Curious About Your Vital Signs? One Day Soon, Check Your Laptop

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The cameras and MP3 players are fun, but the next wave of add-ons for cell phones and laptops may help users keep track of their health.
A University of Florida engineer has built a working prototype for a small, portable system that can monitor a person's breathing and heart rate automatically via wireless signal, with no need for cords or plugs. The goal is to make it easy for people to check their own vital signs, and then transmit them in real time to medical personnel through a cell phone or Internet connection, all with little more than a press of a button.

"The initial idea is that elderly people who may have difficulty getting around – they won't need to go to the hospital or the doctor's office every time they need a checkup, they can just send in their data and talk to the doctor," said Jenshan Lin, a UF electrical and computer engineering associate professor who pioneered the technology with colleagues at Stanford University and the University of Hawaii.

The system is a fresh development in a growing trend aimed at tapping the latest technology to improve home health care, widely acknowledged as an important solution to rising health care costs. Drivers of the trend include increased research funding from the National Institutes of Health as well as the emergence of private companies seeking to capitalize early on a new market for the nation's growing elderly population, experts say.

Arye Rosen, a professor of biomedical and electrical engineering at Drexel University in Philadelphia and a National Academy of Engineering member, said the Lin group's system is at the forefront.

“I believe, from the point of view of monitoring patients, they are pushing the envelope. They are doing very important research,” he said.

Lin and his colleagues first described the system, developed while Lin was at Bell Labs, in two Institute of Electronics and Electrical Engineers papers last year. Since then, he and two graduate students have revamped the prototype, improving its range and sensitivity. He has submitted a paper on the latest device for presentation at a biomedical engineering conference in China later this year.

The current version is housed in a cigarette-carton-sized metal box, out of which sprout two bright blue wires holding fingernail-sized antennas. The box’s key innards: a miniaturized Doppler radar. High-frequency waves broadcast by the radar bounce off a person, scanning the in-and-out movement of the chest and more subtle, but also detectable, motion of the heartbeat against the chest wall.

Hardware and software developed by Lin and his students then translate the return signal to breathing and heart rate, creating an EKG-like image on an oscilloscope or laptop.

The system is accurate within about nine feet, more than adequate if installed on a laptop or cell phone. Lin said he plans to shrink it to about the size of a deck of cards, and that there is no outstanding technical reason cell phone or laptop manufactures couldn’t miniaturize it further. He also said the system, which transmits only 1 microwatt of radio frequency power, would add an insignificant load to laptop and cell phone batteries and poses no threat to human health.

Remaining challenges include upgrading the hardware and software to enhance its resolution so multiple heartbeats can be detected and distinguished simultaneously, Lin said.

Lin said the system may have other applications in medicine. For example, engineers might be able to tune it to “see” the vibrations in a speech-impaired person’s throat and then translate those vibrations into computer-produced speech.

Outside medicine, it’s possible that law enforcement officials could use the system as a surreptitious indicator of a subject’s nervousness, noting when his or her heart rate or pulse picks up in response to certain questions, he said.

Rescue officials, meanwhile, could turn it into a “life detector” to determine if someone is buried in rubble following an earthquake or building collapse.

Lin and his students have found in tests that the system can penetrate 1-inch particle board, but concrete could be more of an impediment, he said.

Lin collaborated on the first version of the system with Stanford University professor Greg Kovac, Stanford student Amy Droitcour, and University of Hawaii professors Olga Boric-Lubecke and Victor Lubecke.

Source: University of Florida