BEAMING THE INTERNET THROUGH TRADITIONAL TELEVISION SIGNALS

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Rice University engineers have demonstrated the first system that allows wireless data transmissions over UHF channels during active TV broadcasts. If the technology were incorporated into next-generation TVs or smart remotes, it could significantly expand the reach of so-called “super WiFi“ networks in urban areas.
“Due to the popularity of cable, satellite and Internet TV, the UHF spectrum is one of the most underutilised portions of the wireless spectrum,“ said lead researcher Edward Knightly. “That's a bitter irony because the demand for mobile data services is expected to grow tenfold in the next five years, and the UHF band is perfectly suited for wireless data.“

Knightly said the UHF spectrum, which ranges from 400 to 700 megahertz, is often called the “beachfront property“ of the wireless spectrum.Unlike the higher frequency signals used for existing WiFi, UHF signals carry for miles and are not blocked by walls or trees. Because of these advantages, wireless hotspots that use UHF are often referred to as “super WiFi.“

Though most of the UHF band is already taken, it is largely underutilized. To demonstrate that wireless service providers could make use of the UHF spectrum without interfering with TV broadcasters, Knightly and Rice graduate student Xu Zhang developed a technology called “WiFi in Active TV Channels,“ or WATCH, and tested it at the Rice campus.

WATCH requires no coordination with or changes to legacy TV transmitters. Instead, TV signals are broadcast as normal and the WATCH system actively monitors whenever a nearby TV is tuned to a channel to avoid interfering with reception. The technology to allow this comes in two parts. One aspect of WATCH monitors TV broadcasts on a channel and uses sophisticated signal-canceling techniques to insert wireless data transmissions into the same channel; that eliminates TV broadcasts from interfering with the super WiFi data signals being sent to computer users, Knightly said.

The other aspect of WATCH is dedicated to making certain that data transmissions do not interfere with TV reception; this part of the technology would require TVs to report when they are being tuned to a UHF channel, Knightly said. In practice, this could be accomplished with either smart TV remotes or next-generation TV sets. In the tests at Rice, Zhang constructed a “smart-remote“ app that reported whenever a test television in the lab was tuned to a UHF channel.When that happened, the WATCH system automatically shifted its data transmissions to another part of the UHF spectrum that wasn't being used.

“Our tests showed that WATCH could provide at least six times more wireless data compared with situations where we were limited only to the traditionally available whitespace spectrum,“ Knightly said. With WATCH in use, Knightly said it took a fraction of a second longer than normal to tune in a broadcast on the test television. While the increment could be measured it was less than a 5 per cent increase it's imperceptible to the person switching channels.