NEWS

Signal-Filtering Algorithms Tackle Smartphone Interference

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Tim Sobering, director of the Electronics Design Laboratory, is collaborating with Alexei V. Nikitin, founder and the chief science officer of Lawrence-based Avatekh Inc. to improve the technology behind wireless communication systems and smartphones.

New signal-filtering algorithms developed to reduce interference in smartphones could provide users with faster performance, longer battery life and fewer dropped calls.

Created through a partnership between Kansas State University's Electronics Design Laboratory and Lawrence, Kan.-based research company Avatekh Inc., the algorithms are intended to more efficiently combat interference between different radio technologies into the same device—such as Wi-Fi, Bluetooth, GPS and cellular—which may be transmitting or receiving signals simultaneously in close proximity. While the individual systems may use different bands, says Tim Sobering, director of the university's Electronics Design Laboratory, they can still interfere with each other, affecting the performance of the device.

Overcoming this interference often requires equipment to identify and cancel out certain wayward signals, a process that is often done through digital processing after the signals have been captured and digitized, Alexei V. Nikitin, founder and the chief science officer of Avatekh Inc., told *ComputerWorld*. However, instead of trying to mitigate the interference post-conversion, the new algorithms work with the analog signals directly to prevent potential interference at the source. According to Nikitin, this approach enables the correction of some forms of interference that can't be fixed through digital processing.

"What we have developed and patented are advanced nonlinear algorithms and circuits called adaptive nonlinear differential limiters, or ANDLs, which reduce the impact of noise and interference in a communication channel," Nikitin said. "What makes ANDLs unique is that they are implemented in the analog portions of transmitters and receivers and operate in real time. The result is an improvement in performance coupled with a reduction in size, complexity and power consumption when compared to conventional linear analog or digital processing techniques."

In addition to increasing smartphone performance, the technology could be used to counter intentional jamming, says Sobering, as well as to prevent damage to powerline networks. As more electronics are made available to the public, government and industrial sectors, the potential for interference to cause performance degradation or economic losses increases.

"ANDLs provide improvements when conventional techniques fail, and also enable elegant and inexpensive

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real-time solutions to the man-made interference problems that may be used in addition, or as a low-cost alternative, to the state-of-art interference mitigation methods," Sobering said.

To support their work, the researchers recently received a Phase I Small Business Innovation Research grant from the National Science Foundation, as well as a patent. A paper on the research titled "adaptive analog nonlinear algorithms and circuits for improving signal quality in the presence of technogenic interference" will be presented at the 2013 IEEE Military Communications Conference (MILCOM 2013) in San Diego, Calif., November 18-20, 2013.

By Aliza Becker

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