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Spectrum Sensing Cognitive Radios

Technology No. z09142

IP Status: Issued US Patent; **Application #:** 13/260,698

Radio Spectrum Management May Not Provide Sufficient Bandwidth

Growing wireless applications, driven primarily by mobile broadband, are creating a challenging environment where many experts predict that the most innovative radio frequency spectrum management policies and technologies may not provide sufficient bandwidth. ProTOMAC (Proactive Transmit Opportunity Detection at the MAC Layer) is a spectrum sensing cognitive radio algorithm capable of detecting unused channel capacity (transmission margin) and intelligently adding traffic. The spectrum analysis process optimizes the power of transmission for a secondary opportunistic user so that quality of service for primary network users is maintained and overall spectrum use is maximized.

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Cognitive Radio Uses Media Access Control Layer

Sensing the unused signal in the interference temperature is the most important step. All current opportunistic spectrum access techniques for cognitive radio work at the physical layer

using methods like energy detection, cyclostationarity signal detection, multi-resolution spectrum sensing, etc. This is the first approach to this problem at the Media Access Control (MAC) Layer level of the OSI model. In other words, the data packets of the primary system are used to identify and exploit the transmission opportunities for the secondary system. The technology also allows for much higher power communication compared to ultrawideband (UWB) communication technologies. ProtoMAC has the potential to increase capacity in new and existing wireless spectrum management systems by as much as 70%. ProTOMAC is a flexible architecture that implements a transmit margin, a concept inspired by the FCC proposal of an interference temperature (IT) metric. ProtoMAC is applicable to all bandwidth intensive applications, including fixed and mobile applications in rural or urban areas. Another application is in chipset (ASIC) or transceiver DSP (low-level software implementation) and in addition to working in IEEE 802.22, is backwards-compatible with IEEE 802.11.

BENEFITS AND FEATURES OF THE SPECTRUM SENSING COGNITIVE RADIO ENHANCEMENT:

- ProTOMAC monitors changes in network management statistics, optimizing throughput (up to 70% increase in capacity) while ensuring negligible interference with other users
- The software-based technology works in the media access control layer (MAC layer); the technology will work with a wide range of existing, cost effective radios
- Applications in Chipset (ASIC) or transceiver DSP (low-level software implementation) and can work in IEEE 802.11.
- Useable in wireless broadband (fixed and mobile) for commercial or military purposes including rural broadband data, video and telephone service

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