Signal Detection Algorithms for Wireless Communication (MIMO) Systems (#6824/6878)

Several algorithms for highly efficient wireless MIMO detection

Inventors at Georgia Tech have developed several algorithms for highly efficient wireless MIMO detection using (1) an efficient greedy LLL algorithm (Technology ID 6824) and (2) an incremental fixed-complexity LLL algorithm, fcLLL (Technology ID 6878).

When the efficient greedy LLL algorithm (6824) is compared to existing greedy LLL algorithms, simulations show that the efficient greedy LLL not only converges faster but also exhibits much lower complexity (saving over 55% and 62% complexity on average for 4 x 4 and 8 x 8 MIMO systems) than the existing greedy LLL variants while maintaining similar error performance in lattice reduction (LR)-aided MIMO detectors. The enhanced fixed-complexity LLL algorithm invention (6878) uses an improved column traverse strategy and enhanced termination criterion for practical LR-aided SIC (successive interference cancelation) MIMO detection. This new fcLLL algorithm exhibits a significant complexity advantage, saving around 90% LLL iterations in average compared to the existing fcLLL algorithms for a 128 x 128 MIMO system with 64-QAM (quadrature amplitude modulation).

Benefits/Advantages

- Significantly enhances the efficiency of wireless MIMO signal detection
- Efficient implementation of algorithms converges faster with much lower complexity of error detection
- Yields improved error performance over existing LLL (Lenstra-Lenstra-Lovasz) and fcLLL algorithms

Potential Commercial Applications

Improved signal detection for MIMO systems will continue to be a critical area of development as the demands for faster and more complex wireless communications systems and devices are developed. These inventions will be useful in wireless communication and satellite systems and wireless devices, including mobile phones, PCs and communication platforms.

Background/Context for This Invention

In today’s society, a growing number of users are demanding more sophisticated services from wireless communication devices. This demand has led to an increase on the wireless channel. In order to meet this rising demand and capacity, communication devices have increased the number of antennas at the transmitter and receiver, thereby creating multiple-input multiple-output (MIMO) channels. However MIMO communication techniques greatly increase the complexity of signal detection at an exponential rate.
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For more information about this technology, please visit:
https://industry.gatech.edu/technology/signal-detection-algorithms-wireless-communication-mimo-systems