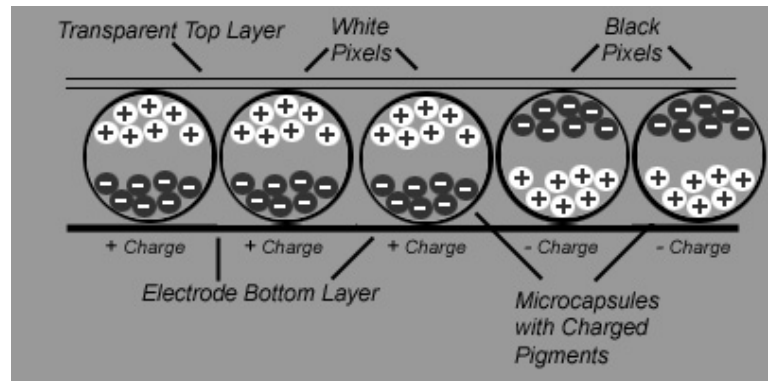


Emerging Technologies – What’s Coming and Do We Care?

E-Ink

The technical concept is simple. Place microcapsules, smaller than the diameter of a human hair between thin sheets of membrane, one transparent and one wired with nano-electrodes. Then fill the microcapsules with charged pigments and send a positive charge through spots with the electrodes in the bottom membrane. Positively charged white pigments are repelled toward the top, transparent membrane — white pixels. Then send a negative charge to the same spot, and suddenly the black, negatively charged pigments rise to the transparent membrane — a black pixel.



The result is active matrix, high resolution, and flexible computer displays thinner than a credit card, and flexible. The original research came almost simultaneously out of Xerox PARC (<http://www.parc.com/>) and MIT's Media Laboratory (<http://www.media.mit.edu/>), and both centers spun off companies that are continuing to develop this technology into practical and marketable products.

Imagine textbooks that are wirelessly connected to a network. On command, the e-pages of the book erase themselves, download the next class period's textbook chapter and any supplemental materials selected by the teacher, and the pages reprint themselves with the new text, images, and, potentially, video.

What may be even more exciting are flexible computer displays with adhesive backs. You stick it on your walls, windows, whiteboard, or even the desks of our students. Computer generated media displayed almost anywhere.

Currently, Gyricon Media, which spun out of the research done at Xerox PARC, is marketing MaestroSign™, computer-controlled signage available to retail and other organizations. E-Ink, in Cambridge, Massachusetts, and spun out of the Media Lab, is marketing display cells that can be integrated into signage, portable electronic products, fashion accessories, and a broad range of commercial and industrial products.

Prospects for the future: The technology is nearly here, though more ideal levels of resolution will be needed. We are reminded, though, that it took 40 years for overhead projectors to move from the bowling alley to the classroom. Still, technology as an entirely different life span and integration model today, than it did in the last century.

Related Web Sites:

E-Ink -- <http://www.eink.com/>

Gyricon Media -- <http://www.gyriconmedia.com/>

ZDNet Article -- <http://www.zdnet.com/anchordesk/stories/story/0,10738,2656348,00.html>

BBC News Article -- <http://news.bbc.co.uk/1/hi/sci/tech/1530678.stm>

How Stuff Works -- <http://www.howstuffworks.com/e-ink.htm>

Quantum Computing

Most of us know that microprocessor elements are etched using light. Many of us do not know that we are beginning to demand processor elements that are smaller than a single wavelength of light, that processor foundries are beginning to use ultraviolet light and super ultraviolet light. But this will not satisfy us for long.

Forced against a technical brick wall, engineers have begun to rethink how we create our processors. One untapped process of nature that is beginning to draw the interest of computer scientists is quantum mechanics, what happens at the subatomic level, and how we might use these laws of nature to add, subtract, and remember things -- compute.

Enter Quantum Computers with processor elements only a single molecule in size, self-assembled chemically, instead of etched in billion-dollar chip foundries. Using the behavior of quantum particles, these computers will redefine the fundamentals of computing. For instance, we will no longer talk about bits, bytes, and kilobytes (remember your first computer literacy workshop in 1982?). In stead, we will begin to think in Qubits. The difference is that adding bits and bytes, computing power increments by one. When you add a qubit, you double the processing power. In 2001, IBM scientists and graduate students at Stanford University created a 7-qubit computer using designer-molecules to calculate the factors of numbers.

Considering this doubling of computing power with each qubit, when a 333-qubit machine is built, the number of calculations that it can perform instantaneously, will exceed the number of atoms in the universe. One of the bigger challenges of this almost unimaginable computing power is our imagination. What would you do with it? This question will increasingly be asked as engineers create new and amazing tools. We will all be inventors of how we use these potentials to improve the quality of our lives and those of others. We need to teach students to be inventors.

Will we see quantum computers on the desks of our students in the foreseeable future? Probably not. However, we may be able to access these machines through our networks and learn within highly realistic virtual reality or search the entire video library of the world by keyword.

Prospects for the future: Research in this technology is in its infancy. However, the belief that such a machine would have the power to crack any security system in the world has many governments scurrying to build the first, especially the U.S. Research and development are escalating.

Related Web Resources:

Quantum Physics Meets the Qubit --
<http://www.wired.com/news/technology/0,1282,40968,00.html>

Centre for Quantum Computation -- <http://www.qubit.org/>

Quantum Information and Information Physics at IBM Research Yorktown --
<http://www.research.ibm.com/quantuminfo/>

The Quantum Computer -- <http://www.cs.caltech.edu/~westside/quantum-intro.html>



"Quantum Information"
Visions Institute of Physics.
22 Sep. 2002
<http://physics.iop.org/Policy/v_production/v2.html>

Emerging Technologies – What’s Coming and Do We Care?

Tablet Computers

What would you get if you merged a notebook computer, handheld device, and your textbook? A tablet PC? That remains to be seen. Tablet sized computers have risen before and then receded into the background -- a technology before their time, or plain bad idea. The almost unprecedented enthusiasm over handheld computers and Palm OS devices in education indicates that tablet PCs may be close to finding their time. We need to ask the question, If the human palm is the ideal size for delivering content, then our textbooks would be the size of index cards today. Perhaps the ideal size for the student computer is more the size of their spiral notebooks.



Tablet PCs are not there yet. For instance, the primary technology being touted by manufacturers is handwriting recognition. In my opinion, we have seen enough value instructional time wasted by students copying down the notes from the board. Voice recognition makes much more sense. Just lay your Table PC down and have it record and transcribe the lecture, or meeting.

A few products that are available and in development:

View Sonic Airpanel 100 — A mobile computer monitor that can be carried away from the desktop computer. Communicates via wireless network connection. --
http://www.viewsonic.com/products/airpanel_airpanel100.htm \$930

Honeywell WebPAD II — A wireless (802.11b) internet appliance enables web and document viewing, e-mail exchange, and entry of information. --
<http://content.honeywell.com/yourhome/webpad/webpad.htm>

FIC AquaPad — Another wireless web pad with two USB ports, a PCMCIA type slot and more —
<http://www.aquapad.org/> \$900

ViewSonic ViewPad 1000 Super Tablet PC -- Windows XP Professional, 20GB disk,° and 256 MB RAM, integrated 802.11b WiFi wireless, integrated camera, wireless keyboard and slip case! --
http://www.viewsonic.com/products/tablet_pc_viewpad1000.htm \$1700

Compaq Tablet PC — a concept machine — <http://www.compaq.com/newsroom/presspaq/TabletPC/>

Prospects for the Future: These machines need to be used and refined based on natural niches that they seem to fill. It would make sense, though to begin exploring the use of these tools in the classroom soon. The prevailing model has been for technologies to find their niches in business and then transpose them over the classroom. Perhaps we should take a computer that has not found its business niche yet, and discover its ideal instructional use.

Related Web Resources:

Is there a Tablet PC in your Future? -- <http://www.pcmag.com/article2/0,4149,13595,00.asp>

Why a Tablet PC is in your Future --
<http://www.zdnet.com/anchordesk/stories/story/0,10738,2824111,00.html>

Windows XP Tablet PC Edition Beta -- <http://reviews.zdnet.co.uk/review/42/1/1463.html>

Tablet PCs are Back in Style -- <http://www.linuxjournal.com/article.php?sid=6236>

My Yahoo (create a personal web page with content and links to resources geared directly to you) — <http://my.yahoo.com>

Intelligent Agents

The Internet is a big place with many tasks to be done, more than there are people to complete them. Intelligent agents take up the slack. These are usually software programs that semi-autonomously perform tasks thoroughly and tirelessly. The best example of Intelligent Agents (or Bots —*short for robots*) are search engine spiders. Sometimes called *crawlers*, they are small programs that are designed to crawl around on the World Wide Web, looking for new web pages. When they find a new page, they gather pertinent data about the page and then bring it back to the search engine for indexing.



Knowledge Navigator
Apple, 1987

Perhaps the most famous intelligent agent was illustrated in the 1987 Apple Video, *Knowledge Navigator* (<http://ox.curtin.edu.au/streaming/knowledgenav.html>). A college professor prepares for his rainforest lecture with the help of his knowledge navigator intelligent agent. A far more practical tool was available two years ago. Called *Kenjin*, this client-based search tool read the text on your active window, and then automatically searched the Net for related web sites. As an additional feature, Kenjin could (optional) read all of the text files on your hard drive, upon installation, and use its findings to more finely tune its searches for your needs.

From a teacher's point of view, this sort of intelligent agent could be extremely valuable as the she types her lesson plan into the computer and Kenjin automatically starts searching the Net when it has realized the theme of the lesson.

Prospects for the future: This is another technology that is looking for a problem to solve. It is not there yet for education. However, as teachers are increasingly being asked to manage more and more information, intelligent agents may become quite popular.

Related Web Resources:

What s a Bot -- http://www.botspot.com/common/whats_bot.html

Software Agents Group at MIT -- <http://agents.www.media.mit.edu/groups/agents/projects/>

Is There an Intelligent Agent in Your Future --

<http://www.nature.com/nature/webmatters/agents/agents.html>

Ubiquitous Computing

It is ...computing power freed from the desktop - embedded in wireless handheld devices, automobile telematics systems, home appliances, and commercial tools-of-the-trade.¹ It is the opposite of virtual reality, where the person is placed inside of the computer. In ubiquitous or pervasive computer, the computers are put out in the real world, and integrated into almost everything.

- Refrigerators that order groceries through the Internet as you run low on items
- Microwaves that know what has been placed in them, and then access the vender s web site for cooking instructions
- Cloths washers that warn you when the dies of certain clothing may bleed onto another
- Cars that tell you when they are on the verge of breaking down, and the closest service center that has the required parts in stock

Prospects for the future: In the Classroom, the possibilities are almost endless. Education is an information intensive endeavor. The information exists in our libraries, our textbooks, videos, chalkboards, wall posters, etc. Imagine digital versions of all of these information sources, and imagine them connected by means of a wireless network. Any of the information from any digital source could be displayed and used by any other digital device. Both teachers and students could project their information, knowledge, or ideas onto the classroom display panel. Teachers and students would have access to any digital information, no matter where they sit, stand, or lounge through tablet PCs or pocket-carried devices (cell phones & handhelds). Couple with this the emerging Radio Frequency Identification Tags (RFIT), where students and teachers would where a nametag with an implanted RFIT. Any digital device that they approach would know who they are and their specific information needs and preferences. Think of a standard globe, wirelessly networked to the rest of the school. A student touches a spot on the globe and immediately the location is displayed on their personal computer (or classroom display panel), showing a detailed map, and geophysical, economic, demographic, and environment information about the area; hypertexted into even deeper information.

Related Web Resources:

Ubiquitous Computing -- <http://www.ubiq.com/hypertext/weiser/UbiHome.html>

Ubiquitous Computing News -- <http://ubicomp.editthispage.com/>

Pervasive Computing from IBM -- <http://www.research.ibm.com/journal/sj38-4.html>

Handhelds: Ubiquitous Computing, from The Concord Consortium --
<http://www.concord.org/themes/handhelds.html>

Center for Highly Interactive Computing in Education -- <http://www.handheld.hice-dev.org/>

¹ "Pervasive Computing Software" IBM IBM. 21 Sep. 2002 <<http://www-3.ibm.com/pvc/index.shtml>>