

Session Name:

Title: Integrated biosensors for cell culture monitoring

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Abstract

Biosensors for endogenous compounds, such as glucose and lactate, are applied to monitor cell cultures. Cells can be cultivated for several purposes, such as understanding and modeling some biological mechanisms, the development of new drugs and therapies, and in the field of regenerative medicine. We have realized a self-contained monitoring system with remote readout. Metabolite detection is based on oxidases immobilized onto carbon nanotubes. We calibrate the system for glucose and lactate detection in phosphate buffer solution. A hw/sw architecture records the signal generated by the biosensor and transmits it to a remote station by means of a Bluetooth module. We have validated two biosensors for metabolic monitoring in culture medium and we detect lactate production in neuroblastoma cells after 72 h of cultivation. The integrated system proposed in the present work opens new opportunities towards the development of novel tools for cell analysis.

Biography

Giovanni De Micheli is Professor and Director of the Institute of Electrical Engineering and of the Integrated Systems Centre at EPF Lausanne, Switzerland. He is program leader of the Nano-Tera.ch program. Previously, he was Professor of Electrical Engineering at Stanford University. He holds a Nuclear Engineer degree (Politecnico di Milano, 1979), a M.S. and a Ph.D. degree in Electrical Engineering and Computer Science (University of California at Berkeley, 1980 and 1983).

Prof. De Micheli is a Fellow of ACM and IEEE and a member of the Academia Europaea. His research interests include several aspects of design technologies for integrated circuits and systems, such as synthesis for emerging technologies, networks on chips and 3D integration. He is also interested in heterogeneous platform design including electrical components and biosensors, as well as in data processing of biomedical information. He is author of: *Synthesis and Optimization of Digital Circuits*, McGraw-Hill, 1994, co-author and/or co-editor of eight other books and of over 500 technical articles. His citation h-index is 81 according to Google Scholar. He is member of the Scientific Advisory Board of IMEC and STMicroelectronics.

Prof. De Micheli is the recipient of the 2012 IEEE/CAS Mac Van Valkenburg award for contributions to theory, practice and experimentation in design methods and tools and of the 2003 IEEE Emanuel Piore Award for contributions to computer-aided synthesis of digital systems. He received also the Golden Jubilee Medal for outstanding contributions to the IEEE CAS Society in 2000, the D. Pederson Award for the best paper on the IEEE Transactions on CAD/ICAS in 1987, and several Best Paper Awards, including DAC (1983 and 1993), DATE (2005) and Nanoarch (2010 and 2012).

He has been serving IEEE in several capacities, namely: Division 1 Director (2008-9), co-founder and President Elect of the IEEE Council on EDA (2005-7), President of the IEEE CAS Society (2003), Editor in Chief of the IEEE Transactions on CAD/ICAS (1997-2001). He has been Chair of several conferences, including DATE (2010), pHealth (2006), VLSI SOC (2006), DAC (2000) and ICCD (1989).