PRIMARY TARGET
VIDEO GAME INVASION

BY LIAM O'DONNELL

Watch out, video games are taking over! Okay, it isn't exactly horror movie material, but it's true that the line between computer graphics and reality is getting blurry.

Check out NASCAR racing on television, for example. Bubble-shaped graphics follow race cars around the track telling you the driver's speed, their position in the race, and much more. NFL football games now have a yellow line that runs across the field, marking the distance to a first down. Some luxury cars even have night vision systems that project hard-to-see road obstacles onto the driver's windscreen. These are more than fancy computer graphics. These are the first steps in a new wave of computer technology known as Augmented Reality.

Augmented Reality, also known as AR, puts computer graphics over objects in the real world. Just like those bubble-graphics hovering above the race cars on television. The AR graphics give us information about what we're looking at, like how fast that car is racing around the track. Research into Augmented Reality is still very new, but scientists are learning a lot from a very familiar source: video games.
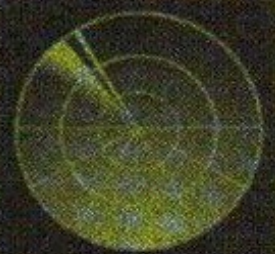
TARGET: GARBAGE
OBJECTIVE: REMOVE ALL GARBAGE TO WASTE STORAGE CONTAINER BEFORE PARENTAL UNITS ARRIVE
TIME: 5 MINUTES

WARNING
SYSTEM OVERLOAD

SCANNING...   BATTERY - 78%

GAMES THAT TEACH

"Video games have mastered giving information to help players," say Shahzad Malik, an AR researcher for the National Research Council of Canada and a PhD student at the University of Toronto. At one time Malik made video games for a living. Now he applies his gamer know-how to building Augmented Reality devices.

When you're playing your favourite video game, your brain is hard at work (try telling that to your parents). You are constantly responding to colourful graphics that guide you, monitor your character's health, tell you when you're low on items, and much more. Good video game graphics are easy to understand. Computer scientists like Malik want to apply the power of game graphics to Augmented Reality. That way, using future Augmented Reality devices will be as easy as playing video games.

MAKING MOBILE REALITY

Augmented Reality will really take off when it leaves television screens and hits the streets. That's why the goal of many researchers is to build a portable AR system that we can wear wherever we go. The perfect mobile outdoor Augmented Reality system would cost as much as a home computer, be the size of a MP3 player, and use a pair of specially designed eyeglasses to display graphics over the real world.

But don't add an AR system to your birthday wish list, just yet! Research is still in the early stages; however, scientists are excited about the potential applications. For example, in the future, repair people wearing an AR system could look at a broken piece of machinery and have the repair instructions displayed in front of their eyes. Or one day you may rent an AR system while visiting a new city—graphics would appear above the entrances of unfamiliar restaurants showing you menu details, daily specials,

and much more. (As if it isn't hard enough pretending you're not just a tourist.)

Even the military is getting in on the action. An AR system could give soldiers access to aerial maps providing details about their surroundings, letting them see into buildings despite fog, smoke, or other obstructions.

VIDEO GAMES ON THE GO

It will be years before we're popping on a pair of high tech specs to check our email, but don't tell that to Wayne Piekarski. He is the assistant director of the Wearable Computer Lab at the University of South Australia and one of the brains behind *AR Quake*, one of the earliest working AR systems.

TARGET: STUDIO OBJECTIVE: MEET PARENTAL UNITS IN FRONT OF STUDIO AT EXACTLY 1:00PM TIME: 1 HOUR, 37 MINUTES, 29 SECONDS

CONTACT: MOM ALIAS: DIANE

CONTACT: DAD ALIAS: BRUCE

Piekarski and his boss Dr. Bruce Thomas didn't just study video games when they built *AR Quake*. With help from a team of students, they turned their university campus *into* a video game. "Games always push the limits of what computers can do," says Piekarski.

The research team pushed the limits of an old video game called *Quake*. They mapped the game's computer code over the buildings of their school. Then, they put on a pair of bulky goggles wired to a laptop computer.

Examples of Augmented Reality technology: using a glove to manipulate a virtual cursor (left); superimposing a model building onto the landscape (centre); moving a virtual picnic table (right).

AR Anatomy

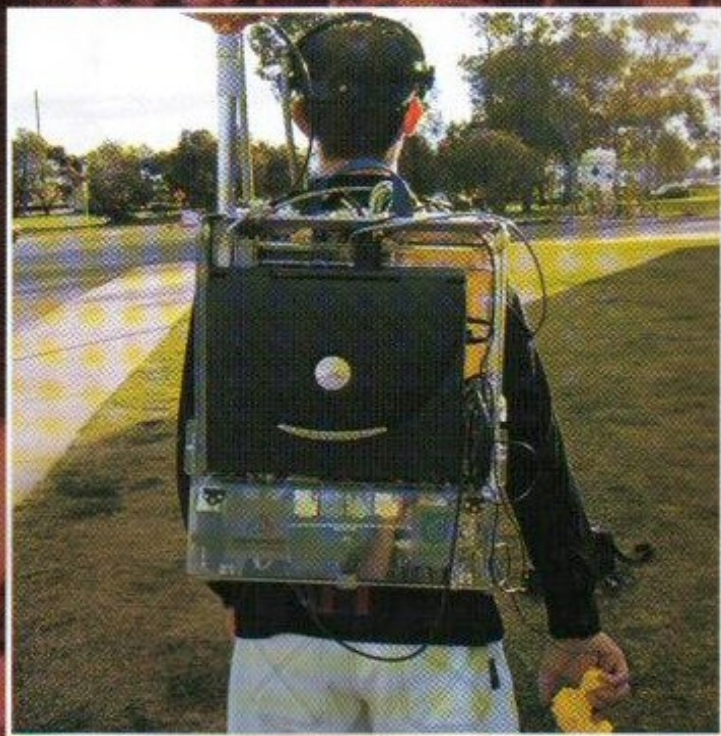So what does it take to build an AR system? Let's put on the goggles and have a look:

Head-mounted Displays (HMDs):

HMDs allow us to view graphics created by an Augmented Reality system. Wearing a HMD is like hanging a television screen in front of your face, so it's no surprise that the biggest challenge facing developers right now is size. Current HMDs are pretty bulky. The goal is to shrink them to the size of eyeglasses. But will they be fashionable?

Tracking:

To tell you where to go, your HMD needs to know where you are. That means you need an accurate tracking system. Today, Global Positioning System (GPS) receivers are the best solution, but they're not perfect. GPS receivers can tell you exactly where you are on the planet by communicating with satellites orbiting the earth. GPS receivers are great for finding your way when you're lost in the woods. But, even the best GPS receiver is not accurate enough for a seamless AR experience.

The results for the *AR Quake* team were positive, but not perfect. "You can still see the computer is not quite getting the alignment right," says Piekarski. "And it doesn't work well when you run or jump around." GPS also does not work well inside buildings, so it has limited use for for indoor AR applications.

Mobile Power Source:

Getting AR on the road requires portable power, and lots of it. You need a computer powerful enough to drive a GPS receiver, send signals to a HMD, and handle 3D graphics. Oh, and it must be small enough to fit on your belt. Seriously.

Today, a laptop computer is as small as researchers can go. And they owe that portable power to video games. When laptops first came out, people complained that they couldn't play games on their new machines (and you thought they were using them for work). So, computer makers made laptops powerful enough to handle 3D graphics and took a big step toward creating an AR system. Lugging a laptop around town gets tiring pretty quick, so AR researchers are aiming to get their power source down to the size of a MP3 player.

The laptop fit into a special backpack and sent signals to the goggles, displaying computer graphics over the normal school buildings. When the researchers looked through the goggles, they saw video game graphics and the real world at the same time. They had created a working AR system.

It wasn't the size of a MP3 player, but for Piekarski and his team, it was definitely a big success.

TARGET:
FOCUSING
OBJECTIVE:
ASK DIRECTIONS TO NEAREST CANDY STORE
TIME: ESTIMATED TIME - 3 SECONDS

Augmented Reality is very new and the first systems won't hit the stores for at least 10 years. But you won't have to wait that long to see Augmented Reality in action. Already, gamers can hook up a small video camera to their game consoles and appear on the television screen beside video game characters. Standing in front of the television, gamers can watch themselves on screen as they wash windows, fight ninjas, or strut their stuff in a fast-paced dance competition. Talk about getting *into* a video game!

Keep your eyes open for more video game invaders, no doubt they'll have you seeing reality in a whole new way.

To better understand how Augmented Reality technology could be used, researchers from the University of South Australia created AR *Quake*, an AR version of the popular video game *Quake*.