



ABSTRACT PREVIEW

A SELF-POWERED BIOMEDICAL SOC PLATFORM FOR WEARABLE HEALTH CARE

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Abstract:

This paper will focus on Systems-on-Chip (SoCs) presented as a part of the UAE SRC (Semiconductor Research Corp) Center of Excellence on Energy Efficient Electronic Systems (aka ACE4S <http://www.src.org/program/grc/ace4s/>) which involves researchers from 5 UAE Universities who look at developing new technologies aiming at innovative self-powered wireless sensing and monitoring SoC platforms. The research targets applications in self-powered chip sets for use in public health, ambient intelligence, safety and security and IoT. ACE4S is the first SRC center of excellence outside the US. One such application, which we will discuss in details, is a ground breaking self-powered SoC platform for wearable health care. More specifically, we will present a novel fully integrated ECG signal processing system for the prediction of ventricular arrhythmia using a unique set of ECG features extracted from two consecutive cardiac cycles. Two databases of the heart signal recordings from the American Heart Association (AHA) and the MIT PhysioNet were used as training, test and validation sets to evaluate the performance of the proposed system. The system achieved an accuracy of 99%. The ECG signal is sensed using a flexible, dry, Graphene-based technology and the system is powered up by harvesting human thermal energy. The system architecture is implemented in Global foundries' 65 nm CMOS process, occupies 0.112 mm² and consumes 2.78 micro Watt at an operating frequency of 10 KHz and from a supply voltage of 1.2V. To our knowledge, this is the first SoC implementation of an ECG-based processor that is capable of predicting ventricular arrhythmia hours before the onset and with an accuracy of 99%.

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