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IEEE Galveston Bay Section

Joint Technical Societies Chapters

Present

**"Instrumentation and Measurement WEEK"**

**with special Webinars**

**on**

**TUESDAY-September 20th, and WEDNESDAY- September 21st, WEDNESDAY- September 22nd**

**TUESDAY-September 20th, 9:00 AM US-Central**

**TOPIC : "Research on the influence of the layout of the laser multi-coordinate measuring system on the measurement accuracy"**

**SPEAKER: Dr Dongjing Miao,** National Institute of Metrology, Beijing, China

**PRESENTATION:**

The laser multi-coordinate measuring system has the advantages of high precision and wide measuring range and has wide application prospects in the fields of large-scale high-precision coordinate measurement. In order to improve the coordinate measurement accuracy of the laser multi coordinate measuring system, the influence of station layout on measurement accuracy is quantitatively analyzed, meanwhile, and the influence of the positional relationship between the measuring equipment and the measured point on the uncertainty of coordinate measurement is introduced too.

**PRESENTER:**

Dr. Dongjing Miao received the B.E. and M.E. degrees from Jilin University, Changchun, China, in 2007 and 2009, respectively, and the Ph.D. degree from Tsinghua University, Beijing, China, in 2014, all in mechanical engineering. He was a Postdoctoral Researcher with the Division of Metrology in Length and Precision Engineering, National Institute of Metrology, Beijing, where he is currently an Associate Researcher. His current research interests include large-scale dimensional metrology and automatic measurement system

**Complimentary Registration on VTool:**

https://events**.vtools.ieee.org/event/register/320887**

**Deadline: September 19th, 5:00 PM US-Central**

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**Wednesday, September 21st, 11:00 AM US-Central**

## **TOPIC: Measurement Performance of Sensor Systems Towards Autonomous Vehicles**

**SPEAKER: Prof Sergio Saponara, University of PISA, Italy**

**PRESENTATION:** The tutorial will focus on sensor and measurement systems for new generations of vehicles with driver-assisted/autonomous capability. This is the main trend that is revolutionizing vehicles and mobility of people and goods and is also making smart our cities. The economic and social impacts of this application field are huge. Worldwide every year 90 million vehicles are sold, but 1.25 million people are killed due to a lack of safety. In the US 3.1 billion gallons of fuel are wasted due to traffic congestion. Assisted driving and autonomous driving aim at increasing safety, improving fuel efficiency and our lifestyle by avoiding traffic congestion, at ensuring mobility for elderly and disabled people (inclusivity). The interest in this research subject is demonstrated by the huge investments of companies like Google, Intel, Tesla, Uber, Ford, and GM, to name just a few, and by technology alliances, e.g. between BMW and Intel, planning autonomous cars for 2021. A convergence between automotive and ICT/Electronics industries is foreseen in the near future. An example of this convergence is the 5G Automotive Association **<http://www.5gaa.org/>**, which includes all main car manufacturers, telecom service providers, electronic industries, and measurement system providers (Keysight, Rohde&Schwarz).

The key enabling technologies for this scenario are the sensing and measurement systems, needed for accurate vehicle positioning and navigation, vehicle context-awareness, obstacle detection, and collision avoidance, for driver assistance (enhanced vision, driver’s attention, and fatigue detection).

The lecture will be divided into multiple sections:

First, in the Introduction, innovation and market trends in the field of sensor and measurement technologies applied to vehicles and smart mobility systems will be discussed, focusing on the next generation of driver-assisted/autonomous vehicles.

Then, new Radar and Lidar systems, appearing on-board vehicles beside an array of imaging cameras, will be discussed for measurement of obstacle positions, distance, and relative speed. A trade-off has to be found between the power and size of active sensing systems like Radar and Lidar and their maximum measurement range. Moreover, in continuous wave Radars, the limited frequency sweep range and the limited number of TX/RX channels lead to limits for the resolution in distance, direction of arrival, and speed measurements. Examples of X-band mobility surveillance Radar and mm-wave automotive Radar will be provided.

On the other hand, MOEMS (micro opto-electro mechanical systems)-based scanned systems, used to reduce the size and cost of Lidars are causing distortions that are worsening the accuracy of light-based measurements. Distortions due to fish-eye lenses, used to enlarge the field of view, are decreasing the measurement performance of imaging sensors. Techniques to mitigate such artifacts will be discussed.

Practical examples of traffic sign recognition systems, road sign recognition, and image mosaicking for an all-around view will be discussed. In addition, Lidar and imaging cameras suffer from decreased measurement performance in case of harsh operating conditions (e.g. bad weather or light conditions).

New biometric sensing and measurement systems will be also reviewed, such as Radar-based contactless heart/breath-rate measurement, smart steering wheel for skin temperature/galvanic-response measurements, or heart-rate detection, with the final aim of detecting the driver’s attention or health status.

Concerning onboard sensors for positioning and navigation, recent advances in MEMS accelerometers and gyroscopes will be discussed. A careful analysis will be carried out about the measurement errors they cause on position and navigation, due to their bias and random walk output noise.

Finally, the lecture will analyze the trend in computing platforms, where parallel architectures and machine learning/AI (artificial intelligence) techniques, will be exploited to manage in real-time many and heterogeneous sources of measurements and to take autonomous decisions.

Suggestions for future directions of interest for the I&M society, and references to recent publications on IMS journals and conferences, in the field of automated and connected vehicles, will be provided as a conclusion.

**PRESENTER:**

Sergio Saponara is Full Professor of Electronic Engineering at University of Pisa. He is an IEEE IMS Distinguished Lecturer and he got the Master Degree cum Laude and the PhD degree, both in Electronic Engineering, from University of Pisa.

At University of Pisa he is the President of the Bachelor and Master degrees in Electronic Engineering. He is also the promoter and scientific Director of the Summer School of the University of Pisa.

He served in the organization of more than 150 international conferences, most from IEEE and SPIE and as guest editor of special issues in several ISI journals. He served as member of the reviewing board of more than 70 journals from IEEE, IET, Elsevier and Springer. He held plenary/invited talks and tutorials at IEEE and SPIE conferences. He is also Associate Editor and/or Guest Editor of 15 international peer-reviewed journals and in 2019 he got a best editor award from IEEE TC-VLSI.

**Complimentary Registration on VTools**

https:// https://events.vtools.ieee.org/event/register/321258

**Deadline: Tuesday September 20th , 5:00 PM US-Central**

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**THURSDAY- September 22nd, 11:00 AM US-Central**

#### **TOPIC: Medicine 4.0: AI and IOT, the new revolution**

**SPEAKER: Prof. Eros G. Pasero, Politecnico of Turin, Italy**

**IMS Distinguished Speaker**

**PRESENTATION:**

Industry 4.0 is considered the great revolution of the past few years. New technologies, the Internet of things, and the possibility to monitor everything from everywhere changed both plants and the approaches to industrial production. Medicine is considered a slowly changing discipline. The human body model is a difficult concept to develop. But we can identify some passages in which medicine can be compared to the industry. Four major changes revolutionized medicine:

Medicine 1.0: James Watson and Francis Crick described the structure of DNA. This was the beginning of research in the field of molecular and cellular biology

Medicine 2.0: Sequencing the Human genome. This discovery made it possible to find the origin of the diseases.

Medicine 3.0: The convergence of biology and engineering. Now the biologist’s experience can be combined with the technology of the engineers. New approaches to new forms of analysis can be used.

Medicine 4.0: Digitalization of Medicine: IoT devices and techniques, AI to perform analyses, Machine Learning for diagnoses, Brain Computer Interface, Smart wearable sensors.

Medicine 4.0 is definitely a great revolution in patient care. New horizons are possible today. Covid 19 has highlighted problems that have existed for a long time. Relocation of services, which means remote monitoring, and remote diagnoses without direct contact between the doctor and the patient. Hospitals are freed from routine tests that could be performed by patients at home and reported by doctors on the internet. Potential dangerous conditions can be prevented. During the Covid emergency, everybody can check his condition and ask for a medical visit (swab) only when really necessary. This is true telemedicine. This is not a WhatsApp where an elder tries to chat with a doctor. This is a smart device able to measure objective vital parameters and send to a health care center. Of course, Medicine 4.0 requires new technologies for smart sensors. These devices need to be very easy to use, fast, reliable, and low cost. They must be accepted by both people and doctors.

In this talk, we’ll see together the meaning of telemedicine and E-Health. E-health is the key to allowing people to self-monitor their vital signals. Some devices already exist but a new approach will allow everybody (especially older people with cognitive difficulties) to use these systems with a friendly approach. Telemedicine will be the new approach to the concept of a hospital. A virtual hospital, without any physical contact but with an objective measurement of every parameter. A final remote discussion between the doctor and the patient is still required to feel comfortable. But the doctor will have all the vital signals recorded to allow him to make a diagnosis based on reliable data.

Another important aspect of medicine 4.0 is the possibility of using AI both to perform parameter measurements and to manage the monitoring of multiple patients. The new image processing based on Artificial Neural Networks allows doctors to have a better and faster analysis. But AI algorithms are also able to manage intensive care rooms with several patients reducing the number of doctors involved in the global monitoring of the situation.

**PRESENTER:** Eros G. Pasero is a Professor of Electronics at the Politecnico of Turin since 1991 after a four-year appointment as a Professor at the University of Roma, Electronics Engineering. He was also Visiting Professor at ICSI, UC Berkeley, CA in 1991, a Professor of digital electronics and electronic systems at Tongji University, Shanghai, China in 2011, 2015, and 2017, and a Professor of digital electronics and electronic systems at TTPU (Turin Tashkent Polytechnic University), Tashkent, Uzbekistan since 2012 to 2014 where he was also vice-rector in the first period of 2014.

Prof. Pasero established in 1990 the Neuronica Lab where hardware and software neurons and synapses are studied for practical applications; innovative wired and wireless sensors are also developed for biomedical, environmental, and automotive applications. Data coming from sensors are post-processed by means of artificial neural networks.

Prof. Pasero is now the President of SIREN, the Italian Society for Neural Networks; he was v. General Chairman of IJCNN2000 in Como, General Chairman of SIRWEC2006 in Turin, general Chairman of WIRN2015, WIRN2016, and WIRN2017, WIRN 2018 and WIRN 2019 in Vietri. He holds 6 international patents (two were the first silicon European neurons and synapse together Texas Instruments). He was supervisor of tenths of international Ph.D. and hundredths of Master's students and he is the author of more than 100 international publications.

Together with his group, he was awarded the 1982 CILEA-Sperry award for complex application systems and local distributed architecture”, with the ASSIPE Design-In-Award in 2003 and 2004, with Premio "Innova S@alute2017" at the “forum dell'innovazione per la salute” on September 2017; he was IEEE keynote speaker at 2014 Symposium Series on Computational Intelligence in Orlando, Fl, USA; Distinguished Lecturer of the 2016 IEEE Medical Information Summer School, Distinguished Lecturer of the 2017 IEEE school "Smarter Engineering for Industry 4.0"

**Complimentary Registration on VTools**

**https://events.vtools.ieee.org/event/register/321334**

**Deadline for registration: Wednesday, September 21st, 5:00 PM US-Central**

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GBS "Societies WEEK" Coordinator:

Dr Zafar Taqvi, Chair GBS Joint Societies Chapter, University of Houston Clear La

GBS Website //r5.ieee.org/gb