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LIVING IN TECHNOLOGY

Powerful microprocessors and the Internet may finally deliver whole-house control. But are you ready for the "therapists of the new millennium"? **By Patrick Joseph**

FANCY A HOME in which the refrigerator knows you're out of eggs and orders them for you from the grocery store? Imagine the television scouring the ether for the types of programs you like and dutifully recording them for you to watch at your leisure. How about a thermostat that takes running stock of the local weather forecasts and adjusts itself in preparation for whatever is coming and a sprinkler system that kicks in whenever necessary to keep your lawn looking like the third green at Augusta National?

Chances are this is not the first time you've read predictions of domestic wonders along these lines. Ever since the 1939 World's Fair, if not earlier, futurists have been telling us that technology will soon eliminate household drudgery. A technology called X-10, which controls home electronic devices by sending command messages in the form of signal bursts across the electrical wiring, has been on the market since 1979. Even the term "Smart House" is a long-standing trademark. But despite improvements in the technology, whole-house control, as it is sometimes known, has largely remained the domain of small, private companies. These generally cater to either the technically inclined hobbyist or to the wealthy, who can afford to hire experts to figure out how to use the typically baffling products now available.

So why might the picture change in the near future? Three factors could finally bring whole-house control to the masses: very powerful microprocessor chips, which are the "brains" of products ranging from personal computers to microwave ovens; the increasing pervasiveness of the Internet; and a growing commitment to home networking among major software and hardware companies.

PUFFED-UP PCs

As we enter what has been dubbed the post-personal-computer era, the line between consumer electronics and computers is growing increasingly blurry. "The future of any appliance is likely to be

a stripped-down or puffed-up PC," wrote Nicholas Negroponte, director of the Massachusetts Institute of Technology's Media Lab, in his 1995 book *Being Digital*. Microprocessors, like all digital silicon chips, continue to keep pace with Moore's Law, which holds that the number of transistors per unit area of chip is doubling every 24 months. The upshot is that microprocessors and operating systems are becoming much more powerful, and household devices that contain them are growing smarter. The trend seems inevitable: all that computing power will cry out for new applications. Most important, if the home-networking honchos have their way, these smart appliances will function not as stand-alone devices but as players on an in-home network—which, in turn, will connect to the outside world via the Internet.

Though the high-tech help described here may seem decades off, in fact essentially all the technology already exists to make it reality. Frigidaire Home Products, for instance, has teamed up with ICL, an information-technology services provider, to build a prototype refrigerator with a built-in PC and bar-code scanner to track inventory. Several sites on the Internet are already in the business of delivering groceries from their stockrooms to your door. Another smart device on the market today, ReplayTV, employs an intelligent agent to search for television shows based on your preferences and records them to a hard drive.

The weather-conscious thermostat is not here yet, but it would not be hard to build, according to Mike Paull, managing director of intelligent home systems at Microsoft. As he envisions it, the thermostat would tap into the processing power and memory of a PC and monitor the local weather via the Internet, while receiving data on ambient temperatures from sensors around the house.

Internet connections—and communication among the dozens of microprocessors scattered around your home—present all manner of opportunity. Negroponte, obviously a coffee lover, cites the classic example involving the alarm clock and the coffeemaker. Today, if you reset your alarm clock for 6:45 A.M. and the coffeemaker is still programmed to grind the beans and steep the grounds at your usual wake-up hour of six, you will start the day with awful coffee. Which is, of course, a crying shame. But in Negroponte's coffee-friendly vision of the future, the alarm clock will not only confer with the coffeemaker about when to begin brewing, it might also monitor traffic reports from the Internet. Noticing that, say, the commute will be better than usual, it might let you sleep an extra 15 minutes. In the future, the coffee is always fresh and the alarm clock is your friend. At least that's how it ought to be.

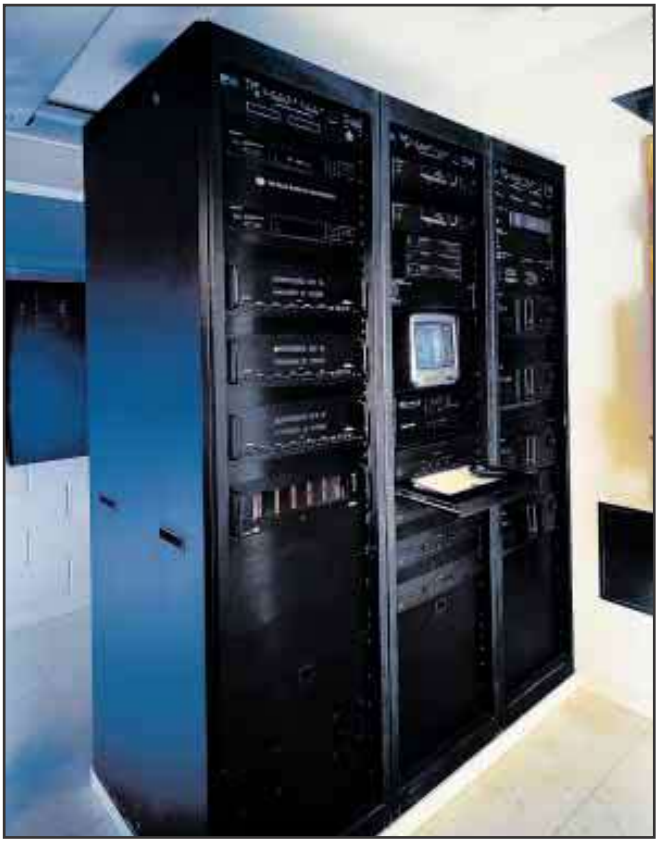
Although that may seem a little frivolous as visions go, it's just one small example taken from the gestalt. The wider view involves a whole array of possibilities, including sprinkler systems that know when to water the lawn, lighting that senses your presence in a room and turns itself off when you leave, digital audio and video programs delivered in real time to your multimedia center, and voice-recognition software that responds to your verbal commands.

COMPUTING EVERYWHERE, CONNECTING EVERYTHING

Perhaps the most convincing sign that the age of whole-house control is dawning is the interest of such information technology giants as Cisco Systems, IBM, Intel, Microsoft and Sun Microsystems. Alliances have been formed to deliver high bandwidth across the figurative "last mile" to the home, and divisions have sprung up within companies to champion their vision for the home of the future. Different terminologies have been adopted to describe this concept—some of the current buzzwords are pervasive computing, ubiquitous computing and spontaneous networking. Craig Mundie, senior vice president of the consumer strategy division at Microsoft, calls it the "computing everywhere, connecting everything vision." Whatever the name, the long-range plan is nearly the same: networked homes full of interconnected intelligent devices.

The high-tech companies "see 100 million homes, and maybe 50 percent of them are potential, likely candidates to buy into home networking over the next 10 years," says industry analyst Bruce Kasrel. "So there are 50 million homes where they could sell five, maybe 10 different devices. That's a large potential market." But initially, he says, the money will not be in whole-home connectivity, but in networking multiple PCs in the home to share high-speed Internet connections and peripherals. Kasrel's firm, Forrester Research, is forecasting over $1 billion in sales in the home-networking market by 2002.

Not all industry observers are so enthusiastic, especially in the short term. "This is still a technology looking for an audience," says analyst Rob Enderle of Giga Information Group. "The appliance makers are going to need to see a market before they start building refrigerators with browsers in them. And consumers are going to have to justify the costs to themselves." Grayson Evans, president of



The front of a high-tech beach house (*opposite page*) in California offers no clue about the wonders within. In the central machine room in the basement, equipment racks (*right*) hold an Ethernet hub, phone switching gear, digital dimming controls for all the lights, satellite receiver electronics, the master control unit, and video and audio systems, including an 800-disc CD changer.

Touch panels scattered throughout the house let the occupants control the lights, the motorized window shades and skylight covers, the audio system and the climate. The illuminated panels are seen here in the kitchen (*left*), the dining room (*center left, top*) and another view of the kitchen (*center right, top*). Near the wet bar (*center left, bottom*), which is in a corner of the media room/library, is a rack of entertainment electronics, including DVD and VHS players and an auxiliary CD chang-

a home-automation consultancy called The Training Dept., agrees, saying that residential-networking technologies will be adopted only incrementally over time. "The consumer thinks this is nice and it's all very interesting, but it's not something that they're demanding or setting aside a budget for."

Stewart Brand, cyberpundit and founder of the *Whole Earth Catalog,* thinks such skepticism misses the point: "The fact that this is not a need is not at all an indicator that there's no market. What innovation is, basically, is creating markets where they didn't exist. And there's great money in that because the first couple in get to control it."

Convinced that consumers are ready for home networks, the high-tech companies are struggling to establish standards for operating in and across the wide variety of communications media most home networks are expected to employ—namely, coaxial cables, phone lines, power lines, and infrared and radio signals. On the software front, Sun Microsystems and Microsoft are already engaged in a code war: Sun is pushing Jini, a Java-like language that will automatically configure components to "announce" themselves to networks. Microsoft's model, called Universal Plug and Play, is based on open standards, including IP, TCP/IP and Extensible Markup Language.

The goal for all involved is to make any networking system simple enough for consumers, many of whose VCRs are still flashing an inexorable 12:00. "It has to be brain-dead simple," says Ed Arrington, marketing manager for the Intel Architecture Lab's home-networking initiative. "Walk up, touch button, there it is. We like to say, 'Nothing to learn and nothing to load.'"

REBOOTING THE KITCHEN

Simple or not, consumers may be suspicious about a home in which the reading lamp has its own Internet address, the alarm clock a mind of its own. Touching on such fears, Michael Schrage wrote a column on smart houses for the *Washington Post* in 1993. Writing in diary form, the journalist adopted the persona of a "totally wired" homeowner, tickled at the idea of having the "smartest house on the block." Predictably, his networked utopia becomes a dystopia in short order. "Yesterday the kitchen crashed," he records, five days into his log. "Turns out the problem was 'unanticipated failure mode.' The network had never seen a refrig-

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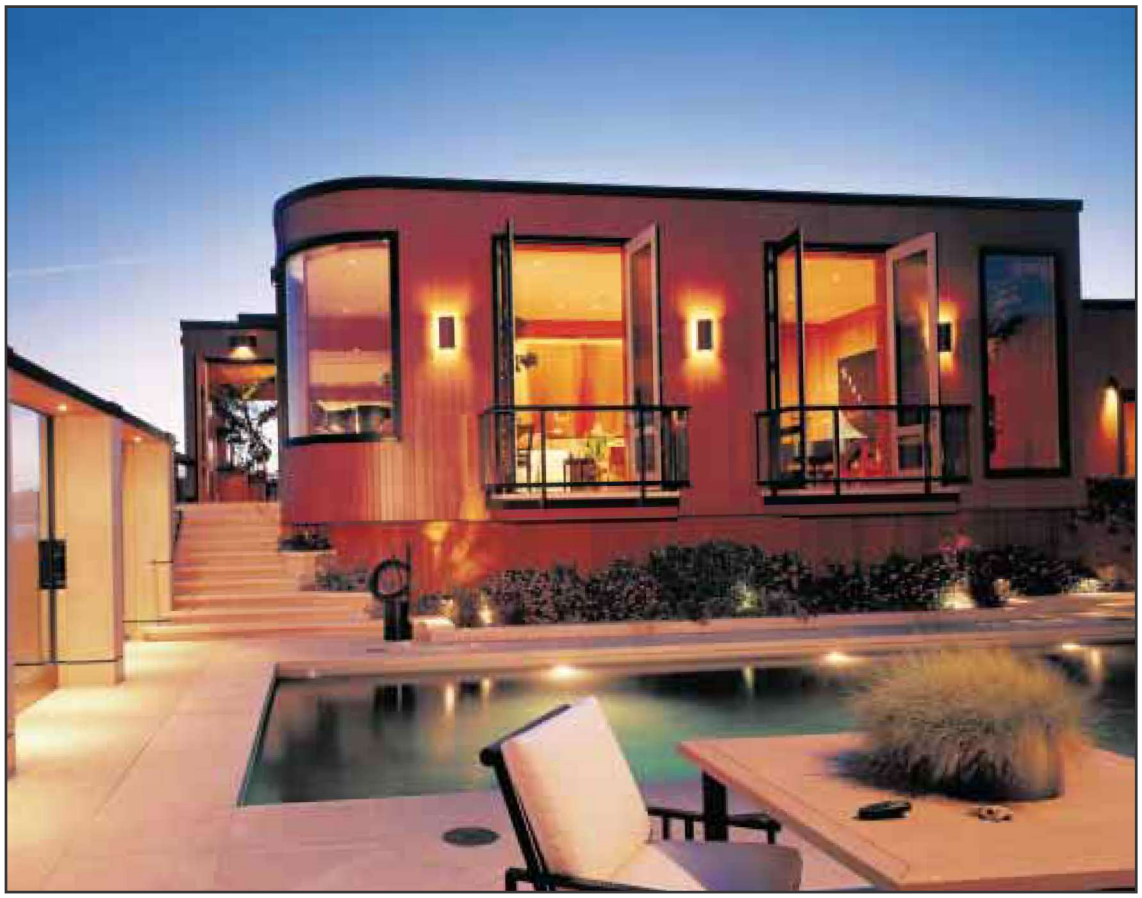

er. The large touch screen is the principal controller for the home's CD management system. Elsewhere in the media room/library (*center right, bottom*), a tabletop touch panel controls the room's audiovisual options. It can also convert the room in the middle of the day to pitch darkness in 25 seconds. Behind the house (*right*) a handheld version of the touch panel (*in front of chair*) controls the music system, which emanates from four speakers hidden in the courtyard.

erator bulb failure while the door was open. So the fuzzy logic interpreted the burnout as a power surge and shut down the entire kitchen. But because the kitchen memory sensor confirmed that there hadn't been a power surge, the kitchen's logic sequence was confused, so it couldn't do a standard re-start.... Rebooting the kitchen took over an hour."

In fact, reliability is a real concern, according to Stephen Selkowitz, head of the building technologies department at Lawrence Berkeley National Laboratory. Although Selkowitz and his colleagues see ways in which smart homes will improve energy efficiency as well as comfort, he confesses to worrying that "things that were once obvious and mechanical are now being made invisible and mysterious."

In a multimillion-dollar home on a beach in northern California, the mysteries are kept fairly tidy. In racks in a basement chamber resembling an office-server room stands an impressive array of neatly stacked black boxes—amplifiers, CD players, satellite receivers and a master control unit to tie all the systems together. A small television monitor displays a control interface that the installer, Gary Huff of The Media Room, Inc., accesses with a wireless keyboard. On the walls of the room, gray panels hide the wiring to the lighting controls. Circuitry for the digital phone system is housed in a compact panel by the door. The room is impeccably neat; no Medusa-like chaos of wires anywhere. The back panels of the electronics stack are as orderly as a museum display case.

The rest of the home is similarly impressive. As warmth radiates from the hydronically heated floor, Huff summons music from a small touch screen by the front door. The blues spill out of nowhere. From another touch screen in the living room, he brings the shades down, dims the lights and drops a large projector screen, all with the touch of a button. A projector descends from the ceiling, where it has been deftly hidden, ready to play cable, satellite or DVD selections.

Then a minor glitch. Searching remotely for a particular title from the 800-CD music library, the interface locks up. "No problem," says Huff, unfazed. "It's just a simple reboot." When a visitor remarks that technical help will very likely become the priest class of the future, Huff nods. Taking in the view from his clients' dream home—a tranquil stretch of beach and the white-capped Pacific beyond—he adds his own spin: "They're the therapists of the new millennium."

ABOUT THE AUTHOR

PATRICK JOSEPH is a freelance writer living in Berkeley, Calif. In his idea of a high-tech house, the alarm clock delivers a low-voltage shock, and the coffeemaker buys the beans and brings a steaming cup to the bed.