Wireless Implantable Neural Recording (#4654)

A WINeR system, 32 electrode multichannel wireless implantable neural recording system

Georgia Tech inventors have introduced a WINeR system, a multichannel wireless implantable neural recording system on a signal application specific integrated circuit (ASIC). The system can amplify, filter, multiplex, modulate, and wirelessly transmit neural signals from up to 32 electrodes and even more. The system-on-a-chip (SoC) time division multiplexes (TDM) a pulse width modulated (PWM) sample from every channel, while eliminating the need for large off-chip components, digital buffers, and particularly, the high frequency on-chip clock. The transmitter utilizes an analog-to-time conversion (ATC), while the receiver utilizes a time-to-digital conversion (TDC) to reduce the size and power consumption of the implantable unit by moving the digitization circuitry to an external unit. As a result, the overall system noise is reduced, a wider bandwidth is used, and both the complexity and power dissipation on the transmitter unit has lowered.

Benefits/Advantages

- Wide wireless bandwidth
- Small sized wireless link system (3.3 x 3.0 mm-sq)
- Low power consumption (~5.6mW)
- Robustness against noise and interference

Potential Commercial Applications

- Electrophysiological research
- Behavioral neuroscience research
- Neuroprostheses
- Brain-computer interfacing

Background/Context for This Invention

Majority of ongoing electrophysiological and behavioral neuroscience research is conducted on animal models, and its accelerating pace has created a considerable demand for microsystems that can simultaneously record neural signals from a large number of electrodes in awake behaving animals. For decades, researchers have been using racks of bulky data acquisition systems, connected to electrodes through a bundle of thin wires and a pre-amplifier headstage. Although they are wideband and easy to use, wires can potentially bias the animal behavior and add both noise and motion artifacts to the recorded neural signals. Thus, neuroscientists are interested in replacing the wire bundles with a wireless link that can continuously record and process the entire neural signals without losing any piece of information over a

wide bandwidth with minimal noise and interference.

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More Information

U.S. Patent Issued - 8958868

Publications

For more information about this technology, please visit:
https://licensing.research.gatech.edu/technology/wireless-implantable-neural-recording

Images:

The automated sequential delivery of multiple fluids. A varying number of delay gates imprinted in the branches are shown in the figure.

COVID-19 and flu saliva test on paper: (A) The automatic sequential delivery of multiple reagents required for virus test; (B) Water pouring into the device triggers the virus assay, allowing the presence of SARS-CoV-2 and influenza A & B viruses to be visually identified by the color changes in the corresponding detection spot