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Editorial

Design and Application of Biomedical Circuits and Systems

Alberto Yúfera [1,*], Gloria Huertas [1] and Belen Calvo [2]

[1] Instituto de Microelectrónica de Sevilla (IMSE-CSIC), Universidad de Sevilla, Av. Americo Vespuccio 24, 41092 Sevilla, Spain; gloria@imse-cnm.csic.es

[2] Grupo de Diseño Electrónico, Instituto de Investigación en Ingeniería de Aragón (GDE-I3A), Universidad de Zaragoza, 50009 Zaragoza, Spain; becalvo@unizar.es

* Correspondence: yufera@imse-cnm.csic.es

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1. Introduction

The development of new sensing technologies, biomaterials, microelectronic devices, microfluidic systems and micro-electro-mechanical systems (MEMs) etc., opens the window to new biomedical circuits and system opportunities to measure "better", and to develop "alternative" methods to find relevant information for physician and biologist teams, in applications such as diagnosis, therapy, clinical tests and bio-signal monitoring. However, the accomplishment of new medical equipment for specific tests in the health field poses significant challenges regarding the electronic circuits and systems needed, whose performance is vital for proper and accurate data acquisition tasks.

2. Design and Application of Biomedical Circuits and Systems

This Special Issue is devoted mainly to incorporating proposals of bio-sensing signals based on new circuits and system approaches. In general, it is focused on new bio-signal analog front-end (AFE) circuits; the development of specific circuits for known and new sensor/sensing approaches; circuits for biomedical signal processing; low-voltage and low-power (LV/LP) circuits and its application to implantable and wearable devices; circuits and systems for clinical applications; circuits for sensing/actuation in MEM systems, lab-on-a-chip (LoC), micro-total-analysis systems (uTAS); cell assays and manipulation, etc. Main topics of interest are well described by the Special Issue keywords (but not limited to):

- Analog front-end (AFE) circuits;
- Circuits for bioimpedance test;
- Capacitive based circuits;
- Circuits for new sensing devices and microelectrodes;
- ECG, EEG, EMG, EoG etc. circuits and systems;
- Circuits for implantable and wearable devices;
- LP/LV circuits in biomedical environments;
- Micro-energy harvesting;
- Circuits and systems in clinical applications;
- Circuits for cells, DNA, bacteria, viruses etc. assays;
- Brain interfaces;
- Internet of Things for remote healthcare;

In the present Special Issue, twelve papers have been successfully incorporated. We hope you enjoy reading this Special Issue and are inspired to address the technological challenges to help the

medical industry and biologists to increase the human quality of life, which is the main objective. These are the contribution papers:

1. On the DC Offset Current Generated during Biphasic Stimulation: Experimental Study [1].
2. Multichannel Biphasic Muscle Stimulation System for Post Stroke Rehabilitation [2].
3. High-Performance Analog Front-End (AFE) for EOG Systems [3].
4. MEDUSA: A Low-Cost, 16-Channel Neuromodulation Platform with Arbitrary Waveform Generation [4].
5. FPGA-Based Doppler Frequency Estimator for Real-Time Velocimetry [5].
6. An Interference Suppression Method for Non-Contact Bioelectric Acquisition [6].
7. New RSA Encryption Mechanism Using One-Time Encryption Keys and Unpredictable Bio-Signal for Wireless Communication Devices [7].
8. Development of a Compact, IoT-Enabled Electronic Nose for Breath Analysis [8].
9. A Computationally Efficient Mean Sound Speed Estimation Method Based on an Evaluation of Focusing Quality for Medical Ultrasound Imaging [9].
10. Incremental Low Rank Noise Reduction for Robust Infrared Tracking of Body Temperature during Medical Imaging [10].
11. Soft Elbow Exoskeleton for Upper Limb Assistance Incorporating Dual Motor-Tendon Actuator [11].
12. Insight on Electronic Travel Aids for Visually Impaired People: A Review on the Electromagnetic Technology [12].

We are conscious about the very wide scope of biomedical circuits and systems applications, and that our contribution it is only a grain of sand more, but we expect to be it useful for knowledge progress in the field.

3. Conclusions

Biomedical engineering is today one of the most important research fields in the world. This fact is parallel with the health challenges surrounding the improvement of human health as one of the main vehicles to increase the quality of life. The maturity of many technologies, such as microelectronic, biomaterial, microfluidic, together with progress in the biology and medicine fields, develop alternative solutions for medical evaluation, diagnosis, therapy and research in general, opening the opportunity for new medical devices, e.g., lab-on-a-chip, wearable technology, and implants. The biomedical electronic industry supports the development of many of these new devices, as the main technologies for bio-signal acquisition, processing, and communication. In this Special Issue contribution, we present some significant contributions for biomedical applications, which, of course, should be fulfilled and improved by future contributions.

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