

EE Team Wins Awards for Advancing Wireless Sensor Technology

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Electrical engineering Ph.D. student Kshitij Yadav and his advisers, Professors Peter Kinget and John Kymissis, have won a pair of awards for their power-saving ultrasonic wireless sensor.

Led by Yadav, the team won a \$150,000 Phase I National Science Foundation Small Business Research award to conduct further tests on the sensor, in addition to the \$100,000 first prize in the Interdigital Innovation Challenge, which was announced last month at the GigaOM's Mobilize conference held in San Francisco. This latest award was a competition that drew entries from top universities all across the United States and Canada, and consisted of a written proposal submission round followed by an incubation-phase round in which the teams were interviewed and submitted a final proposal. [Watch a recording of the final round here](#) (<http://www.youtube.com/watch?v=GJLH0sxYh3c>).

In work done so far, Yadav says their custom-designed ultrasonic receiver Integrated Circuit achieves a ten-fold reduction in power consumption over the current standard, state-of-the-art RF-based (radio frequency) receivers.

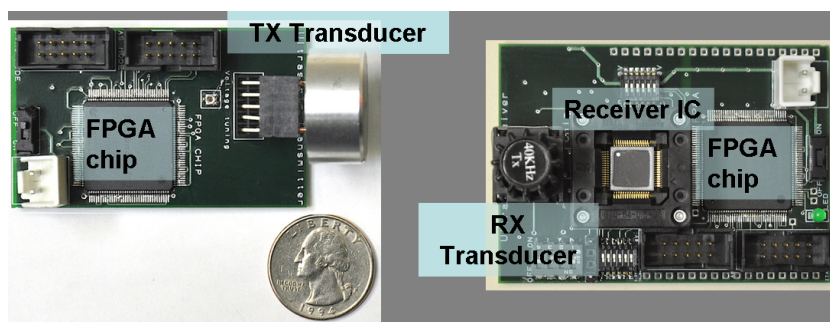
"Unlike radio frequency, which is a well understood communication medium, ultrasound has not been explored well for data communication," Yadav says. "Several factors, which are quite specific to ultrasound, like reverberations and acoustic noise have to be considered to design a system that can be used in real-life environments. An understanding of these factors was developed in the academic research that preceded the inception of our company. Based on this knowledge, we are developing our ultrasound technology further."

He says the ultrasonic wireless technology can also extend the battery life of wireless sensor nodes by more than an order-of-magnitude. The team has built a custom integrated circuit to demonstrate the ultra-low power operation of this technology.

This technology has many applications, Yadav says. Several of the potential applications include border surveillance, air-pollution monitoring, forest fire detection, greenhouse monitoring, machine health monitoring, and wastewater monitoring.

"As researchers, we often see the transition from concepts to implementation," he says. "But, we are thrilled to see the response that our technology has got and are looking forward to the transition of our idea to a commercial product. However, it would not have been possible without the increasingly entrepreneurial ecosystem at Columbia. We will specially like to thank Chris McGarry for his continuous efforts in linking us to Columbia Alumni."

McGarry leads alumni engagement in entrepreneurship programming at Columbia Engineering.



(http://engineering.columbia.edu/files/engineering/tx_and_rx_modules.png)

In the image above is the 'proof-of-concept' transmitter (left) and receiver (right) prototypes for the ultra-low-power ultrasonic data communication system. Click the image to enlarge.

At right is EE Ph.D. student and team leader Kshitij Yadav.



— by *Jeff Ballinger*

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