ACTA IMEKO
ISSN: 2221-870X
March 2023, Volume 12, Number 1, 1 - 2

Introductory notes for the Acta IMEKO first issue 2023 General Track

Francesco Lamonaca[1]

[1] *Department of Department of Computer Science, Modeling, Electronics and Systems Engineering (DIMES), University of Calabria, Ponte P. Bucci, 87036, Arcavacata di Rende, Italy*

Section: EDITORIAL

Citation: Francesco Lamonaca, Introductory notes for the Acta IMEKO first issue 2023 General Track, Acta IMEKO, vol. 12, no. 1, article 1, March 2023, identifier: IMEKO-ACTA-12 (2023)-01-01

Received March 29, 2023; **In final form** March 29, 2023; **Published** March 2023

Corresponding author: Francesco Lamonaca, e-mail: editorinchief.actaimeko@hunmeko.org

Dear Readers,

As usual also this issue includes a General Track aimed to collect contributions that do not relate to a specific event. As Editor in Chief, it is my pleasure to give to you an overview of these papers, with the aim of encouraging potential authors to consider sharing their research through Acta IMEKO.

Power Quality (PQ) measurements and auditing play a vital role for smart grid applications, industrial safety and reliability. The major electrical PQ characteristics and parameters are studied and analysed for single-phase and poly-phase systems in the IEEE 1159 recommended practice. In [1], a power quality monitoring system to identify the utilisers performance, audit, PQ issues is presented practically for a two-panel boards switchgear equipment as a case study in Malaysia.

Today, an innovative leap for wireless sensor networks, leading to the realization of novel and intelligent industrial measurement systems, is represented by the requirements arising from the Industry 4.0 and Industrial Internet of Things (IIoT) paradigms. In fact, unprecedented challenges to measurement capabilities are being faced, with the ever-increasing need to collect reliable yet accurate data from mobile, battery-powered nodes over potentially large areas. Therefore, optimizing energy consumption and predicting battery life are key issues that need to be accurately addressed in such IoT-based measurement systems. This is the case for the additive manufacturing application considered in [2], where smart battery-powered sensors embedded in manufactured artifacts need to reliably transmit their measured data to better control production and final use, despite being physically inaccessible. A Low Power Wide Area Network (LPWAN), and in particular LoRaWAN (Long Range WAN), represents a promising solution to ensure sensor connectivity in the aforementioned scenario, being optimized to minimize energy consumption while guaranteeing long-range operation and low-cost deployment. In the application presented in [2], LoRa-equipped sensors are embedded in artifacts to monitor a set of meaningful parameters throughout their lifetime. In this context, once the sensors are embedded, they are inaccessible, and their only power source is the originally installed battery. Therefore, in [2], the battery lifetime prediction and estimation problems are thoroughly investigated. For this purpose, an innovative model based on an Artificial Neural Network (ANN) is proposed and developed starting from the discharge curve of lithium-thionyl chloride batteries used in the additive manufacturing application. The results of experimental campaigns carried out on real sensors were compared with those of the model and used to tune it appropriately. The results obtained are encouraging and pave the way for interesting future developments.

Bouaouiche et al. in [3] present an innovative method for the analysis of the vibration signals of a ball bearing for the diagnosis of rotating machine defects by vibration analysis. The signals are available on the platform Case Western Reserve University in the form of MATLAB files. The proposed approach consists of several methods and steps including the decomposition of the signals by feature mode decomposition (FMD) method and then, according to the Kurtosis values by selecting the signals useful for the defect diagnosis.

In [4], the design, the prototyping, and the first results of experimental tests of a Capacitive Oil Level Sensor (CLS) intended for aeronautical applications are described. Due to potentially high vibrational stresses and the presence of high electromagnetic interferences (EMI), the working conditions on aircraft can be considered quite harsh. Hence, both the sensing part and the conditioning circuit should meet strict constraints. For this reason, in the design phase, great attention has been paid also to the mechanical characteristics of the probes. All the design aspects are exposed and the main advantages concerning alternative level sensing techniques are discussed, and the preliminary experimental results of sensitivity, linearity, hysteresis, and settling time tests are presented and commented.

Analogue data acquisition is a common task which has application in several fields such as scientific research, industry, food production, safety, and environmental monitoring. It can be carried out either using systems designed ad-hoc for a specific application or by using general-purpose Digital Acquisition Boards (DAQ). Several DAQ solutions are nowadays available on the market, however, most of them are extremely expensive and come as commercial closed products, a factor which prevents users to adapt the system to their specific applications and limits the product compatibility to few operating systems or platforms. The paper in [5] describes the design and the preliminary metrological characterisation of a digital data acquisition solution based on the Teensyduino Development Board. The aim of the project presented in [5] is to create a hardware and software infrastructure suitable to be employed on several operating systems and that can be freely modified by the users when required. Taking advantage of the Teensyduino features, the proposed system is easy to be calibrated and used, and it provides functions and performance comparable to many commercial DAQs, but at a significantly lower cost.

In recent years, technological innovation has acquired a fundamental role in the agri-food sector, in particular in food quality control. The development of technology allowed to improve the quality of food before it is placed on the market. Recently, non-invasive techniques such as those operating in the THz spectral band were applied to the field of food quality control. In the laboratories of the ENEA centre in Frascati, close to Rome (Italy), a THz imaging system has been developed operating in reflection mode, together with an experimental setup able to measure both reflection and transmission of the samples in the frequency range from 18 GHz 40 GHz. With these two setups, the Authors in [6] will distinguish rotten and healthy hazelnuts by acquiring in real time both images of the fruit inside the shell by using the imaging system and the transmission data exploiting the 18-40 GHz system.

Also this issue shows heterogeneous topics, all connected by the common focus on measurement and instrumentation. I hope you will enjoy your reading.

Francesco Lamonaca
Editor in Chief

REFERENCES

[1] D. V. N. Ananth, N. Hannoon, Mohamed Shahriman Bin Mohamed Yunus, Mohd Hanif Bin Jamaludin, V. V. S. S. Sameer Charavarthy, P. S. R. Chowdary, "Real-time power quality measurement audit of government building – A case study in compliance with IEEE 1159", Acta IMEKO, vol. 12 (2023) no. 1, pp. 1-9.
DOI: 10.21014/actaimeko.v12i1.1287

[2] A. Morato, T. Fedullo, S. Vitturi, L. Rovati, F. Tramarin, "A learning model for battery lifetime prediction of LoRa sensors in additive manufacturing", Acta IMEKO, vol. 12 (2023) no. 1, pp. 1-10.
DOI: 10.21014/actaimeko.v12i1.1400

[3] K. Bouaouiche, Y. Menasria, D. Khalfa, "Diagnosis of rotating machine defects by vibration analysis", Acta IMEKO, vol. 12 (2023) no. 1, pp. 1-6.
DOI: 10.21014/actaimeko.v12i1.1438

[4] F. Attivissimo, F. Adamo, L. De Palma, D. Lotano, A. Di Nisio, "First experimental tests on the prototype of a capacitive oil level sensor for aeronautical applications", Acta IMEKO, vol. 12 (2023) no. 1, pp. 1-6.
DOI: 10.21014/actaimeko.v12i1.1474

[5] L. Lombardo, "Multi-platform solution for data acquisition", Acta IMEKO, vol. 12 (2023) no. 1, pp. 1-8.
DOI: 10.21014/actaimeko.v12i1.1475

[6] Manuel Greco, Fabio Leccese, Emilio Giovenale, Andrea Doria, "Terahertz techniques for better hazelnut quality", Acta IMEKO, vol. 12 (2023) no. 1, pp. 1-8.
DOI: 10.21014/actaimeko.v12i1.1477