Wireless Communications and Mobile Computing

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Special Issue on

Key Link Techniques for Secure Future Wireless Networks with Full-Duplexing

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Physical-layer security will play extremely important role in the future wireless networks and attract a heavy research interest from both industry and academia. In conventional wireless systems, noise and interference are not welcomed and have a destructive impact on system performance. In the recent several years, scientists and engineers discover that artificial noise (AN) can be constructively used to jam the eavesdroppers and improve the security of the desired receivers.

Recently, full-duplex (FD) technique becomes a hot research topic in wireless communications due to its ability of doubling data transmission rate by simultaneously transmitting and receiving signals over the same frequency band and time slot compared to time-division-duplex (TDD) and frequency-division-duplex (FDD). The major problem of facing FD is that the weak received signal is severely interfered with the strong FD self-interference (SI). Reducing such a self-interference is crucial to the type of FD wireless transceivers. Due to full-duplex, the desired receiver can simultaneously jam the eavesdropper when it receives the confidential message from the desired transmitter. Thus, full-duplex is a very attractive technique and may be applied to wide future wireless scenarios such as cooperative relay networks, WLAN, mobile communications, satellite transmission, unmanned-aerial-vehicles networks, and Internet of Things (IoT).

Combining full-duplex and security can simultaneously improve both security and spectrum efficiency of conventional wireless systems. This special issue will focus mainly on how to exploit full-duplex techniques to improve the physical-layer security and spectrum efficiency of wireless systems and strike a good balance between security and spectrum efficiency. The following areas are of particular interest for this special issue.

Potential topics include but are not limited to the following:

- Derivation and analysis of system performance and their limits, including secrecy rate, outage capacity, and average SER/BER for secure full-duplex wireless systems (e.g., secure STBC, secure directional modulation, secure spatial modulation, and secure cooperative relay communication)
- Optimization of pilot pattern, signal detection, and resource management like power allocation that obviously, even dramatically, improve the performance of secure full-duplex wireless communications
- Design of secure modulation schemes, high-performance channel estimators, flexible medium access control, high-performance scheduling, and cross-layer design that benefits the practical implementation of secure full-duplex wireless systems
- Routing security for future full-duplex wireless networks
- Convert full-duplex wireless transmission
- Physical-layer security for full-duplex wireless systems: cooperative jamming and precise jamming , and so forth
- Energy efficiency and Simultaneous Wireless Information Power Transfer (SWIPT) for secure full-duplex wireless communication systems
- Relation between secrecy and energy efficiency: particularly, the introduction of new metrics and tools to evaluate the trade-offs between secrecy, capacity, energy efficiency, and QoS
- Information theoretic secrecy aspect in such a system

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