Multi-carrier Ultrasonic Communications, Resource Allocation, and Medium Access for Implantable Devices

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Technology description

Description

Implantable medical devices with wireless capabilities have become the cornerstone of many revolutionary digital health applications. In prior-art, such wireless medical implants are generally connected through radio-frequency (RF) electromagnetic waves, which tend to scale down traditional wireless technologies to the intra-body environment, with almost no attention to specific characteristics and safety requirements of the human body. Some of the other common limitations associated with RF-based technologies are lack of appropriate tissue propagation, high energy consumption, and lack of appropriate network reliability, security and safety of the patient. This invention relates to a novel networking scheme (ultrasonic orthogonal frequency multiplexing – UOFDM) that offers link-to-link physical layer adaptation with distributed control to enable multiple access for implantable devices, overcoming most prior-art limitation and/or unmet needs.

Value Proposition

The networking scheme:

· Is first of its kind scheme used for implantable medical devices

· Uses ultrasonic mode of communications as compared to traditional radio-frequency electromagnetic based communications

· Is more secured against eavesdropping and jamming attacks as compared to conventional schemes

· Effectively regulates the data rate of each transmitter to adapt to the current levels of interference and channel conditions, avoiding the centralized control requirement as observed with conventional schemes

· Effectively leverages cross-layer real-time adaptation with distributed control to enable multiple access

· Eliminates any potential conflict with existing RF communication systems and over-crowded RF environments

· Uses a much unregulated ultrasonic frequency spectrum, enabling high flexibility in terms of spectrum allocation

· Offers a rate adaptation by jointly optimizing several physical layer parameters such as instantaneous power, FEC coding rate and modulation

· Efficiently interconnects implantable medical sensing and actuating devices, enabling many revolutionary biomedical applications

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