

COMPUTING

Annotating the Real World

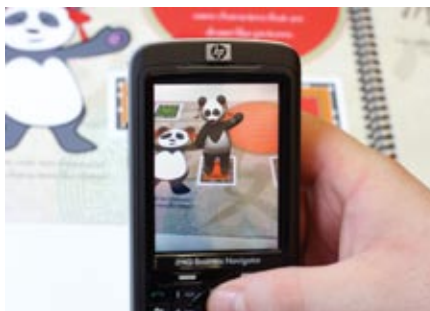
Augmented reality starts making commercial headway **BY STEVEN ASHLEY**

Rich Jenkins opens a child's picture book and aims a camera phone at a page depicting a cartoon panda bear that is gesturing toward a set of Chinese characters. As Jenkins and I view the page through the cell phone screen, the printed panda suddenly erupts into a 3-D video version that points at the first symbol, pronounces it in Mandarin and then defines it in English.

Jenkins, who leads Media Power, a New York City-based firm that develops mobile communications applications, smiles at my rather startled reaction. "A software application that we've downloaded into this phone reads cues that the book designers have embedded into the graphics," he explains. "It then calls up the video segment appropriate for that page from the network server. The result is like a pop-up book on steroids." Jenkins notes that this new kind of animated content could help kids learn and that these "magic books" could become available by the end of this year. The company will also be introducing cell phone-enabled museum exhibit tours based on the same technology, as well as the means by which consumers can trigger delivery of targeted advertising by directing camera phones at brand logos.

Media Power is part of a vanguard of organizations that is working to commercialize augmented-reality (AR) technology, which can be characterized as the timely overlay of useful virtual information onto the real world. According to Mark Billinghurst, director of the Human Interface Technology Laboratory at the University of Canterbury in New Zealand, AR incorporates three key features: virtual information that is tightly registered, or aligned, with the real world; the ability to deliver information and interactivity in real time; and seamless mixing of real-world and virtual information.

When explaining AR technology, Blair MacIntyre, who directs the Augmented Environments Laboratory at the Georgia Institute of Technology, often invokes the



"MAGIC BOOK" PAGE triggers a video segment when viewed through a camera phone.

virtual first-down marker seen as a yellow stripe in televised football games. "The technical challenge of AR is to do something similar but more complex with the live video feed from a cell phone camera and without the 10-second delay required to generate the virtual marker."

Although AR has mostly lived in the lab (except, notably, in the form of head-up displays for fighter jets), the recent emergence of highly capable mobile devices is fueling a surge in interest. (Much of the AR technology on cell phones is based on work done at Graz University of Technology in Austria.) "I think that we're on the cusp of widespread application of AR technology, perhaps in a year or two," Billinghurst says,

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pointing to the Eye of Judgment, a video game for Sony's PlayStation 3, as the most prominent example of the trend. Players look at cards through a camera and watch animated versions of the game characters on the cards fight one another. The ability is based on identifying real-world objects and estimating their locations in space.

AR-like technology is also finding its way into industrial manufacturing. InterSense, a Bedford, Mass.-based company, offers process-verification systems that use sensors and cameras to track the positions and motions of tools as workers do their jobs. Computers then compare the actual tool movements with ideal procedures to detect errors or confirm correct completion, information that is then provided graphically to the workers in real time.

If today's trends hold true, more AR-based products will arrive before long. Commercial entities that have entered the field are split among suppliers of AR-authoring and development tools, includ-

ing ARToolWorks in Seattle, Germany's Metaio and France's Total Immersion, and large companies such as Sony, Canon, Qualcomm, Motorola and Nokia. Billinghurst estimates that around 40 academic labs shell out a combined \$50 million to \$60 million every year on AR research and that commercial firms spend two to three times that. Progress in AR depends on advances in display technologies ("virtual" eyeglasses, for example), tracking systems, cameras, and processors and

graphics chips for mobile devices, as well as the means to deliver AR services wirelessly where and when users need them.

Widespread use of AR, though, will probably depend on integrating AR with social networking, Billinghurst states. Such a mix, he says, would, for example, "allow users to leave annotation notes—advice or opinions—for their friends on the network at sites such as restaurants or scenic spots all over the world." Reality would take on a whole new meaning.

The Road Better Traveled

Researchers at General Motors (GM) are developing a windshield that combines lasers, infrared sensors and cameras to monitor what is happening on the road ahead and deliver that information in a way that allows drivers to see their way a little more clearly. GM's prototype head-up display windshield will make objects ahead stand out, especially for aging eyes. The technology will enhance just a few objects that are already in a driver's view and avoid splashy, distracting data on the glass. When a driver was in heavy fog, for example, a laser would project a blue line onto the windshield that followed the edge of the upcoming road. Or if infrared sensors detected an animal in the driver's path during a night ride, the system would display its outline on the windscreen.

FIELD NOTES

Danger in the Forest

Drug traffickers and other outlaws confront scientists in a reserve **BY CHARLES Q. CHOI**

Deep in the Maya Biosphere Reserve in Guatemala, armed men near a stopped white truck face us—one gripping a shotgun, another slashing a nearby branch with a machete. They glare at us menacingly as we drive by. "That was a perfect place to kill someone," half jokes our guide, Javier.

"Let's not talk about that right now," curtly replies Seth Factor, Guatemala director of the environmental advocacy group Trópico Verde. Bands of armed outlaws are a common threat in the western third of the Maya Biosphere Reserve—"the Wild West," as one scientist here has called it.

The reserve is the heart of

the biggest intact forest in the Americas north of the Amazon—at 2.1 million hectares, it is roughly twice the size of Jamaica



SMOKED: Settlers try to clear trees with fire in Guatemala's Maya Biosphere Reserve to make way for illicit cattle ranching. These and other illegal activities hamper conservation efforts.

and covers nearly a fifth of Guatemala. In terms of biology, it is one of the richest forests in the world, boasting at least 100 mammal species, 400 bird species and 3,000 plant species. And it is also home to the epicenter of the ancient Maya civilization, holding the largest excavated Maya city, Tikal.

Fieldwork in this steaming-hot forest has always been challenging; scientists must brave venomous snakes, flesh-burrowing botflies and repeated bouts of malaria. But in the past decade the risks have escalated as criminal activity has invaded the reserve's western region. Cocaine smugglers have burned tracts of forest to set up