality at UC Santa Barbara working under psychology Professor Jim Blascovich, with whom he now collaborates. When Blascovich talks about virtual reality, he doesn't limit it to digital technology. Humans have cultivated virtual worlds from the beginning with storytelling and sculpture, theater and books, he said, and more recently with photographs, movies, radio and television.

"The concept of being in a synthetic world isn't restricted to digital technology," he said. "Neurophysiologically, we're wired for it because people are convinced of being present in their dreams all the time. ... The human race seems amenable to being someplace else virtually."

But today, digital technology is changing the fundamental landscape of how humans interact. Video games are one way. Many researchers believe violent games can cause aggressive behavior, but what happens if people witness positive digital behavior?

Jesse Fox, one of Bailenson's graduate students, has Stanford volunteers don the helmet and watch 3-D digital images of themselves -- their "avatars" -- jogging on a treadmill. The student volunteers are ostensibly supposed to memorize numbers flashing on the avatar's chest but become engrossed in seeing themselves in virtual reality and explore the image from every angle. Later, they report exercising significantly more over the next 24 hours than students who watched someone else jogging or themselves just standing there.

Fox envisions the technology someday reducing childhood obesity rates by letting kids watch themselves exercising and losing weight.

"I'm an idealist at heart and big into social change," she said. "How can we use this for health purposes and get people to engage in more healthful behaviors?"

Another graduate student, Nick Yee, is studying whether inhabiting a different body in virtual reality can change someone's actions in the real world. In one experiment, people with attractive avatars in virtual reality later showed more confidence in the real world: They felt they would have better luck with more attractive mates in a mock dating service than students who had experienced less attractive avatars.

This potentially means that online role-playing games like World of Warcraft, where people adopt characters with positive traits such as leadership qualities, could end up bettering their behavior.

"Video games don't necessarily have to teach violence," Yee said. "There's a lot more potential."

Another aspect of Bailenson's research has to do with digital advancements that allow people to easily change their images, a common practice on sites like MySpace. Studies have shown people are more attracted to those who resemble them. Before the 2004 presidential election, Bailenson had unwitting subjects view pictures of the candidates morphed with their own faces. Just a week prior to the election, when most people had supposedly decided on a candidate, people had a higher likelihood of choosing the candidate that resembled them than the one who didn't. The technology to do this is cheap and accessible, and the implications for

elections and mass media are huge, said Bailenson.

"When you're online, transforming yourself digitally is easy to do," Bailenson said. "It's rarely detected. It has huge implications for social influence."

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