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FEATURE

Helpful House



For The Elderly, UF's Experimental House Is A Smart Idea

By Aaron Hoover (MFAS '02)

Matilda isn't your average able-bodied woman. At 89 years old, she has trouble reading the small type on soup can labels. When someone rings her doorbell, the arthritis in her knees prevents her from answering the door quickly. And when daylight gives way to evening, making her way around her house to turn on lights can be quite a chore.



William Mann, director of the center in which the smart house was developed, moves "Matilda" via remote control.



Sumi Helal

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While the obstacles of her daily life mirror those of millions of elderly people in the world, Matilda has one big advantage: She's a motorized mannequin UF researchers are using as a prototype in a new "smart house" that could be the technological solution to common problems facing today's older generation.

In this house, there's no need to punch numbers on the microwave: It automatically recognizes entrées and sets the right cooking time. If someone rings the doorbell, the home beams the visitor's picture to wall-mounted screens in whatever room the resident is located. If residents have trouble walking to the door, no problem: They can open it remotely using a "smart" phone. In a house designed for those 85 or older, the phone serves as the ultimate remote control. By simply speaking into it, residents can control the lights, stereo, television, and even open and close the curtains. And those are just a few of the ways the home seeks to make the frailties that come with aging more manageable.

But the researchers' work is not yet complete. Matilda's "house" has a cozy living room, bedroom and small kitchen, but is made of modular walls in a computer laboratory on the fourth floor of the computer engineering building at UF. In the mock

home, the researchers test their technological solutions to the burgeoning need for better elderly care.

“The federal government has recognized that engineers and scientists can play an important role in helping to do something about the overburdened health and nursing care systems, and we’re working on the concepts for how to achieve that assistance here,” says Sumi Helal, a UF associate professor of computer and information science and engineering, as well as the technological brains behind the smart house.

In Florida and nationally, the research comes at an auspicious time. Florida has the highest number of residents aged 65 or older of any state, with close to 1.6 million of its population of nearly 16 million people falling into that category. Floridians aged 85 or older — those most in need of assistance — are projected to almost double by 2020 when the state will be home to almost 650,000 people that age, say state and university demographers.

Nationally, the “age wave” of 78 million baby boomers is already putting pressure on the health care system as the first of the boomers reach their 60s. In two decades, this wave will crest. The downside is the increased needs of the aging population come in an era of soaring health care costs leaving more and more people without the means to pay.

User Friendly

When it comes to technology, the elderly population is not the first group of users that springs to mind. From the Xbox to ever-smaller digital cameras to feature-filled personal digital assistants, most high technology consumer products are clearly designed for people nearer the other end of the age spectrum.

“All you have to do is look at the design of cell phones to see that,” says William Mann, director of the UF Rehabilitation Engineering Research Center on Technology for Successful Aging, which in 2001 won a \$4.5 million federal grant for research on the smart house and related initiatives.

But dozens of studies by Mann and others have shown what may seem obvious: Despite the industry bias, the elderly embrace technology as enthusiastically as any other group given the opportunity. A participant in one of Mann’s studies, an elderly woman who had been given a computer for a telehealth project that focused on maintaining independence, told him, “I used to wake up every morning and pray, ‘God, take me now,’ and now I wake up every morning and tell God to give me more time on the computer.”

By using technology to make aging easier, the smart house seeks to go several steps beyond simply putting computers in elderly people’s hands. In what could be an ironic twist, the effort and similar research may spur some of the biggest advances in information technology in coming decades, just as catering to the desires of savvy young professionals has done until now.

UF’s smart house provides a glimpse at what those advances may be. Hidden behind one of the modular walls is a nondescript gray box that contains its central computer. The box is the computing equivalent of a central air conditioning unit, out of sight but delivering and coordinating the home’s seamless blend of “smart” services.

Sensors in the home communicate through the box to keep track of the inhabitants’ whereabouts. That information is funneled to appliances such as TV sets and lamps. When the resident walks from one room to another, the lights and TV “follow” the resident, turning on and tuning to the appropriate channel. Residents navigate most of the home’s other services with a “smart” phone. The phone doubles as a home monitor: If sensors on the kitchen floor detect a water leak, the sensors report it to the central computer, which “calls” the resident. If the resident wants to check the door and window locks, she can ask the phone, which then reports back any open doors or windows.



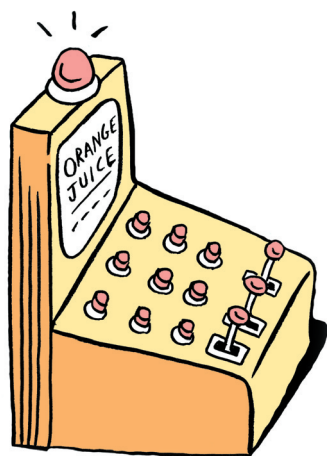
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The idea behind the centralized system is to make it possible for the resident to add “smart” products — which Helal envisions as available at stores such as Wal-Mart — simply by plugging them in to the central network.

“If you want a security system with a door and automatic lock, that’s one piece. If you want a smart microwave, that’s another piece,” Helal says. “Our model is zero engineers, zero configuration — it’s your basic plug and unplug.”

The mock house has clear benefits for the healthy elderly population, but Helal and Mann feel smart home technology can do much more: It can also provide care to those suffering from dementia or other cognitive impairments. For example, dementia patients frequently forget what they are doing mid-task. By monitoring their activities, the smart house can help remind them.

“Dehydration is a major problem with people with dementia: They forget to drink,” says Mann, also the professor and chairman of the occupational therapy department in UF’s College of Public Health and Health Professions. “The smart house could prompt them. Or it can remind a resident to brush his or her teeth in the bathroom.”



Smart homes could not only prompt residents to take their daily pills, eat a balanced diet or get exercise, they could let caregivers know when these activities aren't happening.

Coming Soon: The Real Deal

Equipped with cameras and sensors, a smart house not only monitors a person’s activities, it also can transmit that information outside the home. That opens the door to range of remote health care services not practical today.

Falls are a frequent, sometimes deadly problem for elderly people living alone. Unless the person has a “Lifeline”-type emergency notification device or can reach the phone, he may lie unattended for hours or days. With a properly equipped smart home, remote caregivers could keep track not only of one home but many, checking periodically to make sure residents were still moving about.

The same could be true for more day-to-day care, Helal notes. Smart homes could not only prompt residents to take their daily pills, eat a balanced diet or get exercise, they could let caregivers know when these activities aren’t happening. If needed, caregivers could actually look inside the house by viewing images transmitted by cameras.

The possibilities suggest a new infrastructure for elderly care, Helal says. Whereas police and fire agencies and hospitals wind up with a disproportionate share of that burden today, the job could be handled in the future by utility companies. Just as many utility companies offer online services today, people could sign up for a monthly “smart home service” by the click of a mouse.

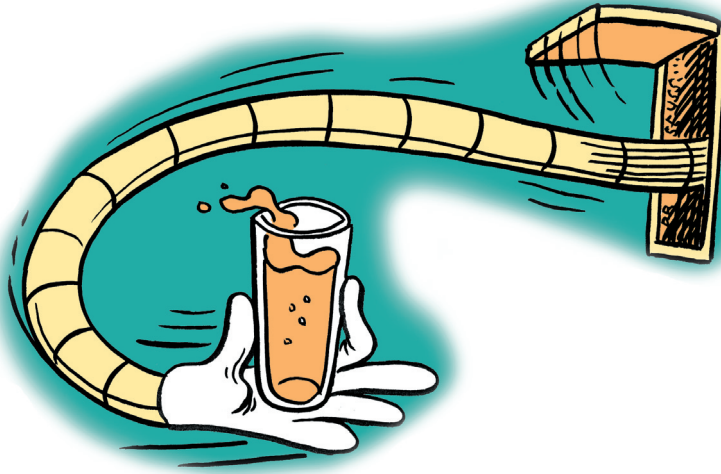
As the age wave flows in, the cost savings could be tremendous.

“You could have a smart [house] center staffed by a group of 50 or 100 trained workers monitoring the people in 1,000 houses,” Helal says. “The cost of that operation is much less than sending nurses on 1,000 visits to those houses.”

Indeed, several studies have already documented savings tied to assistive devices or technology. One of Mann’s studies, for example, showed that a group of seniors who had access to simple devices such as stair guides and shower benches both experienced less decline in their independence and spent fewer days in hospitals and nursing homes.

“We have found that if you give people the tools they need and the environment they need, it can have a very, very significant impact on health-related costs,” Mann says.

Certainly, there are major obstacles between the smart house vision and reality. One obvious issue is privacy. How many people would want an anyony-



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mous person keeping track of virtually all their activities? Helal acknowledges that privacy is a concern but notes that, for elderly people who need major care, sacrificing some privacy to remain in the home may be worth it. “A truly frail elder person — she and her relatives will not be as concerned with Big Brother issues as other, healthier people,” he says.

He adds technology could be used to protect people’s privacy. Cameras could display a digitized image of a person rather than the real person moving around a home, he says.

Another big challenge is to persuade technology companies to invest in smart home research and products. Mann and Helal evangelize their ideas whenever possible. For example, at a recent international conference on aging and disability in Washington, D.C., planned and hosted by the UF technology center, they met with cellular phone companies and personal emergency response companies to encourage the two to collaborate. It only makes sense when surveys show that many older people carry cellular phones solely for security purposes, Mann says.

Perhaps the biggest challenge is improving the technology to the point where it achieves its lofty ambitions. To that end, the UF engineering rehabilitation research center has just begun construction on a real smart house, to be located in Oak Hammock, UF’s retirement community in Gainesville. The home will have all the features of the mock home in the lab and more, including LCD displays integrated into walls and mirrors and numerous systems, such as a medication reminder system. The plan is for volunteers to live in the house for periods of a few days or months to serve as test subjects for services. Three companies have donated \$200,000 to help build this prototype house: PRAXEIS, RDG Shutte Wilscan Birge and The Weitz Co.

“It’s the construction companies that will take the concept of the smart house into the mainstream, so we want to use this model home to show them the possibilities,” Helal says. “One of the end goals is to write a reference book for the construction industry so they can modify house plans to easily turn traditional homes into smart houses.”