Docket #: S11-140

Full-duplex wireless adaptive tuning techniques

Stanford researchers have invented techniques to adaptively tune the operation of a wireless full-duplex node. To enable full-duplex operation, the receiver circuit needs to be able to cancel the transmitter's signal in order to receive data from other nodes.
The two components of the self-interference cancellation system are 1) Cancellation in the Radio Frequency and 2) Cancellation in Digital Samples.
This invention implements adaptive techniques for both components of the full-duplex design to make the design practically implementable.

Stage of Research:
This method has been evaluated using a 5 prototype testbed for a 10MHz wide OFDM signal. In this evaluation, full-duplex reduces packet losses due to hidden terminals by up to 88%. It also mitigates unfair channel allocation in AP-based networks, increasing fairness from 0.85 to 0.98 while improving downlink throughput by 110% and uplink throughput by 15%. These experimental results show that a redesign of the wireless network stack to exploit full-duplex capability can result in significant improvements in network performance.

Applications

- Wireless network deployments in enterprises and institutes
- High performance home wireless solutions
- Multi-hop wireless deployments
- Cellular backhaul

Advantages

- **Full-duplex wireless advantages:**
  - Simultaneous, two-way transmission on the same frequency
  - Faster, more efficient, and robust communication networks
  - Up to double the throughput of current wireless systems in single hop wireless systems. With intelligent medium access designs, the gains are even more for both single and multi-hop wireless systems
  - Helps solve the hidden-terminal problem
  - Improves fairness in WLAN networks
  - Reduces the end-to-end latency in multihop networks.
- This design can adapt to design parameters 'on-the-fly'
- This design can work with MIMO systems

Publications

- Mayank Jain, Jung Il Choi, Taemin Kim, Dinesh Bharadia, Siddharth Seth, Kannan Srinivasan, Philip Levis, Sachin Katti and Prasun Sinha. **Practical, Real-time, Full-Duplex Wireless.** To appear in Proceedings of the 17th Annual International Conference on Mobile Computing and Networking (Mobicom 2011).
- J. I. Choi, M. Jain, K. Srinivasan, P. Levis, and S. Katti. **Achieving single channel, full duplex wireless communication.** In Proceedings of the sixteenth annual international conference on Mobile computing and networking, MobiCom '10, pages 1–12, New York, NY, USA, 2010. ACM.
- News article - **Stanford researchers develop wireless technology for faster, more efficient communication networks**

Patents

- Published Application: 20120201153
- Published Application: WO2012106262
- Issued: 10,230,419 (USA)

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