UF UNIVERSITY of FLORIDA *seeks partner to license*

Improved Microelectrode Array for Neural Recording

Invention

The University of Florida is seeking a company interested in commercializing a novel neural microelectrode that leverages the recording properties of conventional micro-wire electrode arrays with additional features such as the precise control of the electrode geometries and bond pad sites and flexible materials via micromachining. Electrode arrays have high neuronal yield, which improves the accuracy and performance characteristics such as impedance and signal to noise ratio providing unique competitive advantage. Micro-wire electrodes have been extensively used for acute and chronic applications of neural recording. However, they are assembled from discrete components and prove challenging to integrate with circuitry. For brain machine interfaces, the ultimate application of a fully implantable device warrants the need for integration between the amplifiers and electrode arrays.

Application

- Neural recording device for development of a new set of neurotherapeutic devices that computer control prosthetic limbs and devices

Advantages

- Flexible cable design alleviates strain from external connector minimizing chronic tissue damage and patient complications
- Electrodes are designed to pierce through neural tissue during implantation surgery without buckling
- Metal traces and corresponding bond sites can be made to any size specification and spacing distance via photolithography and thus can be used in multiple custom application-specific-integrated circuits

Technology

A flexible substrate microelectrode array has been designed using micro-fabrication techniques and tested in vivo. The neural probe array consists of eight probes with gold-plated electrode sites on the tip that protrude from a flexible cable. The benefits of the micro-fabrication design allows for tailoring the electrode geometry for neuronal structures of interest. High channel count arrays are constructed by layering the proposed design. The flexible cable additionally provides strain relief from the fixed external connection, which will minimize tissue damage from external forces. Due to the adaptability of the fabrication process metals such as platinum may be readily incorporated.

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The inventors

Dr. Toshikazu Nishida is currently an associate professor in the Department of Electrical and Computer Engineering (ECE) and an Affiliate Associate Professor in the Department of Mechanical and Aerospace Engineering (MAE) at the University of Florida. His research interests include solid-state physical sensors and actuators, transducer noise, strained semiconductor devices, and reliability physics of semiconductor devices. He received his Ph.D. (1988) and M.S. degrees in Electrical and Computer engineering and B.S. degree in Engineering physics at the University of Illinois at Urbana-Champaign. He also received the 2003 College of Engineering Teacher of the Year award. He holds four U.S. patents and is a member of IEEE, Materials Research Society, American Physical Society, and the American Society for Engineering Education.

Dr. Justin Sanchez is an Assistant Professor of Pediatrics, Neuroscience, and Biomedical Engineering at the University of Florida College of Medicine, Engineering, and McKnight Brain Institute in Gainesville, Florida. Dr. Sanchez's research interests are in Neural Engineering and neural assistive technologies. He received his Ph.D. and M.E. degrees in Biomedical Engineering and B.S. degree in Engineering with a minor in Biomechanics from the University of Florida. The goal of his research is to develop state-of-the-art novel medical treatments by operating at the interface between basic neural engineering research and clinical care. In 2005, he won two prestigious awards for his work including Excellence in Neuroengineering and more recently an American Epilepsy Society Young Investigator Award.

Erin E. Patrick completed her Bachelor of Science in Electrical Engineering from the University of Florida in 2002 and is currently a doctorate student at the University of Florida. She is a member of the Interdisciplinary Microsystems group. Erin Patrick was selected as a winner of the 2005 University Women's Club Scholarship for Graduate Students.

contact

Karl Zawoy
University of Florida
Office of Technology Licensing
352/846-1877 ◆ email: kzawoy@ufl.edu

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