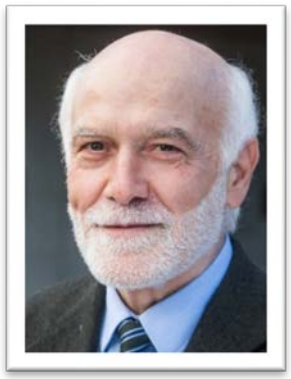
UCLA Henry Samueli School of Engineering
Electrical & Computer Engineering Dept.

EE297 Seminar Series Speaker

A Fully Immersible Deep-Brain Probe with an Analog-to-Digital-Converter under each of the 144 Electrodes for Parallel Neural Recording



Prof. Dr. Yiannos Manoli

University of Freiburg - IMTEK and Hahn-Schickard

Monday, November 19, 2018 * 12:30 p.m. – 1:30 p.m.
Engineering Bldg. VI * Mong Learning Center – Room #180

Abstract: The evolution of tissue-penetrating probes for high-density, deep-brain recording of in vivo neural activity is limited by the level of electronic integration on the probe shaft. As the number of electrodes increases, conventional devices need either a large number of interconnects at the base of the probe or allow only a reduced number of electrodes to be read out simultaneously. Active probes are used to improve the signal quality but still need to route these signals from the electrodes to a base where the readout electronics is located on a large area. In this talk, I present a modular and scalable architecture of a needle probe. Instead of routing or pre-buffering noise-sensitive analog signals along the shaft, it integrates the analog-to-digital conversion under each electrode in an area of 70 µm × 70 µm. The presented reconfigurable 11.5 mm probe with 144 integrated recording sites features a constant width of 70 µm and thickness of 50 µm from top to bottom for minimal tissue damage. The design eliminates the need for any additional readout circuitry at the top of the probe and connects with a digital 4-wire interface. Connected to a cable, it can be fully immersed in tissue for deep-brain recording applications.

Biography: Yiannos Manoli holds the Fritz Huettinger Chair of Microelectronics in the Department of Microsystems Engineering (IMTEK) at the University of Freiburg, Germany. He additionally serves as director of the Hahn-Schickard Institute. He is currently a Fellow at the Thomas Mann House in Pacific Palisades. His research interests are the design of low-voltage and low power, mixed-signal systems with over 300 papers published in these areas. The emphasis lies in Analog-to-Digital converters as well as in CMOS circuits for energy harvesting and sensor read-out. Further research activities concentrate on motion and vibration energy transducers and on inertial sensors.

Prof. Manoli received Best Paper Awards from ESSCIRC 2012, 2009 and 1988, PowerMEMS 2006, MWSCAS 2007 and MSE 2007. Spicy VOLTsim, a web-based animation and visualization of analog circuits, received the Multi-Media-Award of the University of Freiburg in 2005 (www.imtek.de/svs). He received the Best Teaching Award of the Faculty of Engineering in 2008 as well as the Excellence in Teaching Award of the University of Freiburg and the Teaching Award of the State of Baden-Württemberg, both in 2010.

He holds a B.A. degree (summa cum laude) in Physics and Mathematics, a M.S. degree in Electrical Engineering and Computer Science from the University of California, Berkeley and the Dr.-Ing. degree in Electrical Engineering from the Gerhard Mercator University in Duisburg, Germany.

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