OMICS Group Conferences
Accelerating Scientific Discovery

International Conference and Exhibition on
Biosensors & Bioelectronics

May 14-16, 2012 Embassy Suites Las Vegas, USA

Developing an impedance measurement system based on electronic design automation for protein detection

Ming-Lang Chang, J.Z. Tsai, J.T. Liu, C.J. Chen, S.J. Chang and M.W. Lee

Department of Electrical Engineering, National Central University, Taiwan

This research focuses on developing an impedance measurement system by Electronic Design Automation (EDA) technology to reduce analog circuits and convert analog biological information into digital data for the ease of processing, analyzing, and storing. The impedance measurement system includes a field-programmable gate array (FPGA) platform, a function generator, and a personal computer. The FPGA's internal circuit structure includes two analog-to-digital converters (ADC), a baud rate generator, a frequency divider, an up counter, a 2-to-1 multiplexor, a decoder, and a UART transmitter. In order to monitor biological properties and analyze impedance changes, the function generator produces alternating current (AC) signals of various frequencies with specified magnitudes for injecting current into the measured subject. To detect the impedance magnitude and phase, the computer receives the injected AC signal data and the induced signal data from the FPGA through the RS232 serial port. Then, discrete Fourier transform is conducted to obtain the impedance magnitudes and phases angle at various frequencies. A graphical user interface (GUI) in the computer is designed to serve as the gateway through which for the user to observe the measurement results and to view the relationships among various parameters such as frequency, impedance, and biochemical concentration. This electrochemical impedance spectroscopy (EIS) system will be used to measure composite solutions of human serum albumin (HSA) and phosphate buffered saline (PBS) at different concentrations with impedance biosensors.

Biography

M. L. Chang is a Ph.D. candidate in the Department of Electrical Engineering, National Central University, Jung-Li City, Taiwan. He received the BS degree in mathematics from Aletheia University, Taiwan, and the MS degree in digital mechatronic technology from Chinese Culture University, Taiwan. His current research interests include biomedical instrumentation, biomedical signal processing, biomedical image processing, and finite element simulation.

alun4416877@hotmail.com