

Advanced Research in Electronics: The Perspective of Women

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In the past, electronic engineering has been considered a purely male research field and, although this situation has changed slightly, the male prevalence in both academic and professional fields is still marked. However, in electronics, women have reached very high levels, and they have made decisive contributions both to the academic field and to technological progress. Based on these considerations, this Special Issue aims to collect contributions that can serve both to encourage girls to undertake studies on electronics and to make visible and to celebrate the achievements of women researchers from all over the world who focus their research on electronics.

The contributions collected in this Special Issue cover all of the fundamental fields of electronics: power, analog, programmable, digital and integrated electronics, sensors, and specific applications.

Article [1] is focused on the applications of multilevel inverters (MLIs) related to power converters. The differential evolution (DE) algorithm is applied to minimize the total harmonic distortion (THD) value in the output voltage waveform of a cascaded multilevel inverter and the obtained sets of switching angles calculated to achieve a required modular index (Mi) according to the inverter application are analyzed. The authors conclude that effectively minimizing the THD value in an MLI can affect the inverter output voltage, making the Mi inadequate and, therefore, consideration should be given to whether a high modulus value is required, but not to a low THD or a low THD with poor modulus value for a given output load.

Article [2] is an example of how pervasive electronics is nowadays, and it investigates an application in the field of food safety. In detail, in [2], an experimental study is performed on how electrical impedance measurements carried out on UHT milk normally available in supermarkets can provide useful information on the composition of the milk itself. In particular, the authors demonstrate that it is possible to distinguish whether the milk is whole, partially skimmed, fat-free or lactose-free; that it is possible to understand if it has been stored correctly in the refrigerator or out of the refrigerator; and that it is possible to understand if the milk has expired.

In [3], an interesting application of programmable electronics to sport activities is presented. During swimming training, it is relevant to monitor stroke and kick count in athletes. However, while stroke number can be detected by using a wearable “swim stroke meter”, the number of kicks is usually detected with the effort of dedicated staff by acquiring video images. In [3], the authors propose a new method for obtaining the kick count, which is based on one triaxial accelerometer worn on the athlete’s ankle to maximize the athlete’s comfort. An algorithm for the evaluation of the number of kicks has been developed and validated. The algorithm is suitable for embedded and real-time processing on a microcontroller-based device. The system’s power consumption has been optimized and the costs of the system are very low. The implemented measurement method has been tested and compared with gold standard methods (video recording). The obtained results improve on the state-of-the-art methods, proving that the work described in [3] is suitable as a reliable and accurate method for obtaining the kick count during swimming training.

In [4] an application in the field of high-frequency electronics is presented. In fact, a microwave down converter is proposed that could be exploited in satellite systems,



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particularly for electronic warfare applications based on CubeSat systems. The illustrated system has been designed employing commercial off-the-shelf components, and therefore it has the advantages of being cost-effective and of fast prototyping. The system simulations show good performances in terms of spurious free dynamic range, linear dynamic range, noise figure, and flat conversion gain. Another interesting feature of the down converter proposed in [4] concerns its wide operating bandwidth which makes it usable in many applications, such as satellite communication, radars, etc., where it can operate as a receiving stage.

The works described up to now are all based on instrumentation, discrete components, sensors, and programmable devices, and finally, perfectly completing the electronics framework, in [5], a characteristic topic concerning integrated electronics is addressed. In [5], the authors review the effect and impact of small delay defects (SDD) and hidden delay defects (HDD) in logic circuits, due to the technology scaling down in VLSI circuits. This topic is of particular importance for industries that operate in the production of high-quality chips. The review addressed in [5] can contribute to the VLSI testing industry for further progress as, although many effective techniques have been developed to detect most of the defects in chips, many test escapes still happen. The authors provided a deep insight for researchers in the field of VLSI testing by giving a brief overview of the state-of-the-art and a roadmap to further progress.

All the collected contributions have a woman as the principal investigator, as evidenced by their role as the first author or corresponding author.

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