Florida Trend

March 2010

MAGAZINE OF FLORIDA BUSINESS

INNOVATION

Invisible Tech

In your walls. In your clothes. In your mailbox. UF's Sumi Helal is the king of putting tech everywhere. p. 52

Also:

The *Real* Rail Story p. 64

No More Gerrymandering? p. 68

Sector Portrait: Miami: International p. 22

UF professor Sumi Helal

$9.95

7 25274 63171 1

03>

FloridaTrend.com

By Amy Keller

Invisible Tech

Sumi Helal envisions technology everywhere, stitched into everyday life as invisibly as the weave of a fine suit.

In Sumi Helal's mind's eye, clothing — and just about everything else — ought to be full of sensors and technology. Woven into fabric, for example, high-tech devices might monitor the wearer's vital signs, track and analyze an athlete's performance or remind a beleaguered office worker to sit up straight. Wristwatches and cell phones could silently monitor calories that wearers consume. Cars could remind drivers to take their medication or pick up dry cleaning.

Retailers, Helal predicts, will be able to reach out to consumers like never before, via GPS-enabled cell phones that function like tracking devices. Stores like Macy's, for instance, will no longer have to rely only on fliers and ads to lure shoppers inside — retailers will be able to detect regular customers as soon as they enter a mall and, using data generated from massive consumer databases, send a targeted promotion to try to entice the shopper into the store.

Instead of the consumer accessing services, the services will access the consumers, says Helal, an Egypt-born computer scientist who's a professor at the University of Florida. "The world will change."

Helal has become a guru of sorts in the tech circles of what's called ubiquitous, or pervasive, computing — an interdisciplinary field that studies how to use wireless, embedded, wearable and/or mobile technologies to bridge the gaps between the digital and physical worlds. His projects in Gainesville have attracted visitors from as far away as Korea, Japan and France. Last fall, Helal presided over the world's premier gathering of pervasive computing researchers, Ubicomp 2009. The conference, at the Walt Disney World Resort in Orlando, attracted nearly 300 ubicomp researchers

---

Abdelsalam (Sumi) Helal, 50

Roots: Born in Suez, Egypt.
"I was somewhat of a nerd growing up in engineering. I wanted to go to the computer sciences department. It was the first computer science department in Egypt."

Education: Bachelor's (1982) and master's (1985) in computer engineering and automatic control, Alexandria University, Egypt; doctorate in computer sciences (1991), Purdue University

Family: Wife, Melinda; daughter, Shadia Renae, age 5

Hobbies: Beginner level of many string instruments; gourmet cooking

Interests: World history, travel

Professor Sumi Helal and his students designed a sensor platform called Atlas (in photo) that connects "smart" health-aid devices together and makes their information available over a computer network. Helal created a spinoff company called Pervasa to commercialize Atlas, which General Electric has shown an interest in.

and enthusiasts who traveled from around the world to share their ideas for the gadgets of tomorrow.

"Sumi Helal is one of those guys who is larger than life — very well-connected to the reality of problems that matter to society. He is a very, very smart person, and a very, very good technologist and also an entrepreneur. He really has a good mix of all those ingredients," says Jim Osborn, executive director of the Quality of Life Technology Center at Carnegie Mellon University in Pittsburgh. "He spans the spectrum of being very leading edge — and balancing that with being very practical."

The term "ubiquitous computing" was coined 19 years ago by the late Mark Weiser, former chief scientist at Xerox PARC (Palo Alto Research Center). The computer of the 21st century, Weiser predicted in an article in *Scientific American*, wouldn't be a desktop PC or laptop that people would have to lug around with them. Rather, Weiser envisioned a wirelessly integrated network of devices so seamlessly integrated into the world around us that they all but vanish into the background as they help us accomplish a multitude of tasks.

"When Mark published this article back in September of 1991, nobody knew what he was talking about," Helal says with a chuckle. Today, he says, the speed of technological change is quickly making ubiquitous computing a reality.

Helal has long been somewhat of a futurist. In the 1980s, while attending Alexandria University's College of Engineering, Helal offered a scientific journal his technological prediction of what the world might look like in 2084. Helal envisioned the ability to program home appliances in the same way computers are programmed — "writing software applications that could control and coordinate appliances is what I imagined," he says. "This ties in with the work I ended up working on now, which is programmable pervasive spaces, which are spaces instrumented with devices, sensors, actuators, appliances, etc., with technology to enable their physical interconnectivity and their logical interaction, which is programming."

Helal relocated to the United States to further his education and work on new technologies. From 1984-85, he worked on Ronald Reagan's controversial Strategic Defense Initiative at Pennsylvania State University — a position he decided to leave because of campus protests. He then headed to Purdue University, where his research led to improvements in data networks such as ATM machines. "Back then the issue was, how can you make them available all the time? How can you make sure that money was not lost?"

In 1998, with four degrees under his belt, Helal headed to the University of Florida to work on one of the hottest technology areas — mobile and wireless computing. He quickly became known as "the wireless guy" on campus.

A trip to Melbourne with then-University President John Lombardi and Win Phillips, dean of the engineering school at the time and now senior vice president of research at UF, to meet with Harris Corp. executives changed the fortunes of both Helal and the university. Harris agreed to give the university $400,000 to help it establish a "mobile and pervasive" computer laboratory — a high-tech environment where Helal and his students could do cutting-edge research on the creation of smart environments. "That was the kick-up of my career," says Helal.

One of the lab's first research projects was a wireless navigational system for blind people. Helal and his fellow researchers named their system "Drishti," the Hindu word for "vision," and deployed it on the UF campus. "It was basically a system you wear — a wearable computer that has both a GPS and a wireless connection. The system would know where the user is and communicate with a database to try to guide the blind person to keep them on track, like on a sidewalk. The system could detect obstacles and give the pedestrian options," explains Helal.

Since Drishti, much of Helal's focus has been on using ubiquitous computing to improve the lives of the elderly and people with special needs. In 2001, the National Institute on Disabilities and Rehabilitation Research awarded him and other UF researchers a $4.5-million

Business Lessons

Sumi Helal launched his first business venture in 2001 — a Gainesville-based company called Phoneomena. The company's chief product was a software application for mobile phones that allowed developers with web programming experience to create mobile business applications (for the phones) without having to learn complicated or new technologies.

With xPhoneApp, the business would basically "put one application up" and the firm's IT team would be able to easily update or create its own mobile applications. The company, which at its peak employed nine people, generated up to $500,000 in revenue for several years and "was successful to an extent," says Helal. Ultimately, however, he says he did not have enough resources to sustain it and closed the business in 2007. "It was a fun experience but a bit painful going through that — like burying your dog — at the end."

> ## "The most successful technologies are those that disappear and simply become part of our life." — *Sumi Helal, professor, inventor, entrepreneur*

research grant to work on elderly-related technology. "That was the fork in the road, where I sort of expanded my research from wireless mobile to pervasive and ubiquitous computing."

Almost overnight, Helal says, he had to become an expert of sorts on geriatric issues so he could figure out what technologies might help the elderly to continue to live independently. As technical director of the Rehabilitation Engineering Research Center on Technology for Successful Aging, Helal began to develop technologies for a "smart house" that would provide an array of assistance to an elderly occupant.

In 2003, he and his partners unveiled their first mock-up of such a home within the walls of the Mobile and Pervasive Computing Lab. Nicknamed "Matilda's Smart House" for the life-sized, motorized mannequin that inhabited the space, the laboratory experiment featured an integrated system of sensors, cameras and computers that could provide all manner of assistance, tracking a resident's whereabouts in the home, for example, and reminding her to take her medication. Matilda's special microwave oven could recognize frozen food entrees via an RFID tag on the box and determine exactly how long to cook them. Using voice commands delivered through a mobile telephone, lights could be turned on and off, the curtains opened or closed and the stereo or television activated.

Helal's experiment attracted media coverage and caught the attention of several UF alumni and others who donated more than $200,000 to build a full-sized demonstration project in a unit at Oak Hammock, a large retirement community in southwest Gainesville. The resulting Gator Tech Smart House, which opened in 2005, features everything from a "smart floor" that can detect where an occupant is standing to a smart mailbox that can sense when mail has arrived and alert the occupant.

As the Gator Tech Smart House generated eight patent applications and garnered lots of visibility for the university, Helal says he began considering how to make the technology "available to everybody." He believes the only answer is to create a "smart home in a box" — an af-

The Future is Nao

Professor Sumi Helal holds a programmable robot from France named Nao (pronounced "now"). The robot can see, react to touch and talk to other robots. The field of domestic robots "is becoming a mature industry and an emerging market," says Helal, with students (from left) Mark Sisley, Jae Woong Lee, Eunju Kim and Shantonu Hossain. Helal uses Nao as a teaching tool.

fordable, plug-and-play solution that "we can put it on the shelves of Home Depot and Target so a person can pick it up, pay $1,300, take it home to his mom or grandmother, have a network guy there to install it in half a day at a charge of $300 and call a 1-800 number to activate it."

The key piece of the box, Helal explains, is a sensor platform called Atlas that he and his students designed for the Gator Tech Smart House. This small device — or "middleware," as Helal calls it — is the glue that connects a multitude of "smart" health-aid devices together and makes their information available over a computer network. The gadget essentially eliminates the need for "a team of engineers" to go through the laborious process of assembling a smart space from the ground up. It provides a practical mechanism that essentially allows the technology to self-integrate.

Helal has been attempting to commercialize his Atlas middleware through a Gainesville-based spinoff company called Pervasa. The professor hopes his technology — recognized with a "Best of Sensors Expo" silver-level award at the 2007 Sensors Expo & Conference — will become a core platform for integrating devices. While General Electric has shown some interest in the technology, Helal says the company needs to show more sales and marketing heft to close the deal.

While most of Helal's focus is practical these days as he concentrates on improving the lives of the elderly and promoting Pervasa, he has big dreams about the potential of ubicomp technologies.

One day soon, he predicts, pervasive computing and sensor computing will allow us to create smart rooms and even smart buildings that require less power or even no power at all. "Imagine shades

or blinds that allow light, but not heat, to be used in all office spaces," says Helal. "They are more expensive than ordinary shades but can save a lot of energy. These blinds are programmable and change their angle in a segmented way — top, middle and lower segments of the blinds — to fend off the heat and allow maximum lights all day long." The outside surface of such blinds could also be fitted with solar energy panels to harvest energy

thanks to new advances in materials that allow a more flexible solar panel design, he says.

Building on what he's accomplished so far in pervasive technology would be a good fit for Florida's economy, Helal says. "Even though we're the retirement capital of the world, we don't have retirement products for the world. We should definitely create products and services that change the way people live."

Gadgets of Tomorrow

At the 11th International Conference on Ubiquitous Computing in Orlando last October organized by Helal, researchers from across the globe presented a number of ideas for new technology, including:

> **Wearable Therapist** — Researchers in Switzerland are designing a "sensing garment" to help children improve their posture. The system works by measuring "back bending" postures using acceleration sensors that are embedded in the garment.

> **Autism Detector** — Scientists at the Massachusetts Institute of Technology have designed a sensor system that can detect and recognize children with Autism Spectrum Disorders. Using three sensors placed on both wrists and around the torso, researchers were able to detect stereotypical motor movements frequently seen in ASD, such as hand flapping and body rocking, about 88.6% of the time.

> **inAir** — Using an iPod Touch and other sensor devices, researchers at Carnegie Mellon have designed a tool that can detect indoor air pollutants and measure indoor air quality. The gadget, called inAir, uses an air quality sensor that measures particulate matter and counts the number of particles larger than 0.5 microns within a cubic meter of air. A micro-controller then translates that information into an audio signal that is sent to the iPod Touch, which in turn displays a visual graph of the air quality on its screen. Some participants in a field study of inAir said the device encouraged them to change their habits to improve the air quality in their homes: "I was surprised by how poor the air quality becomes when I deep fry. After knowing that, I always turn on the range hood when I deep fry," said one participant. **FT**

FloridaTrend.com/Links

Watch a video showing how British researchers are using sensors and physiological feedback to try to intensify thrills on amusement park rides. Also, see a prototype of the wearable therapist and a photo of the inAir display and take a virtual tour of the Gator Tech Smart House.