

THE LIVING IS EASY

From wireless home networking and movable walls to 'smart' houses that can adjust indoor temperatures, our domiciles of the future will work to ensure our health and comfort

By VINCE WADE

You're padding around the house looking for your glasses as you've done so many times before. But now you're living in a "smart" home with "intelligent" rooms. "Where did I leave my glasses?" you ask aloud. A gentle artificial voice responds: "You left them on the kitchen counter." We're not there yet, but the geeks and gnomes of futuristic home design are working on it.

Most of us have reached the limit of our technical aptitude and patience with "universal" remotes, controls, keypads and so on. The end of the rainbow for designers of the home of the future is computer-driven systems that don't require a degree in computer science or engineering to make technology in your house work for you. Designing artificial intelligence for home appliances and devices is an extremely difficult task. Speech recognition software already exists, but a computer that can reason and interpret what you meant to say and respond appropriately isn't on the shelf at Best Buy yet. Rosie the robot is still somewhere in the future.

Anyone who's used a computer knows they're stunningly powerful yet stupid machines. Computers have a long way to go before they match the simplicity of the light switch, the faucet or the dial tone. Each of those mundane household features masks an astonishingly complex system at the other end. When we use them, stuff happens, and we take it all for granted.

Imagine a home where the refrigerator, the pantry and the spice cabinet gently remind you when you're running low on milk, olive oil or dried parsley flakes. Imagine a home that knows when you're active or when you're relaxing and adjusts the indoor

temperature accordingly. Envision wishing aloud for a nice warm bath, and the tub begins to fill to just the right level, at a temperature you like. This is the home of the future.

Since 2000, the uber geeks at the Massachusetts Institute of Technology's Computer Sciences and Artificial Intelligence Laboratory (CSAIL) have been working on Project Oxygen, a \$30-million quest to make computers as invisible in our lives as the air we breathe. The Project Oxygen team hopes to tame all the techno-gadgets in your home so even Grandma can get the darn things to work properly. The idea is to make computers slaves to us, instead of the other way around. The MIT experts call it "human-centered computation." They want to enable computers to facilitate the things you need done. They are experimenting with cameras, microphones, screen displays and even radar to enable intelligent rooms to respond to your verbal commands and inquiries. Ideally, you will barely be aware that a computer somewhere in the house is deciding how to respond to your wishes.

To make this happen, they've had to create a programming system called "Metaglué." This, according to the MIT wizards, is an extension of the Java program language whereby software adapts to changes in your location and needs, and it controls intelligent rooms on the fly. Part of the hardware to enable this is the "Raw" microchip. This is a "tiled parallel processor" designed to reconfigure itself based upon the location and task at hand, as a component in a "universal personal appliance."

The cutting-edge action in home architecture today involves designing homes that are flexible

and adaptable to changes in your lifestyle without sacrificing beauty or luxury. In the architecture section of the MIT research and development universe, researchers are exploring how to change the fundamentals of home construction to be more responsive to the way you live. They've given this initiative the name House_n. This stands for the nth number of technological configurations that can be created in each house.

Part of House_n is the PlaceLab. It's a research facility scaled to the size of a typical apartment. Volunteers live in this home-like laboratory that's chock-full of tiny sensors, cameras and microphones.

One intriguing area of inquiry involves "microclimates." Personal microclimates would enable three people sitting in a family room to each have his or her own humidity and temperature surrounding the space where they happen to be sitting. This may finally end those seemingly universal domestic disputes in which the female human unit(s) complains about freezing while the male human unit(s) grouches about being hot.

Kent Larson, one of the MIT researchers exploring how to change the assumptions about our domestic living space, says they're spending a lot of time evaluating people's behavior patterns for the purpose of understanding how the fundamentals of home structures can better serve us. He cites health care as a good example. "A lot of people say one of the most serious problems facing the country is lack of medication compliance," Larson says. "If someone had taken their heart medication consistently, they wouldn't have had a stroke and ended up in a nursing home."

Larson envisions a home that unobtrusively

observes what you do, how you do it, and when. Using that learned behavioral information, the responsive home works with you to live a healthier life. "We're trying to prototype systems that aren't annoying and nagging. People don't need a whole lot to trigger a reminder," Larson says. He suggests the home-lighting system as a tool that could be put to use in ways beyond mere illumination. "One way to use it is to deliver information to people so it could be a reminder to take the blue pill while you're waiting for the coffee pot to drip. The light [in the kitchen] goes blue for three seconds," Larson suggests.

The not-so-mad scientists in the MIT labs stress they aren't focused on gadgets. Rather, they are concentrating on the things we do in our homes and how high-tech tools might be modified or created to help us with our tasks, our leisure time and our health. All of this is aimed squarely at changing the way homes are built. "What we're trying to do is not just come up with a cool demo, but to change the entire industry," Larson says.

A seismic shift in the way houses are constructed appears to be under way. The building industry is supporting a public/private research project known as PATH: the Partnership for Advancing Technology in Housing. There is some cross-pollination of home design, creativity between the MIT projects and the PATH group. "One big issue right now is that our homes should be flexible, that they should change as our needs change. That sort of suggests this idea

of outgrowing a home is a bit of an anachronism," says Maureen McNulty, PATH's information and outreach coordinator. McNulty says we must start thinking of interior construction in ways that make it easily adaptable to changes in our lives.

Think movable walls. No, this isn't about making your home look like an office cubicle. "The idea is, we organize all the utilities in dedicated spaces. That could be one central wall in a house [or] it may be under the floor of the second floor. We can have wiring running behind our baseboards," McNulty explains, noting the centralization of utility pipes, wires and ductwork has tremendous living space advantages. "We see that a lot of the walls become flexible. They could be moved," she says, while emphasizing they wouldn't look like those portable walls in a conference center.

In fact, movable walls could look every bit as good as the permanent ones we're accustomed to. Quality crown molding and baseboard molding could hide the mechanisms that would enable a home-improvement contractor to rearrange the walls of your living space to suit your changing needs. McNulty suggests home renovation wouldn't be as astronomically expensive or as difficult as it often is today. There might be more do-it-yourselfers since projects would be less complicated. Home-improvement contractors could benefit as well because nest rearrangers might be more inclined to change the interior layout of the house.

We live in an age where incremental innovation occurs almost daily. One recent residential development is bamboo flooring. Building professionals note it grows like weeds, but when it's processed into flooring, it looks as beautiful as traditional hardwood, and it's more durable. Moreover, it's kinder to our hardwood forests.

One advance we may see soon involves entire walls that are electrically conductive, yet wouldn't jolt us when we touch them. Portable "outlets" would activate the electricity.

Another important building industry initiative is an effort to develop a worldwide standard for wireless home networking. ZigBee, as it's called, is an alliance of 100 manufacturers striving to develop a common residential wireless standard. Think about all the compatibility headaches related to the Windows and Mac computer operating systems, then think about all the things you routinely connect to standardized sockets providing electricity. That's what ZigBee is striving for in the wireless home.

McNulty says the current building industry's focus is on the seemingly incompatible goals of stability and change amid living-space beauty. Larson says the research in home construction, design and technology has a common goal: "We're building environments that are responsive to people and do useful things." ■

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