Award Abstract #1314790

SBIR Phase I: Adaptive analog nonlinear circuits for improving properties of electronic devices

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ABSTRACT

This Small Business Innovation Research (SBIR) Phase I project aims at developing advanced analog nonlinear algorithms and circuits for mitigation of in-band noise and interference, especially that of manmade origin, affecting various signals of interest and limiting the performance of the affected devices and services. Manmade noise, unintentional as well as intentional, is a ubiquitous and rapidly growing source of interference with various electronic devices, systems, and services, harmfully affecting their physical, commercial, and operational properties. This noise comes from a magnitude of various sources such as mutual interference of multiple devices combined in a system (for example, a smartphone equipped with WiFi, Bluetooth, GPS, and many other devices), electrical equipment and electronics in home and office, dense urban and industrial environments, increasingly crowded wireless spectrum, and intentional jamming. The proposed nonlinear algorithms and circuits, Adaptive Nonlinear Differential Limiters (ANDLs), have many significant advantages over existing filtering solutions, providing capabilities that cannot be replicated by linear filtering devices and systems. ANDLs also enable elegant and inexpensive real-time solutions to the manmade interference problems that may be used in addition, or as a low-cost alternative, to the state-of-art interference mitigation methods.

The broader impact/commercial potential of this project is in its ability to advance scientific and technological understanding of the problems caused by manmade interference, as the proposed ANDL algorithms and circuits enable a variety of simplified and inexpensive real-time solutions to these problems, further enhancing the societal and commercial impact of the proposed technology. ANDLs are intended to be fully compatible with existing linear devices and systems, and to be used in addition, or as a low-cost alternative, to the state-of-art interference mitigation methods. When incorporated into existing devices and/or systems as integrated circuit ANDL cells, ANDLs may be widely deployed, in a sustaining as well as disruptive manner, to meet the increasing demand for reducing manmade noise and leading to improvements in physical, commercial, and operational properties of those devices, and the systems and services that incorporate and use the improved devices. This will benefit a wide range of applications in high revenue industries such as, for example, consumer electronics, medical, industrial, and defense electronics, and industrial, consumer, and military communication devices and services.

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