Researchers study best use of 'whitespace' spectrum

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(Phys.org)—The demand for faster, more mobile Internet access for smartphones, tablets and laptops does more than strain the available space we have in our pockets and bags. There's a finite amount of wireless spectrum available to those gadgets as well.

However, in November 2008, the Federal Communications Commission changed its regulation to allow unlicensed devices to use TV "whitespace" spectrum—unused frequencies primarily designated for television broadcasts—as long as they do not interfere with incumbent TV broadcasts and other licensed users such as wireless microphones.

Researchers, including Electrical and Computer Engineering Professor Parmesh Ramanathan, are now looking for the best way to utilize whitespace to increase the data rates of wireless communication.

The 180 megahertz television band offers the best potential for improved wireless communication, since it provides nearly five times the bandwidth of conventional Wi-Fi, with increased range to boot. "TV signals propagate through walls and so on much better than other bands," says Ramanathan. "The higher the frequency, the less they propagate."

But tapping into unused spectrum requires two things: reliable sensing to determine which parts of the airwaves are not being used at any given time; and spectrum-agile radios inside of devices that can reliably determine and switch to the clearest parts of the band for wireless communication.

Ramanathan and Associate Professor Suman Banerjee are refining that radio technology. They pair signal sensing with precise and easy-to-tune software radios as they work toward networks that eventually could provide higher speeds to more users over wider geographical regions than traditional wireless networks could ever provide. "Eventually, people will be replacing traditional Wi-Fi with these kinds of radios," says Ramanathan.

He believes technology that makes more innovative use of spectra is the future of wireless communications. "This is part of a change of how spectrum is going to work," says Ramanathan.

Better technology for sensing spectrum use will enable licensed spectrum owners to buy and sell them in short time scales.

For instance, consider the frequent dropped calls that occur when a football stadium is full of texting, tweeting fans. Ramanathan suggests that someday, cellular service providers could lease extra spectrum to improve communication during game day, invisibly adapting their network to better handle the influx of mobile device use. Moreover, police and security organizations could lease that same spectrum once the game is over, giving them more reliable communications among officers on the ground should an emergency occur.

Until the hardware catches up to the regulatory possibilities, these are all hypothetical scenarios. "Now that the FCC allows for these types of things, it becomes mostly a technological challenge to find the right solutions," says Ramanathan.

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