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Multiple-Input Multiple-Output (MIMO) Systems for Multi-Packet Reception (MPR)

Tech ID: 21328 / UC Case 2010-685-0

BRIEF DESCRIPTION

A new MIMO-aware cross-layer MAC/PHY design that is capable of combating collisions through the use of a multiple packet reception (MPR) technique.

FULL DESCRIPTION

In recent years, the demand for high-quality high-speed wireless communications has been significantly increased. Among wireless local area networks (WLANs), IEEE802.11 family of standards have become more popular than most, if not all, of the other competing standards. Up until now, the main design philosophy behind many MAC standards, including IEEE802.11, has been performance optimization based on a layered approach collision avoidance. Recently, the use of multiple-input multiple-output (MIMO) systems along with cross-layer design methodologies has opened different avenues for improving efficiency and reliability of wireless communications. Generally speaking, layered approaches ignore the impact of PHY layer on the design of MAC algorithms. A traditional MAC design for WLANs usually avoids collisions by attempting to eliminate the transmission of more than one packet at a time over the same medium. Multi-packet reception (MPR) methods have transformed the traditional design. MIMO-assisted communication is able to resolve the problems associated with colliding transmissions. An N-antenna receiver can detect up to N independent streams of data using the V-BLAST technique. There are array processing techniques which provide diversity in addition to the simple multi-packet detection capability for MIMO systems. This motivates the design of MAC/PHY cross-layer algorithms leveraging a multi-packet detection capability. Others have introduced a multi-packet reception MAC/PHY algorithm for adhoc networks which basically utilizes V-BLAST. For WLANs, others have proposed a joint multi-packet detection MAC and adaptive resource allocation algorithm. Indeed, research groups, under the assumption of transmitting over an error free transmission channel, have proposed a cross-layer MAC algorithm for WLANs with single antenna terminals and multiple antenna access points (APs).

Presently, UC researchers introduce a cross-layer MAC/PHY MPR algorithm based on the interference cancellation technique. The University's proposal differs from the previous work in the MPR technique it employs. The choice of the MPR technique affects the overall throughput performance. The researchers have analyzed the throughput performance of the proposed cross-layer technique for a WLAN network operating over "lossy" channels. Their matching simulation results illustrate the significant improvement in the rate of packet delivery as the result of leveraging the proposed MPR technique.

SUGGESTED USES

Multiple antenna communication systems.

ADVANTAGES

Significant enhancements in the throughput of a WLAN

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OTHER INFORMATION

CATEGORIZED AS

» **Communications**
» Wireless

RELATED CASES

2010-685-0

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	8,582,526	11/12/2013	2010-685

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- ▶ Fully Automated Multi-Organ Segmentation From Medical Imaging
- ▶ Cost-Efficient Repair For Cloud Storage Systems Using Progressive Engagement
- ▶ Automated 3D Reconstruction of the Cardiac Chambers From MRI of Ultrasound

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