A LOOK AT HOW WE'LL COMPUTE EXPO PROVIDES 50-YEAR GLIMPSE INTO THE FUTURE

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Body

If you thought the last 50 years in computing have been interesting, get ready to be amazed -- and puzzled -- in the next half century.

We're all on what promises to be a long and event-filled journey, some of the computing world's top thinkers told a high-powered audience Monday in the first session of the three-day ACM97 conference at the San Jose McEnery Convention Center.

But don't believe anyone, they indicated, who says they can predict the path we'll be taking.

Matching the human brain

"For short-term predictions, bet against the optimist," said Gordon Bell, Microsoft Corp. senior researcher and a longtime computing innovator. "Long-term, scientifically based predictions have a good chance."

Look to engineers for short-term predictions, Bell said; they tend to be limited in their vision to the one or two projects in front of them.

Computers could match the processing power of the human brain in 50 years, he said. Such computers would be portable, augmenting one's senses by recording the stimuli of everyday life, he said.

"If we can maintain the storage density gains, these things can be worn in various ways and will be no larger than pagers," he said. "Pagers, watches, belts, billfolds are at the limit of what's comfortable to be 'on-body.' "

Bell strongly believes in "telepresence" -- the notion that people will attend events not in person but via cyberspace -- and he confidently predicted that "the 2047 conference will be in cyberspace, not real space."

Perceptual challenges

A common fruit fly buzzing off the kitchen counter just ahead of your hand does a better job of processing visual information than a state-of-the-art multiprocessor digital computer.

That intrigues Carver Mead, a professor at the California Institute of Technology in Pasadena, who laid down much of the fundamental theory behind today's microprocessors.

He's frustrated that conventional chips aren't getting much better at perception tasks such as hearing and vision -- tasks that apparently pose no challenge to simple life forms, such as insects and reptiles, let alone human beings.

"Digital systems look like the whole world to us today," Mead said. "I look on them as the start in a range of computing systems."

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Mead said it should be possible to mimic the function of what he called the brain's "electrical goo" in a silicon chip. A neuron chip would make comparisons between stored images and input from the real world, then report what it finds -- a sharp contrast to today's computers, which are essentially built on top of chips that can only manipulate 1s and 0s.

Individual software

Someday, says Pattie Maes, a message will flash across our eyeglasses that no one else can see -- even if it's nothing more than "Buy milk."

It would be the work of intelligent agents -- software tailored to our needs. Intelligent agents will help with the things that computers are better at than humans, such as jogging a bad memory, digesting and understanding big slugs of information or doing several things at once.

Maes, associate professor at the Massachusetts Institute of Technology Media Lab, sees artificial intelligence as well-suited to crafting prosthetics for the mind, the extra eyes and ears that we always complain we need.

People will have several agents, all working together, she said. For example, a "monitoring" agent in your refrigerator could see that you need milk and tell your "remembrance" agent, leading to that message on the glasses. If you wanted to buy a car online, you could tell a "transaction" agent your price range and model choice, and that agent could work with a "matchmaking" agent to find other people looking for similar deals.

But she asked, if we rely on agents, will we fail to make mistakes and learn from experience? If we are a sum of our memories, will we also need agents to flesh out our personalities? Could remembrance agents be subpoenaed when people testify in court that they "don't remember" what happened at a crime scene?

Tomorrow's computers

The ultimate direction of tomorrow's computing will be decided by "unreasonable men," said Joel Birnbaum, head of research and development for Hewlett-Packard Co.

"Reasonable men seek to understand the world and adapt themselves to fit within it," he said. "Unreasonable men seek to understand themselves, then change the world to adapt to them."

Researchers already are scheming to create tomorrow's computers, mind-bogglingly fast machines based not on electrons but on everything from photons and atomic nuclei to synthetic DNA strands. The innovators, Birnbaum said, are more likely to be physicists and molecular biologists, mathematicians and geneticists than computer scientists.

Anyone peering down the long-range road of computing, he says, must allow for what he calls "disruptive technologies" -- discoveries and innovations so advanced they are unimaginable today. For example, the integrated circuit was the disruptive technology that blew away all thought about the future of vacuum-tube computing.

Birnbaum focused on three possible innovations: _**quantum computing**_, DNA computing and optical computing. Quantum is most likely to come to fruition first, he said.

**Quantum computers** would do their calculating on the subatomic level, where the laws of nature to which we're accustomed are turned upside down.

And it's possible that optics could take computing to the next dimension, using photons -- the particles that make up a beam of light -- the same way electrons are used in classical computing today.

Self-evolving software

Most of today's programs are crafted, line by line, by people. But Nathan Myhrvold, who studied with renowned physicist Steven Hawking and now heads Microsoft's research and development efforts, said the day is coming when software will educate and evolve itself.

"We're not getting smarter every year," he said, but computers are.

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We could scan our brains, digitize the information and become one with software, he said. "In 50 years, I hope I won't be talking about software. I hope I will be software."

Age of Storytelling

Television doesn't attract an audience because of production engineers, said Bran Ferren -- it is the actors, directors and writers. But the Web, he said, remains controlled by technical people who don't think in terms of storytelling.

As the storytellers take over, this age will come to be known not as the Information Age, but the Age of Storytelling, said Ferren, head of creative technology for Walt Disney Imagineering.

Who will tell the stories? It could be anybody, he said, but expect to see many of the same brand names you see today, still telling stories.

The Web, for all its vast promise -- and Ferren is among those who consider the eventual impact of the Web up there with the printing press and television -- remains "ugly, stupid and unresponsive. It can't begin to teach, share an idea or tell a story as well as a human being," he said.

And it won't, he said, until the Web is designed not just by computer scientists and engineers, but by artists and storytellers.

By storytelling, Ferren doesn't mean the spinning of tales around a campfire. He means that the conveying of knowledge -- whether it's teaching math or sharing the day's news -- is best done in narrative form. It's been that way, he said, from the stone age to Socrates to modern novels.

Notes

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Mercury News staff writers Mike Langberg, Jodi Mardesich, Michelle Quinn, Janet Rae-Dupree, Larry Slonaker and Dan Stober contributed to this report.

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