Melanie Ooi

Instrumentation and Measurement in Australia and New Zealand

The IEEE International Instrumentation and Measurement Technology Conference (I2MTC 2019) will convene in New Zealand next month from May 20-23. Therefore, in this issue of *I&M Magazine*, we will take a closer look at some of the diverse instrumentation and measurement problems that are being studied in Australia and New Zealand.

Much of today's instrumentation and measurement (I&M) technologies are either focused on measuring and supporting biological systems, or are nature-inspired themselves, or both. For example, the paper "Neuromorphic Engineering – A Paradigm Shift for Future IM Technologies" by Vanarse, Osseiran and Rassau at Edith Cowan University describes the latest developments in neuromorphic engineering systems, which are large scale integrated circuit systems that replicate neurobiological systems. They describe the effectiveness of applying this technique to design non-intrusive measurement instruments such as electronic tongues, tactile sensing and olfactory sensors.

Instruments to measure and enhance the performance of human muscle are being designed at the Auckland Bioengineering Institute. The paper "A Dynamometer for Nature's Engines" by Taberner *et al*. provides a detailed overview of the different I&M technologies that have been incorporated into various components of such systems, for example supplying energy to the muscle, measuring and controlling muscle and trabecula movement, measuring heat rate and 3D tomography imaging of muscle shape.

In the field of measurement, sources of noise, misinformation and uncertainties are still prevalent. As such, it is important that these are studied, documented and resolved in order to drive the further development of accurate instrumentation. At Massey University's Photometric Laboratory, the accurate measurement and characterization of light sources are of great interest, with special focus on the blue region in the visible light spectrum where measurement inaccuracies tend to occur. The paper "The Measurement Blues" by Mander and Chitty presents an evaluation of the mainstream methods used to describe the amount of blue light from a given light source, how misinformation can occur, and how these issues can be prevented.

Sources of biasing error in time-of-flight measurements are also thoroughly investigated in the paper "Metrological Aspects of Time-Of-Flight Range Imaging" by Streeter and Kuang at the University of Waikato. They present solutions such as design modifications to data acquisition systems and signal processing techniques to improve measurement accuracy. These techniques improve reliability for applications such as animal husbandry, fruit measurement and grading, etc.

Finally, we have a paper "Measurement Uncertainty Evaluation: Could it Help to Improve Engineering Design?" by Rajan *et al*. which comes from a multi-institutional research team from Monash University, University of Waikato, Massey University and Unitec Institute of Technology. The paper introduces a relatively new analytical measurement uncertainty evaluation technique that, when incorporated into probabilistic design and optimization systems, can increase efficiency and accuracy. The case studies include the design of a steel-framed five story building.

It is my hope that these articles will interest and inspire magazine readers, especially those who will be making their way to New Zealand for the 2019 I2MTC in Auckland.