Horizon Newsletter
Informing Businesses Using Computers
August 2002

Back to the Future

Inside this issue

Published by
Roger Petersen of
Advanced Horizons
Elmhurst, IL 60126
630-941-9332
Fax: 630-941-9338
Email: Roger@AHInc.com
Visit our web sites at
www.AHInc.com
www.EZForYou.com

A Look into the Future

Everyday we are reminded of the 911 event, price drops on stocks and crocked leaders of companies. To help overcome these issues, I thought it would be a good time to look at some positive issues. So, I have compiled a **list of new inventions that have a promising benefit to all of us.** ***Hope you enjoy reading about my findings***.

Hybrid Nanorod-polymer Solar Cell

Janke J. Dittmer, *Wendy Huynh, Professor Paul Alivisatos* and his research group at the *University of California* are working on a **hybrid nanorod-polymer solar cell that will lower the cost of mass-producing inexpensive and very flexible solar cells**.

The nanorod could power things like PDAs and other small devices with just ambient room lighting. These solar cells are able to convert about 2.5 percent of the light they take in into electrical power. Improvements over the next few years will eventually attain 10% efficiency, which will justify production costs.

Making hybrid nanorod-polymer solar cells does not require expensive clean rooms, high-temperature kilns, or vacuum chambers. They are made by two separate mixtures combined and spin-cast at room temperature to produce an even film of nanorods that's approximately a thousandth the thickness of a human hair.

This technology will **probably be available within three years**.

MicroFuel Cell

Robert Hockaday of *Manhattan Scientifics* is researching ways to get more power for mobile devices via **MicroFuel cells**.

Fuel cells generate electricity by means of hydrogen or methanol as an alternative power source in cars. The MicroFuel Cell is designed for devices such as cell phones, notebooks, and PDAs, and it has potential to replace the lithium-ion battery. The MicroFuel Cell can **power a cell phone for up to one week of talk time**, compared with the 5 hours by a lithium-ion battery. They can **power a notebook computer for an entire day**. Because methanol is so inexpensive, they are **cheaper than lithium-ion batteries**.

Ball Aerospace, Fraunhofer Institute, Motorola, Samsung, and *Toshiba*, are working on integrated fuel cell technology. *Toshiba's* fuel cell technology is expected to offer 10 times the battery life of current lithium-ion batteries.

Smart Fuel Cell is expecting to ship an **external MicroFuel cell as early as the winter of 2002**. It is a 6.7-ounce, 40-watt external power supply.

Hybrid cars, running on both gas and electric power are now available, but expensive. The *2003 Ford Escape Hybrid SUV* is projected to get nearly 40 miles per gallon. *DaimlerChrysler*

and *Ford* are investing in engines powered by fuel cells for 2004.

Expectation is the MicroFuel Cell will **start shipping by late 2003**.

Holographic Digital Storage

In 1947, British/Hungarian scientist *Dennis Gabor* theorized that crossing two beams of light could produce a 3-D image called a hologram. In 1962 Gabor's theory was fully realized by *University of Michigan* scientists *Emmett Leith* and *Juris Upatnieks*. Holograms have appeared on magazine covers, pendants, stickers and supermarket checkout scanners. A recent application could prove to be the most important breakthrough for holography in decades: **holographic video storage**.

InPhase Technologies, spinoff of *Lucent Technologies*, has a prototype called the *InPhase Tapestry*. By storing video data as holograms, the Tapestry **can store 100GB, equal to about 20 compressed feature films, on one DVD-like disc**. InPhase expects that future models will be able to store up to 1.3 terabytes. It stores more data than magnetic media because it writes throughout the entire thickness of the disc, instead of just across a disc's surface. It acheives a data-transfer rate of about 20 MBps. Today's magnetic video storage units have transfer rates of only 2 MBps.

Two markets are targeted: professional video and data archiving. The Tapestry could be a boon to production houses that need massive storage and quick retrieval. The appeal to the data archiving market is the write-once medium that cannot be altered and is much more difficult to pirate. InPhase expects to begin testing next year, with **volume units scheduled to ship in 2004**.

3D Technology

Today's 3-D display technology has 2 problems: the glasses and content creation. The glasses are obnoxious irritants. Content creation is troubled by the lack of standards and the need for special cameras, extra bandwidth for broadcast, and new ways to record content and play it back.

Philips has a 3-D display prototype in an LCD computer-monitor form factor. The display requires no special glasses yet **shows 3-D images from normal 2-D sources**, such as film and videotape. Several people can see the 3-D effect at the same time. What you see is like the old View-Master.

The display is a blend of lenticular imaging which are colorful cards with finely ridged plastic over a color picture that either have a 3-D look or appear to move as you tilt the card from side to side.

Philips applies a lenticular surface to a high-resolution color LCD that displays tightly interleaved slices of several versions of the scene, giving a sense of dimensional perspective.

The prototype is tuned for a normal working distance from a monitor. The images are still clear as you step away from the monitor, but the 3-D effect diminishes significantly.

To convert everyday 2-D images into 3-D images, Philips developed an algorithm to examine each frame and determine which objects are in the foreground. By isolating the foreground objects, the software can assemble slightly different views of the objects, displacing them relative to the background. This creates a sense of being able to peer around the edges, greatly increasing your depth perception.

IBM Infoscope

Ismail Haritaoglu at the *IBM Almaden Research Center* and *Daniel M. Russell* of the *User Lab* have developed the *IBM InfoScope*. **Point it at a sign and it translates the words into your own language**.

It uses a Casiopedia Pocket PC and a Casio digital camera. You capture an image from a sign on the screen and then select a bounding box to indicate where the text is. A wireless connection sends the image to a server where optical character recognition (OCR) software is run on the text and converts the text into your language. The InfoScope works only for short translations and doesn't understand context limitations. The prototype can translate 4 languages into English: Chinese, French, German, and Italian.

Researchers are investigating a faster wireless connection that will translate signs in less than 5 seconds. They're also working on support for Japanese translation and on adapting the technology to run on phones with built-in cameras.

IBM is also developing *Information Augmentation in the City*, which uses the InfoScope to collect information from a GPS and a wireless modem. The **goal is to point the handheld at a tourist site and receive all sorts of information, from its history to its hours of operation and admission prices**.

No matter how accurate the software, translation will always be an art, not a science. Using the InfoScope in San Francisco's Chinatown, it translated the Bank of America sign in Chinese as "Great Wall of Money Bin."

It may be **2 to 5 years from being commercialized**.

Portable Display

Today's LCDs are often too small to use or too large to carry. *E Ink Corp*. and *Philips* are collaborating on a **portable monitor** that you simply plug into a cell phone or PDA when you need to read e-mail or connect to the Web on the go. Once plastic transistors are perfected, such displays will conveniently roll up.

The enabling technology is E Ink's electronic ink, which uses thin layers of plastic and glass to sandwich electronic ink. The prototype reaches a resolution of 240 pixels per inch with the overall effect of black ink on white paper.

Its contrast ratio of 12:1 is close to the traditional 15:1 ratio and has a viewing angle of 180 degrees. It can be used in any lighting condition where you can read a paperback book.

A device the size of a large PDA should last for 10,000 page views on just 2 double-A batteries.

Portable monitors should arrive next year, along with PDAs, cell phones, and electronic books that use electronic ink displays.

Color displays are now in the prototype stage and should hit the market by 2004. They currently support 4,000 colors, but with some extra color depth and an increase in frame rate, they could one day be a lightweight, portable, and flexible way to watch movies.

E Ink estimates that in **mid-2005**, it will be able to replace all the glass with flexible plastic providing a **roll-up and fold-up display** for all your electronic gadgets.

Virtual Patient

Surgeons will be able to practice surgury by seeing, hearing, and feeling every slice of the scalpel. The technology to operate on a virtual body is *haptics* which let users interact with 3-D environments via the sense of touch.

Immersion Corp is the leader in haptics development and is behind two of the best-known haptics devices: the *Microsoft SideWinder* joystick and the *Logitech iFeel* mouse.

The Immersion *CyberForce System* ($90,000 to $100,000) uses a spandex glove equipped with sensors to detect motion and vibrotactile feedback motors, all attached to a complex exoskeleton that provides subtle force and kinesthetic feedback sensations to the user's hand and arm.

Two units have already been sold to *Ford* and *Boeing* who are currently using the glove part of the CyberForce today, and may use the entire CyberForce in the future to design new engines. Boeing doesn't want to design an engine and find that a mechanic can't get his hand into an area. Using the Cyberforce they can use a CAD model and reach into the virtual model and feel collisions. Ford will use the CyberForce to design the cockpits of new cars.

Stanford University School of Medicine and New York's *Mount Sinai School of Medicine* are currently using some of Immersion's medical simulation devices to **teach students how to perform catheterizations, endoscopies, IV insertions, and other procedures without touching real patients**.

Under the guidance of *Dr. Adam Levine* at Mount Sinai, residents practice virtual intubations. Residents can practice indefinitely until they get the technique, and there's no person to harm. Mount Sinai also uses Immersion's medical IV simulator, which includes a moving mechanical arm complete with haptics feedback.

There is also the concept of **telesurgery where a robot would perform surgery or administer to the wounded in hazardous environments, such as a battlefield**, while the surgeon feels and guides the procedure from somewhere else.

SensAble Technologies produces a force-feedback armature system that **helps CAD designers and artists sculpt and prototype 3-D objects**. In the near future, we will likely see haptic interfaces on portable devices like PDAs, possibly in the form of scrollable wheels that produce the sensation of rolling over small bumps as you click over spreadsheet cells and then smooth tension as you switch over to volume control.

Visual Text to Speech

AT&T researchers may have hit on technology that could improve the interaction between man and machine with its *Sample-Based Visual Text to Speech* technology which lets any computer put a friendly and convincingly humanlike face on its speech-based communications backbone.

AT&T's solution breaks speech down to the visime (visual phoneme) level and records each discrete position of the mouth for later assembly. Words are formed from combinations of each of these individual mouth positions, resulting in highly accurate, "readable" speech.

Convincing speech involves the entire face. A smile at the wrong moment might convey sarcasm, and a question asked without the proper visual cues can confuse viewers. The

team's approach is to break the face down into discrete units. Several hours of video are recorded by the voice talent. The video is then ripped at the subpixel level into component pieces of right eye, left eye, eyebrows, mouth and stored in a database.

The face is rendered on a 3-D wireframe and the components are pulled from the database to render visimes, words, phrases, and sentences, combined with the proper expressions and head movements. The wireframe rendering lets the head be rotated 10 to 15 degrees. When this is combined with AT&T's *Natural Voice* speech recognition technology, the result is **a computer that can carry on a limited but natural conversation**.

The goal is for the application to run on everything from personal computers to the forthcoming 3G mobile phones.

The success of the system depends on users' reactions. The technology is currently good enough for lip readers to follow the agents without sound, and the agents have already passed the test that users cannot distinguish between human and virtual agents for short 4 or 5 word prompts.

Tuning the prototype for **final release is expected to take another 1 to 2 years**. The goal is that within 10 years, the application will be able to deliver an entire newscast that will fool viewers.

Phone-Or Everbeam

A new optical microphone, slated for arrival late next year, promises to make cell phone conversations crystal-clear.

The *Phone-Or EverBeam* microphone approaches the background-noise problem by harnessing the physics of a supersensitive optical membrane and a photodetector to capture sound, along with a tehhnology to suppress background noise.

It is better than a typical condenser microphone at picking up a speaker's voice but not the annoying background noise. The noise it does pick up is canceled out in real time. The speech recognition rate is 5 to 10% higher and quite close to the critical levels of 90 to 95% recognition.

DNA Recognition

Researchers at *Northwestern University's Institute for Nanotechnology Center* developed a **Handheld DNA Detector** that can spot the DNA of nasty diseases in a matter of minutes instead of days.

It not only **lets doctors make on-the-spot diagnoses**, but it also costs a fraction of conventional diagnostic testing, which requires a doctor to mail samples of blood to a laboratory for polymerase chain reaction (PCR) testing.

The DNA handheld **could rapidly detect virtually any viral, bacterial, or genetic agent with a known DNA sequence**, including biological weapons and genetic markers for cancer.

Inserted into the device on a glass slide is a strand of DNA designed to recognize, for instance, the DNA of smallpox. Next, the patient's sample is mixed in. Then, if the matching strand is present, they will stick together like Velcro to form a double helix, and a positive identification of smallpox can be made.

Electrical DNA detection turns out to be 10 times as sensitive and 100,000 times as selective as PCR. The Handheld DNA Detector needs very few molecules to spot diseased DNA and can easily differentiate DNA associated with anthrax from DNA that is very similar but associated with something benign.

Nanosphere, in Northbrook, Illinois, has licensed the technology and is currently selling a large version of the device. A prototype of the handheld version is now under development.

Advanced Horizons
322 Ferndale Avenue, Elmhurst, IL 60126