Design of a reconfigurable, modular and multi-channel biolodimpedance spectroscopy system

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Abstract
This paper presents the design and implementation of a module-based multi-channel biolodimpedance system with a field-programmable gate array (FPGA). The proposed system is capable of acquiring multiple signals from multiple biolodimpedance sensors, processing the data on the FPGA and storing the final data in the on-board memory. The system employs the Digital Automatic Balance (DAB) method to acquire data from bioimpedance. The DAB measures initial data to determine impedance at the value of the impedance for the device under test. This method offers a simple approach because the balancing of the circuit is done digitally in the FPGA rather than using an external circuit. Calculations of the impedance values for the device under test were done in the processor. The final data is sent to an onboard Flash memory to be stored for later access. The control unit handles the interfacing and the scheduling between these different modules (Processor, Flash memory) as well as interfacing to multiple BioImpedance Bridge and multiple bioimpedance sensors. The system has been implemented successfully and has comparable performance to other FPGA-based solutions. The system has a robust design that is capable of handling and interfacing input from multiple bioimpedance sensors. Data processing and storage is also performed with minimal resources on the FPGA. © 2017 Institute of Electrical and Electronics. All rights reserved.

Author keywords
Biolodimpedance, multi-channel, DAB

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