

Ongoing Education

From the Editor's Bench

Shlomo Engelberg

Numeracy in the Service of Humanity

We engineers are generally “number people,” and we should do what we can to help our fellow citizens see how numbers can help them understand the world around them. One area where many people could use some help is risk analysis. In an “Opinionator” column that appeared in the New York Times on March 9, 2010 titled “Toyotas Are Safe (Enough),” Robert Wright explains why he is not going to worry much about sudden acceleration in certain car models. Wright used a very simple argument to show that his chances of being involved in a fatal accident caused by sudden acceleration are very, very small. His point is that the other dangers involved in driving a car far outweigh those caused by the risk of sudden acceleration, and that by understanding the numbers properly, you can make a better decision about how to live and what to worry about.

A similar point that comes to the fore from time to time is the issue of false positives in testing for diseases like cancer. Given a disease that is present in 0.01% of the population and a test that reports correctly that someone suffers from the disease 98% of the time if the person suffers from the disease and that incorrectly reports that the person suffers from the disease only 1% of the time when the person does not suffer from the disease, can the test be said to be effective? In any ways, the test looks good. It will almost certainly detect the disease if the disease is present. If the disease is not present, it will almost certainly say so. However, considering a simple example in an approximate way shows us that this test is not as good as it seems. Suppose we administer the test to a group of one million people. About one hundred of these people will suffer from the disease. The test will correctly report that ninety-eight of them suffer from the disease, and these people will be able to take appropriate action immediately.

Now consider the rest of the people: the test will incorrectly report that one percent of these people, about ten thousand people, suffer from the disease. These approximately ten thousand people will now have to consider what they should do. At a minimum, they will suffer a few weeks of great stress while they undergo more tests – tests that will hopefully correctly show that they are disease free. At worst, they will start undergoing treatment for a disease they do not suffer from. Looked at in this way, as numerate people would look at it, it is less clear that using this test is a good idea. As numerate individuals, it is our job to help those around us to understand the quantitative side of things. One way we can more effectively help others is by continually updating and upgrading our own “quantitative toolset.”

Here at the magazine we try to provide you with well written, interesting, and informative articles that help you with your ongoing education. In this month's issue, we have tutorials about measuring the physical layer performance of wireless communications systems, pulse metrology,

complexity measures and their applications, and the use of IEEE 1641. We also have our usual assortment of columns. As you will see, there are many ways you can make use of your numeracy to help those around you. Enjoy!

Shlomo

President's Perspectives

Kim Fowler

Cost vs. Benefit

My column in June grappled with concerns about whether IMS and IEEE are still relevant. Since then, other people have been asking the same type of questions. In February, Roger Pollard, a member of TAB, asked the following question in a Linked-In forum: "Why are fewer IEEE members joining Societies?" For most respondents *cost versus benefit* concisely summarized their concerns.

Here are some of the responses to Roger's question that I have extracted:

- Digital library access is already available in universities and large companies
- A free magazine is the only perk for most societies
- Payment for papers in IEEE Xplore is costly
- Most journals are not suited to practitioners; they are too theoretical and have far too few applications. One respondent wrote, "big articles, lots of words, small summaries."
- Many said that the only benefit is the print version of Spectrum
- Some local chapters are not operating
- Employers seem to have the following issues with cost vs. benefit:
 - don't see the need for them and don't support membership
 - want certifications from other professional societies
 - don't care about their lower-level employees making connections outside the workplace
 - want to protect their intellectual property.

Here are some proposed solutions. Some or all of them should be implemented for IEEE, and IMS in particular, to remain relevant and useful to you:

- Have interactive publications on society websites
- Make keynote addresses readily available online and on society websites; possibly even extend this to famous distinguished lecturers giving a title presentation.
- Have virtual conferences so that members who cannot travel can still gain some benefit from conferences.
- For practitioners, the following would be useful:
 - more application content in the journals and magazines
 - application and round table webinars to serve those who cannot travel
 - better networking venues
 - interactions with entrepreneurs
 - continuing education
 - career growth guidance (mentorship)

Right now the AdCom is wrestling with preparing a workable vision to drive our initiatives. We are considering a form, which is not finalized as of this writing, of the following statement:

Re-establish the importance of instrumentation and measurement within the profession.

We would love to hear from you. What would make the society more useful to you? Weigh in at our website forum at <http://www.ieee-ims.org/main/index.php>, and click on the “Membership” tab and find the discussion forum.

Kim

Article Summaries

Measuring the Physical Layer Performance of Wireless Communication Systems: Tutorial 33

(Summary)

Sebastian Caban, José Antonio García Naya, and Markus Rupp

Measuring the physical layer performance of wireless radio communication systems is one important step in clearly understanding their behavior in real-world, that is, non-simulation, environments. Unfortunately, measurements in wireless communications are extremely expensive and time-consuming. The research target presented in this tutorial is the throughput of a wireless communication system using two antennas at the transmitter and two antennas at the receiver (the ‘2x2’ curve). The authors compared this throughput to the throughput of a reference system having only one antenna at the transmitter but still two antennas at the receiver (the ‘1x2’ curve).

This summary includes text from the article.

Resolving Test Ambiguity with IEEE 1641: Tutorial 34

(Summary)

Ashley Hulme

In this discussion of IEEE 1641, the author has shown that the main function of the standard is to enable signals and tests to be fully defined so that they can be understood and reproduced in the future. This is important for military and avionics equipment that has a long service life, for which test programs will have to be updated and re-implemented several times during their lifetime. The standard is defined such that any 1641 signal has an exact meaning, underpinned by a mathematical definition.

This summary includes text from the article.

An Introduction to Complexity Measure: Non-Linear Statistical Parameters in Measurements: Tutorial 35

(Summary)

In previous parts of this tutorial series, the authors have introduced several data processing techniques, including Fourier transform, the wavelet transform, and correlation dimension analysis. In this article, they provide an introduction to how the complexity measure is calculated as an indicator for characterizing many of the signals measured during experiments in engineering practice and specifically show its application in the field of bearing degradation measurement.

This summary includes text from the article.

Columns

Instrumentation Notes

Inkjet-Printed Sensors: A Useful Approach for Low Cost, Rapid Prototyping

(Summary)

Bruno Andò and Salvatore Baglio

The development of low cost graphic technology-based sensors has been proceeding rapidly. The interest in such sensors is justified by the need for both low cost, rapid prototyping techniques for research laboratories and mass-production processes for the realization of very low cost devices. Examples of addressed devices are RFID tags, antennas, keyboards, displays and especially sensors. This paper provides brief explanations of screen printing and inkjet printing technologies that have received more attention for the realization of printed sensors than other printing techniques.

This summary includes text from the article.

Recalibration

The Evolution of Time Measurement, Part 2: Quartz Clocks

(Summary)

Michael A. Lombardi

Quartz clocks are the most common timekeepers of all. Billions of quartz oscillators are manufactured annually for use inside clocks, watches, mobile phones, computers, radios, and televisions. In this article, Part 2 of a four-part series, the author discusses the evolution of quartz clocks, beginning with the discovery of piezoelectricity.

This summary includes text from the article.

My Favorite Experiment

Exploring the World with Ultraviolet Light

(Summary)

John Witzel

While natural human lenses block UV, other animals and insects do not all suffer this limitation. The author briefly discusses some non-natural modifications that can also extend our vision bandwidth and can allow us to see into the Ultraviolet (UV) range, including cataract surgery or loss of a lens due to an accident. He proposes the use of inexpensive LEDs in the UV-B (280-315 nm) and UV-A (315-400 nm) ranges to show how readers how nature looks quite different in UV.

This summary includes text from the article.

Departments

Book Review

(Summary)

Cindy Harnett

Introduction to Sensors by John Vetelino and Aravind Reghu, both at the University of Maine, makes its strongest contributions in the areas of the authors' expertise: piezoelectric sensors and metal oxide semiconducting sensors. The book is targeted to undergraduate and graduate engineering students. The authors wisely decided to focus on only a few major sensor categories in their 180 page introduction to this vast topic. Examples from their work illustrate these chapters and serve to show general principles of sensor engineering.

This summary includes text from the article.

Book Review

(Summary)

Jorge Daher

Intelligent Instrumentation Principles and Applications by Manabendra Bhuyan is meant to be used as a text book for engineering courses but it is also useful for engineers and manufacturers learning about classical and intelligent sensors. The book contains seven chapters that present more than 80 numerical examples and applications in 14 case studies, a very good selection of examples and problems solved to understand the techniques presented in the chapters. Readers can also find almost 100 references for further reading.

This summary includes text from the article.

New Products

Robert Goldberg

Small, Fully Integrated Signal Generator for Automated Test Systems

The R&S SGS100A is a new signal generator from Rohde & Schwarz that enables production lines to work faster and more cost-effectively. Although much more compact than previous RF sources, it delivers the same performance as high-end conventional instruments.

The new R&S SGS100A signal generator covers the frequency range up to 12.75 GHz and has been optimized for use in automated test systems. The signal source is exceptionally compact. It fits in just one-half the width of a 19 in (48.3 cm) rack and requires a single height unit. Its small size means that four RF sources can be installed in the space previously needed for one RF source.

With typical frequency and level setting times of 280 μ s, the R&S SGS100A is three times faster than its conventional counterparts. This means higher production test throughput in addition to significantly reduced space requirements. The compact R&S SGS100A provides RF performance comparable with that of high-end signal generators. It offers a very high output level of typ. +22 dBm as standard and has an electronic step attenuator covering the entire frequency range. Its low nonharmonics of -76 dBc up to 1.5 GHz make the generator the ideal signal source for converter tests.

The R&S SGS100A is available in two models. The CW version generates frequencies up to 12.75 GHz. It can be used as a local oscillator, as well as for interference testing against mobile radio standards. The vector signal generator version with integrated I/Q modulator offers a maximum frequency of 6 GHz and covers the most important frequency bands for digital communications standards.

The R&S SGS100A also reduces operating and capital expenditures. Its initial costs are significantly lower than those of comparable equipment. In addition, it consumes less power (just 70 W) and dissipates less heat. The calibration interval of three years helps to keep the total cost of ownership down.

For more information on the R&S SGS100A, please visit www.rohde-schwarz.com.

Microwave Vector Network Analyzer Models, Up To 67 GHz

Agilent claims the new PNA Series to be the world's highest performing microwave network analyzer. It is based on Agilent's PNA-X architecture. The Agilent PNA is used to test a wide variety of passive and active devices such as filters, duplexers, amplifiers and frequency converters. The high-performance characteristics of the PNA make it an ideal solution for these types of component characterizations as well as millimeter-wave, signal integrity and materials measurements.

The PNAs are available with:

- Two-port internal single-source or four-port internal dual-source configuration in five frequency models: 13.5, 26.5, 43.5, 50 and 67 GHz
- Source output power: +11 dBm at 67 GHz (N5227A 67 GHz model), and
- 0.1 dB receiver compression point higher than +10 dBm (all models).

The PNA Series provides high-power sources and the best linear receivers, giving accurate S-parameter measurements with the widest power range in the market according to Agilent. This performance helps engineers increase yields with less guard band and provides the best data correlation between design verifications and production tests, making the new PNA Series a highly dependable tool in microwave network analysis.

The PNA Series now offers the majority of advanced measurement options currently available for the PNA-X Series and includes noise figure measurements, gain compression, two tone IMD/spectrum analysis, true-mode stimulus, source phase control and fast CW mode. In the design and production of passive and active devices, these advanced applications improve accuracy and productivity for high-performance microwave component characterization and testing.

The PNA family shares a common software platform making it easy to customize for just the right level of performance to meet specific budget and measurement needs. Software options can also be added later to meet future test requirements.

Find more information at www.agilent.com.

Portable, Low-Noise Battery Powered Signal Conditioner for Accelerometer and Acoustic Test Setups

Meggitt Sensing Systems has announced the global market introduction of the Endevco® model 4416B, a portable, compact, low-noise battery operated signal conditioner and power supply, designed to support: ISOTRON® (IEPE-type) accelerometers; prepolarized condenser microphones and preamplifiers; pre-calibrated microphone and preamplifier combination sets; and low-cost array measurement microphones, by supplying power to the transducer from a constant current (4.7 mA) source, with selectable gain of 1 or 10.

The Endevco model 4416B signal conditioner is powered by rechargeable NiCad batteries (supplied with charger), which allow for eight hours of continuous operation. The unit is also able to remain fully operational during the recharging cycle. An LED status indicator notifies the user of a short, open or normal operating condition, with the necessary internal automatic power shutdown circuitry to protect rechargeable batteries from deep discharge damage.

For detailed technical specifications, drawings or additional information, visit www.meggittsensing.com.

New Machine Vision Innovations

Microscan introduces the AutoVISION™ family of machine vision products. The product line includes the Vision HAWK and Vision MINI smart cameras, as well as the new Auto-VISION machine vision software interface. The technology aims to simplify the set-up and deployment of machine vision applications, while providing a powerful tool set for reliable, high performance inspection and identification.

Microscan's AutoVISION Machine Vision software was developed to shorten the learning curve often associated with machine vision software, while providing a complete vision tool set. Real time feedback during programming and device configuration helps time-crunched engineers implement their vision applications with a minimum of effort.

AutoVISION is available on Microscan's Vision MINI and Vision HAWK hardware platforms. The Vision HAWK and Vision MINI smart cameras feature compact, fully-integrated housings for easy integration into the production process and can be operated by either the intuitive AutoVISION interface or the more advanced Visionscape® platform. This scalable format allows users to set up jobs in AutoVISION and later migrate to Visionscape if the application grows in complexity, saving both time and money down the road.

The Vision MINI is designed to provide reliable performance in embedded identification and inspection applications. With fully integrated lighting and autofocus lens, its small form factor, 1.80 x 2.10 x 1.00 in (4.60 x 5.30 x 2.50 cm), allows for flexible positioning in tight spaces. The Vision MINI features wide angle optics for close range machine vision tasks such as component ID, color matching, Data Matrix reading, and part location.

The Vision HAWK is a flexible, industrial smart camera suitable for a wide range of inspection applications, including assembly verification, part identification, symbol decoding and more.

For additional information on Microscan's AutoVISION machine vision software and smart cameras, or other Microscan products, please visit www.microscan.com/vision123.

Industrial Control Switches

Elektron Technology introduces Arcoelectric's latest range of all-plastic industrial switches. The APB, ALB and ALS range is a complete family of 22 mm diameter industry standard switches ideally suited to applications including control stations, instrumentation panels and industrial machines.

The switches are of modular construction with individual contact blocks which can easily be ganged together to provide numerous switching options. The R Type mushroom head emergency stop push switch complies with EN418 regulations. Rated for single and three-phase power supplies (220/240 V at 3 amps and 380/415 V at 1.5 A), the switches carry UL and TUV approvals and come with matching LED pilots lamps for 24 V dc through to 440 V ac operation.

These high quality durable switches come in a wide choice of styles including Push Button with raised and flush profiles with momentary or latching operation, Selector Switches with long or short levers, and Key Operated Switches. The ranges are suitable for standard configurations or can be adapted to customer requirements for volume orders with both illuminated and non-illuminated versions available.

Find more information at www.elektron-technology.com/.

Non-Contact Infrared Temperature Sensor with Wireless Transmitter

Omega's new infrared sensor with wireless transmitter features remote IR sensor and radio wireless transmitter in a NEMA enclosure. Each unit transmits process temperature, ambient temperature, signal strength, and battery status. This unit features an adjustable emissivity from

0.10 to 1.0, and one receiver has the ability to work with up to 48 transmitters. The low power operation and sleep mode feature allow for a long battery life. The package comes with free software that converts your PC into a multi-channel chart recorder or data logger. It interfaces with other Omega products, the UWTC-REC1 for multi-channel PC chart recording and data logging or the UWTC-REC2 (Single Channel Industrial Transceiver with Analog Output and Alarm.)

For more information, please visit www.omega.com.

New 3D Vision

Cognex Corporation has announced the addition of 3D vision in the new release of VisionPro®, the software for machine vision performance. VisionPro 3D delivers accurate, realtime, three-dimensional position information to automate challenging assembly verification, logistics, and robot applications.

VisionPro 3D works with any number of fixed or robot mounted cameras for complete application flexibility. The system is based on Cognex's leading PatMax® and other alignment technologies. VisionPro 3D uses multiple sets of two-dimensional features found by field proven Cognex alignment tools, including PatMax, PatFlex™ and other geometric pattern matching tools. These tools tolerate nonuniform lighting and remain reliable even when patterns are partly covered, ensuring accurate part location under the most challenging conditions.

Application performance is enhanced by high-precision Cognex calibration tools that adjust for optical distortion and camera position and synchronize cameras with vision-guided robots—key to the success of any 3D application. VisionPro 3D offers a starter kit for fast start up and easy training, which includes the VisionPro 3D software and a turnkey training application. The training application comes complete with source code and all the hardware needed to get started quickly, including cameras, a tripod, and precision calibration plates.

For more information, visit www.cognex.com/visionpro3D.

Oscilloscope has Analog Bandwidth of 500 MHz

Pico Technology introduces the new four-channel PicoScope 6404 PC Oscilloscope with an analog bandwidth of 500 MHz. This is matched by a real-time sampling rate of 5 GS/s, which guarantees accurate representation of signals up to the full bandwidth. The scope also has an ultra-deep 1-gigasample buffer memory that allows capture and analysis of complex waveforms, even when sampling at full speed.

In addition to the headline specifications, the scope offers a built-in function generator, an arbitrary waveform generator, mask limit testing, switchable bandwidth limiting on each channel, and switchable 1-megohm and 50-ohm inputs. This is an addition to the spectrum analysis, advanced triggering and serial decoding that are already standard features of Pico PC Oscilloscopes.

The scope connects to any Windows XP, Vista or Windows 7 computer with a USB 2.0 port. You can use one with a PC to save space on your workbench, or connect it to a laptop to create a portable instrument that's perfect for field servicing and on-site demonstrations. The high sampling rate and bandwidth makes this scope ideal for analog and digital circuit designers, test

engineers and installers. If you want to write your own application to control the scope or use it as a digitizer, Pico provides a software development kit, including example code, free of charge.

For more information, please visit www.picotech.com.

Compact Low-Frequency MEMS Capacitive Accelerometer Modules

Silicon Design, Inc. has announced the expanded availability of its 2260 series modules to include new low-frequency ranges to 0 Hz within a footprint that is 37% smaller than typical industry single axis models.

For best results, it is recommended that a test article be 10 to 20 times the mass of the accelerometer used. The compact size of the Silicon Designs 2260 series supports the accurate measurement of smaller components, such as those found in lights and electrical systems. Their compact size and relatively light weight help to minimize mass loading effects that could otherwise compromise measurement accuracy.

Tailored for zero-to-medium frequency applications, the Silicon Designs model 2260 combines durability, quality and flexibility for precision shock and vibration measurements. It provides high-drive, low impedance buffering for highreliability measurements. The accelerometer produces two analog voltage outputs which vary with acceleration and features a four-wire connection, supporting both single ended and differential modes. The sensitive axis is perpendicular to the bottom of the package, with positive acceleration defined as a force pushing on the bottom of the package. Signal outputs are fully differential about a common mode voltage of approximately 2.5 V and are simple to power – even able to run on a 9 V battery. The sensitivity is independent from the supply voltage of +8 to +32 V.

At zero acceleration, the output differential voltage is nominally 0 V dc at \pm full scale acceleration and the output differential voltage is ± 4 V dc. The sensors feature on-board voltage regulation and an internal voltage reference which eliminates the need for precision power supplies. In addition, the model 2260 features easy self-calibration.

For details or additional information about new low-frequency ranges of the model 2260 or other products available from Silicon Designs, visit www.silicondesigns.com.

Digital I/O Expansion Module added to the Family of Web enabled Data Acquisition Instrumentation

Logic Beach, Inc. announces the newest addition to the IntelliLogger™ Family of stand-alone data acquisition, alarming and reporting instruments, the ILIM-2 Digital I/O Expansion Module. The ILIM-2 connects to the IntelliLogger System Base adding event, counter, and frequency inputs, as well as additional outputs to the IntelliLogger system. Applications include monitoring On/Off control system states and logging and reporting of multiple equipment alarms.

Each ILIM-2 expansion module adds a mix of 16 Event/Counter input channels, two frequency inputs, and 12 outputs. The ILIM-2 can be located local or remote from the IntelliLogger system base and simply connects to the IntelliLogger via a single CAT-5 cable. For larger projects, users can “daisychain” up to 16 ILIM-2 modules onto a single IntelliLogger. The IntelliLogger is a lowpower, stand-alone data acquisition, alarming and reporting instrument that can accept analog, digital and Modbus inputs.

Fully programmable for data logging, alarming and reporting, the IntelliLogger is simply configured via the included HyperWare- II software which features icon-based drag and drop programming. The IntelliLogger is network enabled and when connected to a LAN has the ability to send email and text message status and alarms, FTP data to servers, as well as serve real-time data to Web browsers. The rugged Intelli-Logger is equally well suited to monitoring and reporting on remote equipment, performing energy and compressed air audits, field tests, process refinement as well as R&D applications in a lab.

Find more information at <http://www.logicbeach.com>.

Software Simulation Package Includes Lightning Strikes and Thermal Effects

Infolytica Corporation introduces the latest release of Elec-Net and ThermNet. The two finite element analysis software packages can now be linked together for coupled simulations, expanding the capabilities of the company's design solutions. A new adiabatic feature has also been added to ThermNet. ElecNet and ThermNet now offer the same seamless and easy coupling that is already available with MagNet and ThermNet. Performing a coupled analysis determines the nonlinear steady state temperature distribution due to electric heat sources for both static and time-varying thermal simulations.

The coupling works with the transient, current flow and timeharmonic electric field solvers in ElecNet. The new adiabatic feature available in ThermNet can be used for both coupled MagNet and ElecNet simulations. The adiabatic feature models sudden and rapid heating, such as the process that takes place when lightning strikes. The combinations of the new features allow for devices such as surge arrestors, cables, transmission lines or other phenomena such as dielectric heating to be accurately simulated.

To demonstrate the accuracy and types of results that can be obtained from these new additions, the company has released a detailed example simulating a surge arrestor being struck by lightning.

Please visit www.infolytica.com/ for more information.

Easy Integration of EMG and Wireless Inertial 3D Kinematics

Xsens Technologies B.V. announces that the Xsens MTw™ miniature wireless motion tracking system has been extended to include fully flexible hardware synchronization with third party equipment such as EMG (Electromyography), EEG (Electroencephalography), force plates and optoelectronic systems. Furthermore, the software example code has been completely revised, further increasing the ease of integration for researchers and system integrators.

The Awinda Station of the MTw Development Kit is equipped with four BNC ports, allowing universal connection to a wide variety of hardware. Synchronization with third party devices has is now easier for Xsens customers. The flexibility offered by configuring each synchronization command, including pulse frequency, polarity and width, makes the accurate time source from the MTw Awinda Station easily useable with many other systems, including the EMG systems from leading vendors such as Noraxon Inc. and Delsys Inc.

For customers interested in validating inertial and optical systems, time synchronization is now much faster and easier with all systems compatible to industry standards. Further to the synchronization possibilities, Xsens focused on the ease-of-use of the software development kit. This answers the question of how much work will be involved to make the move to the new completely wireless MTw system. Xsens software engineers have ensured a smooth transition from our existing products to the wireless MTw system including a completely new LabVIEW example code and a detailed workflow described in the MATLAB example code, next to the C/C++ API.

Please visit the Xsens website: www.xsens.com for more information.

Hand Force Measuring System for Biomechanics, Ergonomics and Occupational Health & Safety

Kistler has introduced the Type 9809A, a hand force measuring system designed for both short- and long-term assessments of biomechanical forces, loads or applied stresses to an object or machine. In many areas of research and industry, the need exists for continued assessments of applied hand force effects on typical mechanical machinery and equipment. This also includes added human body stress imposed during pushing, pulling, lifting or carrying of loads and other technical design tasks. Use of the Kistler Type 9809A can help to identify viable occupational health risks, diagnose occupational diseases caused by the handling of loads, and to measure general biomechanical load factors important for the development of heavy machinery and equipment.

The Type 9809A provides critical data for assessment of in-laboratory and field-related ergonomic and occupational health and safety risks, while facilitating the proper measurement of human-machine or system interface operating force parameters required for effective industrial design.

The Kistler Type 9809A consists of two hand force measuring handles with built-in charge amplifiers, as well as a USB interface, datalogger with CompactFlash card, data acquisition system, software and necessary cables. The ready-to-use system incorporates a multi-component piezoelectric force transducer, offering dynamic measurements in three orthogonal directions, with only a laptop PC with USB port (not included) required for operation.

For additional details and specifications, please visit www.kistler.com.

Society News

I2MTC 2011 Graduate Student Panel

Alexandru Nechifor and Kristen Donnell

The annual IEEE International Instrumentation and Measurement Technology Conference (I2MTC) is the flagship conference of the IEEE Instrumentation and Measurement Society (IMS). This conference provides a venue for some of the best engineering minds in the field of

instrumentation and measurement. This year's I2MTC took place on May 9th–12th, 2011 in Binjiang, Hangzhou, China.

The Graduate Student Panel Discussion is organized for students attending I2MTC. Each year, the Panel Discussion features talks given by members of industry and academia. The talks are intended to broaden the attendees' perspectives on job opportunities, research and education while facilitating professional networking on an international level. 2011 was the fourth year of the Panel Discussion at I2MTC and was organized by Kristen Donnell and Alexandru Nechifor, the past and current graduate student representative to the Administrative Committee of the IEEE IMS respectively.

This year's Panel included four panelists and twelve attendees from all over the world. Mr. Huang Dajun, a Ph.D. candidate at the University of Science and Technology of China, was the local speaker at the Panel. He spoke about the Chinese educational system, including similarities and differences to other education systems. Mr. Dajun also highlighted the upcoming educational reforms that are currently being implemented. Mr. David Ingram, a Ph.D. candidate at Queensland University of Technology, Brisbane, Australia, has had thirteen years of electronics and electric power industry experience. Using his industrial experience, he presented constructive ways of promoting new ideas and technologies to conservative managers. Dr. Sarah Seguin, an Assistant Professor at the University of Kansas, Lawrence, Kansas, United States, talked about life as a tenure-track faculty member. She spoke in detail about funding applications, managing research projects, and leading a team of graduate students. She also discussed the importance of publishing and conference attendance. Dr. Tao Wei, a Post-Doctoral Researcher at Missouri University of Science and Technology, Rolla, Missouri, United States, talked about the initial difficulty that comes with changing educational systems, educational background, society and culture all at once. He discussed his experience of adapting to these changes as a student while pursuing his graduate studies in the U.S.

If you would like to volunteer to join the select group of Panelists for next year's conference, which will take place on May 14-16 in Graz, Austria, please contact Alexandru (alexandrun@ieee.org) or Kristen (kristen.donnell@mst.edu). Look for more information regarding the 2012 Graduate Student Panel Discussion at I2MTC 2012 on the IMS website (www.ieee-ims.org) in the Student Activities area of the Membership Section.

A Brief Summary of I2MTC 2011

Hongjian Zhang and Kang Lee
General Conference Co-Chairs

Yong Yan and Ruth Dyer
Technical Program Co-Chairs

The 2011 International Instrumentation and Measurement Technology Conference (I2MTC) was held successfully in Hangzhou, China on 9-12 May, 2011. The conference was attended by a total of 289 registered participants, including 89 postgraduate students and 5 undergraduate students. The post-conference survey results indicate that 84.3% of the attendees were either very satisfied (46.1%) or satisfied (38.2%) with the I2MTC 2011 and that 13.3% of the attendees ticked the "fair" box. The technical program consisted of a series of thought-provoking scientific and technical sessions, covering all aspects of theory and practice of metrology, measurement technology, instrumentation, and related applications.

The technical program included more than 350 papers from all over the world organized in 50 oral presentation sessions and 5 poster sessions. It was encouraging that 137 papers were from postgraduate or undergraduate students. Parallel technical sessions began after the keynote address on Tuesday, 10 May and continued through Thursday, 12 May. There were also 11 tutorial sessions held on Monday, 9 May. In addition, the oral presentation sessions included seven special sessions which were consistent with the conference theme of I2MTC 2011, “Instrumentation and Measurement for Improving Quality of Life”. In particular, special sessions on “Advanced Sensors and Instrumentation for Healthcare and on “Advanced Measurement and Instrumentation for NDT&E and Structural Health Monitoring” attracted overwhelming response from the community and were well attended at this conference. We were delighted to have Professor Jian Chu, the Vice President of Zhejiang University, as our keynote speaker. Professor Chu’s keynote presentation on recent advances on instrumentation, control systems and security problems was very informative and stimulating.

The organization of I2MTC 2011 was a very demanding and complex task. Many people devoted their time and energy to promote the event, solicit and review the submissions, shape the technical program, organize the exhibits, compile conference proceedings, arrange the logistics, and organize the social functions. We would like to take this opportunity to thank all of the contributors to the conference organization. Our special thanks go to the main sponsors: The IEEE Instrumentation and Measurement Society and Zhejiang University.