In-home health tracking system to deliver alerts to smartphones

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For those who are caring for elderly parents, peace of mind is hard to come by. And, for their parents, dignity is hard to retain. But a team of University of Houston researchers hopes to ease worries and frustrations by designing an affordable in-home health-monitoring system that will notify caregivers, via smartphones or PDAs, if their loved ones need attention.

"Our system will allow for such things as vital sign monitoring and location tracking using low-cost technologies and offering fast response times for caregivers," said Driss Benhaddou, an assistant professor of engineering technology at UH's College of Technology.

Four years ago, Benhaddou and his team began work on a wireless health-monitoring system in conjunction with the Abramson Center for the Future of Health, a joint partnership between UH's College of Technology and The Methodist Hospital Research Institute, which emphasizes personalized medicine and medical device development.

"Our original thought was that sensor networks can be applied to any type of removed health care using off-the-shelf technology, which makes it cheaper, because you don't need to reinvent the wheel," Benhaddou explained. "The technology uses processor boards found in a variety of electronics, which cost only about $70 each. You could wire a whole home for about $1,000."

A patient whose movement is being monitored, perhaps because of

Alzheimer's or dementia, will wear a sensor the size of a quarter on a belt or piece of clothing. One whose vital signs, such as temperature, [heart beat](#) and [oxygen level](#), are being monitored will wear the sensor on his or her skin.

"The house would have a handful of sensors in various rooms, depending upon the square footage. Those sensors would communicate with the sensor on the person and with a hub, which would be connected to the Internet and communicate with a caregiver's smartphone or PDA," he said.

Benhaddou said the installation of the system must be simple so that caregivers can do it on their own.

"Components can be added or removed without the intricate knowledge of the system, because it uses plug-and-play technology," assistant professor Deniz Gurkan said. "It is similar to plugging in a mouse to a computer using a USB port. You don't need to be a computer techie to be able to use it."

Though the technologies the team is employing are readily available, Benhaddou said, the challenge is to integrate them, to interpret data generated by sensors and to provide reliable information to caregivers.

"Besides vital sign biosensors, the system has three main components: wireless sensor interface, networking, and digital signal processing," explained assistant professor Xiaojing Yuan. "The wireless sensor interface connects different sensors to the wireless communication module. The communication protocols securely transmit the data to the right person at the right time through the network. And the digital signal processing ensures the timeliness of the communication and determines the impact of the vital sign for the patient's health."

Student Bao Quach, a computer engineering technology major, has been working on implementing mechanisms that will send notifications to the smartphone or PDA through either a regular telephone network or a local Wi-Fi network, Benhaddou said.

"Bao implemented an interface in a smartphone prototype that was tested in the lab," Benhaddou said. "It is amazing how some students can just take the job and run with it."

Meanwhile, post-doctoral student Manikanden Balakrishnan is focused on fine-tuning the quality of service that will be provided to end-users.

"My research aims to achieve stable service and the fewest possible delays for emergency reporting during peer-to-peer device operation," Balakrishnan said. "This will enable reliable emergency alarming from body sensors directly to doctors' phones, eliminating the Internet interface."

Benhaddou said monitoring vital signs with this kind of system in a hospital setting would take some of the burden off physicians and nurses.

"After surgery, for instance, you need to do a lot of monitoring. While you'll always need a nurse, such a system would improve the quality of the data that you're taking. It would track patients every single minute," he said.

Other applications of the wireless system, Benhaddou said, could reduce existing monitoring costs at assisted living centers, keep an eye on potentially sleep-deprived truck drivers and assess astronaut performance during NASA space missions.

Source: University of Houston ([news](#) : [web](#))