Neural Interface System

New approach to building scalable brain-machine interface systems may enable widespread use of wireless, remotely-powered neural interface implants in patients needing prostheses.

Researchers at the University of Central Florida have designed an innovative brain-machine interface (BMI) system that can enable throughput of 1,000 or more parallel recordings to repair human cognitive or sensory-motor functions. Current BMIs consist of bulky devices with massive external wire connections and packaging complexity. By internalizing the external wires within integrated circuits and miniaturizing the interconnections onto a single silicon chip, UCF’s new monolithically-integrated neural interface (MINI) device provides unprecedented scalability for high-density recordings. Thus, embedding more than 1,000 channels, 1,000 amplifiers and 1,000 electrodes on a silicon die is possible. Wireless and battery-less, the new system offers the large-scale recording capability needed to advance brain research, brain mapping, and clinical translations of BMI recordings.

Technical Details

The invention consists of a monolithically integrated neural interface (MINI) device and a method for manufacturing the device. The flexible MINI device is much smaller than existing BMIs and can be implanted under the skull but outside the brain. Since all components reside on one silicon chip, the new device also simplifies the surgical implant procedure and lowers the risk of infection and scar tissue buildup to the patient. The invention includes a low-cost manufacturing method that relies on standard fabrication techniques used in complementary metal oxide semiconductor (CMOS) foundries.

Benefits

- Provides for massive throughput of 1,000 or more parallel recordings, surpassing current BMIs
- Flexible silicon chip implant is substantially smaller than current BMIs
- Monolithic nature of the system can simplify surgical procedures for the implant
- All wires are internalized within integrated circuits, preventing susceptibility to corrosion
- Allows for battery-less operation by simultaneous wireless power and data transmission

Applications

- Neural prosthesis

Technology #34017

• PCT Patent Application Filed

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