"The smart home deserves the word 'smart' because it's now able to give the right support at the right time."

DR. SUMI HELAL, UNIVERSITY OF FLORIDA

Beyond Convenience

Take a look inside the Gator Tech Smart House, a University of Florida project that uses home-automation tools to empower the elderly and disabled. BY ANDREW GEBHART

She has the wrinkled skin of a senior citizen with the thick bifocals and curled white hair to match. Her name is Matilda, but she's not your average grandmother. She wears a flak jacket, for starters, and PVC pipes run the length of her torso underneath, connecting her plastic head to a motorized base.

Matilda is a mannequin, and she lives in the appropriately named Matilda Smart House — a 500-square-foot, paneled-off structure inside an engineering lab at the University of Florida. She's an important part of a study by Dr. Sumi Helal and his students — by testing motion tracking and other smart-home tech on her, she has helped them prove how useful automation could be for real seniors in actual houses. And she's helped Helal's team upgrade from the paneled mockup known as the Matilda Smart House to a full-size home called the Gator Tech Smart House.

By building smart-home devices into a single system intertwined in this full-size family home, Helal's team hopes to use the automated tech tested on this mannequin to give the elderly and people with disabilities the assistance they need to live safely on their own.

Smarts beneath the surface

Amid rows of well-manicured homes in the Oak Hammock retirement community in Gainesville, Florida, the Gator Tech Smart House looks much like its neighbors. Walk inside, and you'll find a spacious kitchen with plenty of counter space. Move to the living room, and you can sit on the floral-patterned couch and look out the framed glass doors to the back deck.

Appearances, though, are deceiving. Just underneath the pristine floor sits a network of wires, radio wave emitters and motion and vibration sensors necessary to transform the home into an interconnected machine that anticipates its residents' needs.

Almost everything in the house feeds information to computers in a central control room tucked away by the laundry machines. The mailbox, the front door, the bed, the electrical outlets, the closet, the floors and even the toilet have sensors that gather information and send it to the computers.

Earning the word "smart"

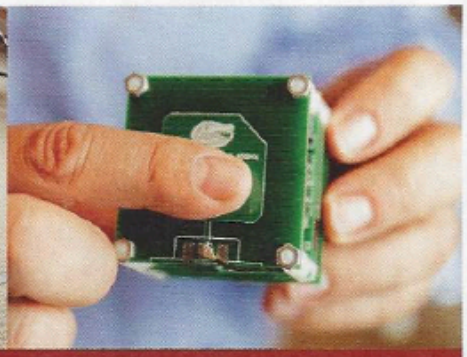
The Gator Tech Smart House is equipped with "smart" floors that track movement and count the number of steps a resident takes each day. The sensors then communicate with other sensors and applications to track residents' motions within the home.

"Knowing a person is walking, counting the number of steps — if one day the number of steps is small compared to the norm," Helal says, "that's a powerful indicator right there [of something wrong]."

Over time, the house determines how many steps a person normally takes in a day, so if the occupant doesn't get out of bed one morning or is much less active than usual, the home will contact a family member. "The smart home deserves the word 'smart' because it's now able to give the right support at the right time," Helal says.

The house also assists residents with day-to-day tasks like making meals and using the TV, saving them from seeking outside help. The microwave in the Gator Tech Smart House uses scanners under the counter to read standard RFID tags on packaged foods. When a resident microwaves a meal, it loads the proper cooking modes automatically, so there's no need to program the machine or even bother reading the cooking instructions on the package.

Similar scanners in the pantry and fridge help residents keep track of what food they have and how soon it'll expire, and the system monitors their calorie consumption and issues a reminder if they need to eat more to stay healthy.



TYLER LIZENBY; HOUSE ILLUSTRATION BY THINKSTOCK

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When the resident finishes preparing her food, the screens in the home follow her as she moves from the kitchen to the dining room, flipping off the TV in the kitchen and turning another set on at the table. Each screen shows her favorite programs, lets her video chat with remote family members, and even reminds her to keep eating.

When she wants to watch a movie, the blinds close automatically, and the lights dim for better visibility. And when it's time for bed, the house works together to turn off the lights and shut and lock the front door.

At night, the bed then tracks how she sleeps, and in the morning she'll receive a reminder to get dressed if she needs it, with sensors in the closet tracking whether she does. Even the mirror in the bathroom can display reminders, like urging her to wash her hands after she flushes the toilet. (Yes, the soap dispenser talks to the toilet.) Individually, the tech in the Gator Tech Smart House is impressive, but the way the system acts together makes Helal's goal of empowerment possible.

Concerns

Because the Gator Tech Smart House is always monitoring its resident, privacy is impossible for that person — a point Helal doesn't deny. "It's really a trade-off of privacy for well-being," he tells us. But he's confident that some people won't mind that compromise.

He speaks of a former resident named Monette who, in the survey she took after her experience, said she'd happily give up some of her privacy if it meant she could continue to live the way she wanted to, enjoying her life safely, while providing her children a convenient means of keeping an eye on her. Ultimately, he says, deciding how much privacy to forgo to enjoy the benefits of the technology will depend on each individual.

A privacy expert with the Electronic Frontier Foundation, Lee Tien, was more concerned. "One house with carefully selected people [has regulations] you'll never see in a commercial setting," he says. "No one's going to give the smart house away, [companies] are going to be monetizing the data."

For the tech of the Gator Tech Smart House to work in the real world, retirement communities would need to secure consent and investment, both from users and suppliers. The smart microwaves, for instance, require that the packages of food have specially designed tags that can send the appropriate radio signal to the nearby antennas.

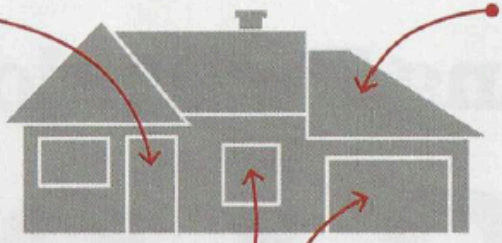
The pantries can make grocery shopping a thing of the past for residents, but each of these conveniences depends on a specific and closed system of supply that might not be financially viable for many retirement communities if only one or two residents opt in. The challenge, then, is convincing elderly patrons that the tech that they might find confusing and violating could provide them with a significant benefit.

Matilda, a motorized mannequin, is used by a team of researchers at the University of Florida who are developing the ultimate smart home for seniors.

The path to implementation

Right now, most of the Gator Tech Smart House's functions happen on their own. But the home still needs the occasional user input, and that creates a potential challenge for the resident. Setting the scene for movie time needs a specific command, and some people would rather have the blinds open and the lights on while they watch TV, requiring some customization.

THE GATOR TECH SMART HOUSE HAS A FEW OTHER AUTOMATED TRICKS UP ITS SLEEVE



The front door: A camera, a microphone and speakers allow homeowners to see who's knocking and to talk to the person before unlocking the automated lock — and all without ever getting up.

Odds and ends: Even the mailbox and the washer and dryer can send notifications, helping the resident remember her chores and keeping her up to date on the progress of a load of laundry.

The bathroom: Not only does the toilet talk to the soap dispenser to make sure the resident washes her hands, it can measure her weight and temperature when she sits on the seat. The shower and bathtub can keep track of who's who, and automatically set different temps for Grandma or Grandpa.

The garage: For an extra sci-fi touch, the garage in the Gator Tech Smart House acts as a virtual reality driving simulator. Residents can practice driving under various conditions and get pointers to help curb unsafe habits, so they can stay behind the wheel in real life, safely, for longer.

Smartphones provide one input source, but again, it's an option senior citizens might be hesitant to use. Helal admits that he had to train his test subjects on how to control the Gator Tech Smart House with a phone, though smartphones with larger displays and apps that simplify user interfaces have helped. Alternatively, as voice-recognition technology on phones improves and becomes more common, a user may never have to press a button.

Aside from smartphones, as an alternative form of input, the team has tried domestic robots that combine voice recognition with an emotional component provided by a moving, talking companion.

Cost is the other prohibitive barrier to entry, and a house with raised floors covering a mass of wires won't always be feasible. The customized equipment and sensors cost around $78,000, though a large part of that sticker price was necessary for research and development. Still, it's those wires that allow the different devices in the Gator Tech Smart House to talk to each other, and it's that communication that separates the Gator Tech home from more fragmented DIY smart-home options. Helal's team demonstrated the benefits this tech can have for elderly and disabled citizens when implemented properly. If a home's tech can't talk to a single, central system, managing a house full of automated technology would require several different apps and a lot of user input. If it can, a smart home could help owners of all ages stay healthy and independent.

If a home can understand its residents, Helal says, it can empower researchers. "Scientists don't know really what triggers an asthma attack," he says. "What are the specific environmental conditions, not just outdoor, but also indoor?"

The home of the future

Though the project started with Matilda, it grew to include Monette, the living test subject who stayed in a real house and who enjoyed it so much that after her stay, she preached and advocated for its benefits to her fellow residents of the Oak Hammock retirement community.

If the interconnected tech demonstrated by the Gator Tech Smart House catches on, she'll be one of many who experience the benefits of smart-home advancements, benefits that go well beyond the convenience of the young and tech-savvy, benefits that could empower the elderly and disabled to live fuller lives longer. ●

Andrew Gebhart (@GebAndrew) reviews appliances at CNET's office in Louisville, Kentucky. He gets excited by smartly designed tech, particularly when it gives him superpowers in his own home.