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Introductory notes for the Acta IMEKO fourth issue 2022 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*

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

Dear Readers,

The end of the year is a time of accounting. Thanks to all of You, as a Community of Authors and Reviewers, Acta IMEKO is increasing its reputation. Indeed, according to SJR ranking [1], in the last year the Journal passed from the fourth to the third quartile both in the field of Electrical and Electronic Engineering and of Mechanical Engineering.

The goal of speeding up the editorial process without reducing the quality of the publications has been achieved too. Indeed, the publication time has been reduced by a factor of ten, and the rejection rate is at about 50%. This was done keeping the blind peer-review process based on at least two reviewers.

Since February 2022 Acta IMEKO is indexed by the Directory of Open Access Journals (DOAJ) [2] and the procedure to be indexed in Web of Science was started.

The Editorial Board (EB) was enlarged including most of the IMEKO Technical Committees Chairs. Please let me thank all the new EB Members for accepting this important role in supporting the Journal with their voluntary service.

Further efforts were done to upgrade the management system of the Journal and the website. It was a huge work, especially in transferring the data and the history of the old system to the new one.

Finally, we have developed a procedure to recognize the voluntary efforts of the Reviewers. In agreement with the IMEKO Presidential Board we have established an Award for the Best Reviewer of the year and a recognition for the Top 10 Reviewers.

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 you an overview of these papers, with the aim of encouraging potential authors to consider sharing their research through Acta IMEKO.

Natural lighting in building environments is an important aspect for the occupants' mental and physical health. Furthermore, the proper exploitation of this resource can bring energy benefits related to the reduced use of artificial lighting. In [3], F. Nicoletti et al. provide some estimates of the energy that can be saved by using a lighting system that recognises indoor illuminance. In particular, it is able to manage the switching on of lights according to the daylight detected in the room. The savings from this solution depend on the size and orientation of the window. The analysis is conducted on an office by means of simulations using the INLUX-DBR code. The locations have an influence on the luminance characteristics of the sky. The analysis is conducted with reference to one city in the south and one in the north of Italy (Cosenza and Milan). The energy saving is almost independent of latitude and therefore representative of the Italian territory. it is highly variable according to exposure, being the highest for southern exposure (97 % with the window size equal to 36 % of the floor area) and between 26 % and 48 % (as a function of window size) for northern exposure.

Following the revision of the SI, Kibble balances around the world may now be used to realise the unit of mass. In a Kibble balance, the weight of a mass is balanced by the electromagnetic force on a current-carrying coil of wire suspended in a magnetic field. At MSL researchers are developing a Kibble balance where the coil is connected to the piston of pressure balance in a twin pressure balance arrangement. The piston-cylinder unit of pressure balance provides a repeatable axis for the motion of the coil in the magnetic field. The twin pressure balance arrangement serves as a high-sensitivity force comparator.

In the paper entitled “Position control for the MSL Kibble balance coil using a syringe pump” [4], R. J. Hawke and M. T. Clarkson highlight that in a Kibble balance, the position of the coil must be finely controlled. In weighing mode, the coil remains stationary in a location of constant magnetic field. In calibration mode, the coil is moved in the magnetic field to induce a voltage. In particular, they investigate how the piston (and therefore coil) position may be controlled through careful manipulation of the gas column under the piston. They demonstrate the use of a

syringe pump as a programmable volume regulator which can provide fall rate compensation as well as controlled motion of the piston. In [4] it is shown that the damped harmonic oscillator response of the pressure balance must be considered when moving the coil. From this initial investigation, Authors discuss the implications for use in the MSL Kibble balance.

Reliability analysis can be committed to companies by customers willing to verify whether their products comply with the major international standards or simply to verify the design prior of market deployment. Nevertheless, these analyses may be required at the very preliminary stages of design or when the design is already in progress due to low organizational capabilities or simple delay in the project implementation process. The results sometime may be far from the market or customer target with a subsequent need to redesign the whole asset. Of course, not all the cases fall in the worst scenario and maybe with some additional considerations on mission definition it is possible to comply with the proposed reliability targets. Marco Mugnaini and Ada Fort, in the paper entitled "How to stretch system reliability exploiting mission constraints: A practical roadmap for industries" [5] provide an overview on the approach which could be adopted to achieve the reliability target even when the project is still on-going, providing a practical case study.

The recent increase in the Internet of Things and Industry 4.0 fields has led many researchers to focus on the innovative technologies that could support these emerging topics in different area of applications. In particular, the current trends are to close the gap between the physical and digital worlds, thus originating the so-called Cyber-Physical System (CPS). A relevant feature of the CPS is the digital twin, i.e., a digital replica of a process/product with which the user can interact to operate in the real world. In the paper entitled "Digital twins based on augmented reality of measurement instruments for the implementation of a cyber-physical system" [6], A. Liccardo et al. propose an innovative approach exploiting an Augmented Reality solution as Digital Twin for the electronic instrumentation to obtain a tight connection between the measurements as the physical world and the Internet of Things as digital applications. Actually, by means of the adoption of the 3D scanning strategy, Augmented Reality software and with the development of a suitable connection between the instrument and the digital world, a Cyber-Physical System has been realized as an IoT platform that collects and controls the real instrumentation and makes it available in Augmented Reality. An application example involving a digital storage oscilloscope is finally presented to highlight the efficacy of the proposed approach.

I hope you will enjoy your reading.

Francesco Lamonaca
Editor in Chief

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