Sam McMillan

Augmented Reality

Seeing is Believing

Once the province of Hollywood special effects wizards, computer science research departments and pilots of the F-35 Lightning II, Augmented Reality has leapt off the lab bench and come to life. You may have seen AR in movies like *Minority Report,* read about heads-up displays for fighter pilots or even come across a cheap, head-mounted, 3-D gaming display under the Christmas tree. Today, thanks to a new generation of smart phones and Webcam-equipped computers, AR is poised to emerge as one of the most influential new mediums of the decade.

At its most basic, Augmented Reality combines a digitally processed video feed with computer-generated imagery and data to augment a view of the real world in real time. If you've seen the yellow first-down stripe on a televised football game, you've seen a simple version of AR.

You won't need a security clearance to experience AR. Point an AR-enabled phone at a street scene and you can find houses for sale, locate the nearest subway or see who is sending you tweets and where they are. On the home front, computer users can visit an AR-enabled Web site, hold up an AR marker to their Webcam, then try on the latest fashions, model a new pair of sunglasses or interact with a 3-D hologram that literally leaps out of their computer screens.

Web Social Shopper: This application will allow anyone with a Webcam to shop online right from within their video feed. It allows users to seemingly hold articles of clothing up in front of themselves to see "how they look."

Corporations ranging from GE to Frito-Lay have taken note, with AR marketing efforts that bring to life GE'S Smart Grid and a Blink 182 mini-concert promo for Doritos created by Goodby, Silverstein & Partners with help from Mekanism and Proto.

Zugara tries AR on for size

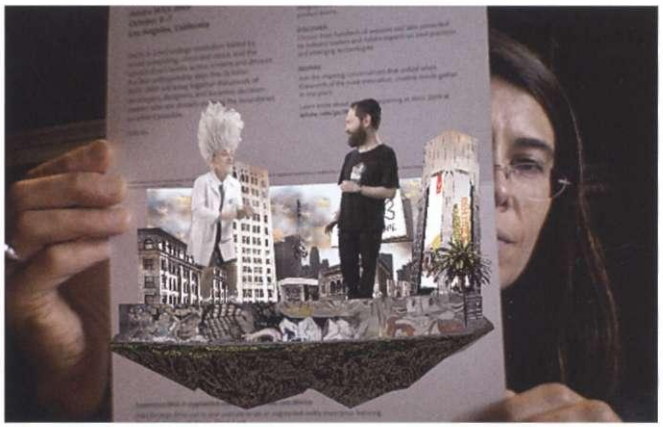
Interactive marketing agency Zugara's Web Social Shopper is based on the idea that many people visit online shopping sites but leave without purchasing anything. Why? Perhaps because they can't try on the items. The Web Social Shopper application aims to change that with an audacious combination of AR techniques, an interface straight out of *Minority Report* and its own proprietary motion-capture technology it calls ZugMo.

Standing in front of a Webcam in the privacy of her own home, a real shopper can try on virtual clothing, in what CEO Matthew Szymczyk calls, "An at the rack moment—when you hold something up to yourself, turn to someone and say 'how does this look?'" Icons that appear in the AR interface can be controlled by the user, simply by gesturing, no data gloves required. As Szymczyk explains, "Motion capture actually 'augments' the traditional augmented reality experience." The prototype has been hugely successful for Zugara. Szymczyk reports that since wss launched, inbound requests to Zugara are up over 4,000 percent.

Autodesk does real-world augmented reality

At Autodesk Labs engineers are exploring how AR can help architects envision the impact their buildings will have on the urban landscape, down to shade patterns and wind effects. As Eddy Kuo, senior software engineering at Autodesk explains, "AR is a way to put something you are trying to design into the real world," without the cost or hassle of building physical models.

Built by Brian Penne and Kuo, the Autodesk AR prototype uses a Web camera, a projected floor plan, Computer Vision software and fiducial markers to locate buildings on a site plan. Moving the markers on the tabletop projection invokes a display of 3-D-modeled high rises on a streetscape. The display shows, in real time, how shadows are cast, how the buildings relate to one another, and even calculates how wind patterns are generated depending on the location of the



Kashka Pregowska-Czerw, associate creative director and lead on this project, is holding Adobe's AR invitation (http://max.adobe.com/MAXar).

This AcrossAir application allows users to find the nearest subway in New York City.

buildings. Instead of having to learn and manipulate complex 3-D software tools, users can see the results on screen simply by picking up the marker and turning it.

Adobe invites DevelopARs

To make a splash at M A X , its big conference for Web designers, developers and marketers, Adobe created a special AR invitation on the Web. Built in-house by the M A X team, lead by creative director Amar Joseph, the tongue-in-cheek invite combines multiple data streams, including video objects as streaming video, 3-D objects and Flash, all intermingling simultaneously.

"We wanted a show-and-tell marketing experience for the end user that is atmospheric, tactile, experiential and educational," Joseph explains. At M A X , a breeding place of technology, experimentation and design, Adobe plans on rolling out sessions specifically devoted to AR and Adobe enabling technologies such as Flash, the FLARToolkit, CS4, open source tools such as Papervision 3D and the SPARK project.

"It's unexplored technology," Joseph says. "We're just at the starting gate of where we're heading. People are innovating every day against this stuff. The opportunity is amazing."

The LAYAR Reality Browser: While looking through a phone's camera lens, users can see houses for sale, popular bars and shops, tourist information and more.

AR augments real estate

Anyone who wants to see the future of real estate need only pick up an iPhone or Android and point it down a tree-lined canal in Amsterdam. There, thanks to an incredible piece of AR programming called LAYAR, from SPRXmobile, every home for sale on a particular block appears augmented with real estate information. Simply scan the block and homes for sale pop onto a radar style grid, along with data such as address, asking price and phone number. Tap the screen once and more detailed information is presented. Tap and hold, and the phone rings through to the real estate agent handling the property.

According to SPRXmobile co-founder Maarten Lens-FitzGerald, the design team for LAYAR had "a bigger vision than the Internet could accommodate. The Web had pages, but the world has layers. We wanted to slice it like a layer cake. Design-wise, we had to figure out how to interface with reality in a digital screen. We incorporated a dot, a square, a radar grid. These small interactions and interface issues had never been dealt with before. We wanted the interface to be logical, new and fun."

Clearly, it's worked. Hundreds of thousands of people have seen the LAYAR prototype on YouTube. "I thought we had a little plane taking off. Now, it's turned into a rocket ship. CNN ran a piece on us. We're getting requests to partner with businesses all over the world."

AcrossAir finds the neARest subway

AcrossAir, a London-based company of six developers and two designers, saw the potential for AR apps as soon as the first iPhone 3GS hit the marketplace. Their two AR apps, called Nearest Subway and Nearest Tube, help footsore pedestrians find the nearest subway station in New York or London, respectively. By exploiting the built-in GPS capability and compass, the AcrossAir apps know where you are, and where your phone is pointing. Fire up the app, hold the iPhone up and the subway stops appear as colored rectangles hovering

A before and after picture of Metaio's iPhone App iLiving that integrates 3-D furniture into photos of your living environment.

over the real street scene. Each colored display shows the name of the station, the trains running and their distance from the phone. Subway stops farther away appear in the background as smaller rectangles. Hold the phone to the ground and the subway station icons change to directional arrows, pointing the user in the general direction of the destination.

The result is so simple, "Even your Mum can use it," AcrossAir co-founder Demani says. "Our main goal was to create something simple, functional, that can be learned immediately." There are no buttons to click, nothing to push, and no need to touch the screen. You turn on the app, and AR is invoked. "We wanted this to look as if it's part of the landscape," Demani says. "Like the information is floating in midair."

What you see is what you get with an AcrossAir app.

AR for industry

Metaio, a Munich-based company with 50 employees in Germany, South Korea and California, has developed a proprietary AR software design platform called Unifeye and is already bringing it to industrial partnerships with Volkswagen, BMW, Volvo and Peugeot. For these companies, AR isn't a marketing ploy, it's a powerful way to save time and money as they develop new models of cars and, just as importantly, plan the assembly lines to produce them. Once a new car model is made, engineers can take a 3-D CAD model, combine it with a picture of the factory floor, and place the model in the real assembly line to see if there will be any collisions. Instead of complex, time-consuming 3-D modeling of the factory floor, factory managers can use AR to make on-the-spot adjustments and see their changes in real time.
But where AR really makes an impact is in the mobile arena. According to Noora Guldemond, head of business development at Metaio, "For now you can get away with marketing gimmicks, but we think mobile is the ultimate device." Metaio's entry into the AR mobile arena is called iLiving, an app for the iPhone that enables users to snap a photo of their home, and place 3-D models of furniture in the space where they can be moved, scaled and rotated within the iPhone. Shaking the iPhone results in a randomized layout. And a screengrab utility lets users capture the result, then share it with friends and family for feedback.

TwittARound

As if Twitter wasn't ubiquitous enough, a new AR app from Michael Zoellner will literally make Twitter part of the landscape. Hold an iPhone equipped with the TwittARound app up to the horizon and the tweets of those nearby float into view. Brilliant in its simplicity, TwittARound detects the geographic locations where people are tweeting, plots their distance from the user, then displays them on an iPhone in real time, mapped against the real environment. You immediately get a sense of the direction the tweets are coming from, and how far away they are. "It's like hearing someone shouting from a certain direction," Zoellner explains. "So you can imagine where he is and how far away he is. It's a direct way of using AR to show information where it happened."

Michael Zoellner's TwitterARound shows live tweets around a location, where the tweet comes from and how far away it is.

Currently the deputy head of the Virtual and Augmented Reality Department at the Fraunhofer Institute for Computer Graphics Research in Darmstadt, Germany, where they have been working on AR solutions for more than ten years, Zoellner remembers when AR meant backpacks equipped with heavy laptop computers, and bulky head-mounted displays. Despite technical advances in processor speed, Zoellner believes AR is still in its infancy. "A design language has yet to be invented for AR," he says, which means designers have free rein to invent a set of conventions for interface and interaction design.

Much like the explosion of creativity that defined Web design circa 1994, AR as a medium is limited only by the imagination of developers. While American companies are experimenting with marker-enabled AR, in wide-eyed "gee-whiz" applications, European developers have taken a more practical approach. It's the opposite of what Maarten Lens-FitzGerald, of SPRXmobile, calls "Bunny Suit AR. Meaning, the first time you see me in a bunny suit, it's pretty funny. But it's not so interesting the second time." As time passes and AR applications become commonplace, we'll see if reality will ever be the same, and who's laughing then.

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