

The IEEE Instrumentation & Measurement Magazine
April 2009 issue

Extreme Instrumentation for Extreme Environments

From the Editor's Bench

Shlomo Engelberg

The Importance of Conferences

Until I started helping edit the I&M magazine, I was not one to attend a conference unless it was either fairly local or located near someone with whom I was trying to collaborate. Because of the need to meet with my colleagues, I went to last year's I²MTC. While there, I gave a tutorial, presented a paper, worked with the then editor-in-chief of this magazine, Kim Fowler, to prepare for the changeover, and went to meetings of various committees connected to the magazine and the I&M society. As someone with a fulltime job from which I was "playing hooky," I was also busily working on projects connected to my job. As a parent who was missing his middle child's birthday, I was feeling guilty.

The conference was well organized and enjoyable, and Kim was very helpful. I learned a lot at the tutorials and from the papers I heard presented, I became more familiar with the operation of the magazine and the I&M society, and I enjoyed myself. The only problem with what I was doing was that there was no need for me to have done it in Victoria, British Columbia—which required an 18 hour trip that I took in three separate flights in each direction.

While at the conference, I took several walks through Victoria. Though the city is pleasant, the walks on foreign soil did not seem to justify the distance I came, the effort I expended, and the money that was invested in the trip.

On the last day of the conference, as I was walking through the city I saw a sign for "whale watching." My wife, Yvette, had been saying that I should be sure to do something interesting while in Canada, and I figured that this would qualify. I went down to examine this possibility and found that the last boat of the day was leaving in five minutes. I decided to go—even though it meant missing a talk that I wanted to go to.

I spent three and a half hours on the boat and managed to see bald eagles, sea lions, porpoises, orcas (killer whales), and much more. We were lucky enough to have an orca swim under our boat. I went in a boat that was capable of doing over 40 mph, and had a captain who enjoyed showing off the boats capabilities. I had a blast, and I did something that I could not have done at home. Jerusalem is a wonderful city, but you will not see a sea lion here.

Whatever you do, it is important to take advantage of all the opportunities with which one is provided. When at a conference, learn as much as possible, renew old friendships and make new ones, and try to learn something about the place where you are staying. When reading this magazine, look over all the articles, tutorials and features.

In this month's issue, we have a tutorial that describes the design of an orientation measurement system that is used in extreme environments, articles about energy management in wireless sensor networks and about the design and testing of a high-resolution acquisition system for marine seismology, the second part of the sensor survey, and our usual columns. Please take advantage of this opportunity to enjoy the magazine.

Shlomo

President's Perspectives

Alessandro Ferrero

Looking Into the Past

We all know that one of the existential questions humankind has asked since the beginning of civilization is: "Where do we come from?" Our present life; our way of thinking, and our behavior are so deeply affected by the cultural legacy we inherited from the past generations, that we cannot evade this question if we wish to understand ourselves and, hopefully, avoid the repetition of past errors.

Too often we think that investigation into our past culture and history is a matter for philosophers and historians, and does not involve scientists and techniques. Science and techniques are supposed to unveil the unknown; looking into the future, and many people assume that time spent to consider the history of science is wasted time. Although it's undoubtedly true that science is aimed at discovering the unknown, I can't fully agree with this outlook.

Science has evolved in intimate connection with the evolution of human thought; many discoveries have been triggered by specific philosophical assumptions, and have influenced new philosophical schools. Science and technique have supported each other's evolution: without the telescope, Galileo's astronomical discoveries would not have been possible, but what would have been the development of telescopes without Galileo? Science and technique have developed in response to human needs, and knowing 'how' is extremely helpful to understand.

Do you believe me? Do you believe that some of the most "modern" concepts of measurement science are much older than we suppose? Let me tell you two of my favorite examples, and, maybe, you too will find science history attractive. Let's go back to the Roman Empire. We know from Latin literature and historical documents that Emperor Augustus unified weight and length measurement units all over the Roman Empire. The length standard for the Roman *pes* (Roman foot) was kept in Rome, in the temple of Iuno Moneta. The Roman *regula* was the small brass bar that realized the *pes*. "Moneta" in Latin, means "money": this is a clear indication that the ancient Romans did understand the economical value of measurements. Every main town in the Empire kept a copy of the standard from Rome: it seems that the concept of "primary" and "secondary" standard is a bit older than we think! We would expect to find clear evidence of the use of the *pes* in the remains of imperial Rome and evidence in the dimensions of the many, perfectly preserved buildings we can find in the regions of the world that were dominated by the Romans. The big surprise is that this is not true. So, when and for what was the unified length unit used?

The answer to this question comes from the wonderful archeological site of Pompeii. As you probably know, Pompeii was destroyed by an eruption of Vesuvius in 79 AD. Actually, the

explosive eruption killed every form of life in Pompeii, but preserved everything under a layer of ash and light pumice stone. When it erupted, it hurled 100,000 tons/s of superheated stones and ash into the stratosphere, and formed a cloud with the classic shape of an umbrella pine tree. The first thing that hit the ground was a hot wind that was estimated to hit Pompeii at about 350 km/h and at a temperature of more than 450 °C. This wave of hot air killed and dried every form of life in seconds. Then ash came down, and light pumice stones, that buried everything without causing any major damage. For this reason, many centuries later, archeologists found Pompeii almost intact, and have learned so many things about everyday life at that time, and found remains that solve our questions about use of the unified length “measurement” problem. (This solution can be found in the paper, “Some considerations about the Roman Pes”, written in Italian by G. Di Pasquale and V. Marchis in *Nuncius*, XI, 1996, pp. 669-675.

The use of the *pes* as a measurement unit was clear by analyzing some artifacts. In the Roman houses, water was stored in reservoirs located under the ground floor. All rooms had small wells for access to water, and the opening was protected by small marble curbs. The diameter of the openings can be traced to the *pes* quite perfectly. Similarly, the dimensions and the distance between the holes in the iron lockers can be traced to *pes* submultiples. Marble artifacts were not produced locally; they came from a distant region. Iron locks were produced by a different craftsman than the one who made doors or coffers on which the locks were installed. The marble and the locks had to fit accurately with another part. Since they were not produced locally, their dimensions could not be measured with the same instrument, and therefore had to be measured according to a unique standard. The Roman Empire was the first global market, and it seems that 2000 years ago the Romans understood quite well a principle that is not fully applied now!

My second favorite example is about Galileo. We all remember his great discoveries in physics and astronomy but Galileo was also a physician and an engineer. (This anecdote is written in Italian by Sigrido Leschiutta in his article “The Nine Scientific Instruments of Galileo”, in *Tutto Misura*, vol. X, no. 2, 2008, pp. 175-176.) As a physician, Galileo knew that feeling the pulse of a patient gave a good indication of his/her health but he had to compare a patient’s pulse on different days to understand if a disease was progressing or regressing. At that time, no clocks were available and sandglasses were not accurate enough to use them for a time reference. Galileo had discovered that the period of a pendulum swing is proportional to the pendulum length. So, he built a small pendulum by binding a string, with a small weight tied to its other end, to a short wooden stick, and called it, in his melodious Renaissance Italian, *pulsilogio* (pulsemeter). While feeling the patient’s pulse, he adjusted the string length by winding it on the stick, until the pendulum period was the same as the patient’s pulse. By checking how the string length varied with the successive patient examinations, he could base his diagnosis on a measurement as accurate as possible for that time.

The interesting point, from our modern perspective, is that with only one device he anticipated a transducer (a time period measurement was converted into a length measurement) and a zero method: in fact, the measurement method was based on zeroing the difference between the patient pulse and the pendulum period, by adjusting the pendulum length. A genius reveals himself also in minor works!

As you see, even though science is always progressing, and our instruments are far more complex than the Roman *regula* and Galileo’s *pulsilogio*, we still have a lot to learn from our predecessors. Casting a glance into the past every now and then is really helpful to understand where we come from and can help us as we go forward.

Alessandro

*Design and Test of a High-Resolution
Acquisition System for Marine Seismology*

(Summary)

Shahram Shariat-Panahi, Francisco Corrêa Alegria, and Antoni Mànuel Làzaro

We are taken to the ocean bottom as the authors discuss the marine environment and the design and test that focus on acquiring acoustic signals from active seismology techniques. The authors designed and built a high resolution acquisition system of acoustic signals for an Ocean Bottom Seismometer. As they explain the system component blocks and acquisition tests, we learn how familiar instrumentation and standards are implemented in unique ways for the marine environment!

This summary was written by June Sudduth

*Energy Management in Wireless Sensor Networks
with Energy-Hungry Sensors*

(Summary)

Cesare Alippi, Giuseppe Anastasi, Mario Di Francesco, and Manuel Roveri

As of the past few years, the number of real-life applications of Wireless Sensor Networks (WSNs) as system management tools has quickly grown. A WSN's ability to accurately sense and process changes within a system and then apply the necessary control responses make it much more appealing than its competitors, which may have lower resolution or require human intervention. But WSNs are not without one major drawback – these networks of power hungry sensors are difficult and expensive to satisfy, and can even require more energy to remain sustained than used to communicate the data. Before the sensor industry is swept by WSNs, we can expect to see major improvements in energy efficiency.

“In this paper, we classify and review the main approaches proposed for energy management at the sensor level. We introduce a general framework for energy-efficient data acquisition from sensors, provide a framework for adaptive sensing strategies, survey the main solutions proposed in the related literature, and discuss the proposed methods and some open research issues.”

This summary was written by Caitlin Woody and includes text from the article

*Tutorial 19: Obtaining Pitch/Roll Measurements
in an Extreme Environment*

(Summary)

Scott Cole and Michael Gard

“Electronics design for extreme environments is rarely addressed in academia, but is a vital issue in many industries. One industry that utilizes various methods to design and manufacture robust electronic products is Horizontal Directional Drilling (HDD). HDD is a steerable trenchless method of installing underground pipe and cable with minimal surface disturbance. HDD allows installations under roads, rivers, and other obstructions, making it a popular alternative to open-cut trenching. Safe and successful HDD operations require accurate knowledge of the drill bit’s operating depth and steering orientation. In this tutorial, we explain the extreme environment experience by HDD systems, the electronic components, and the techniques used for their mechanical isolation, proper calibration and signal processing.”

This summary includes text from the first two paragraphs of the article.

Column Summaries

Instrumentation Notes

(Summary)

Bruno Andò, Salvatore Baglio, Adi Bulsara, Vincenzo Marletta, and Nicolo Savalli

“Electrostatic (E) field sensors are employed in many applications, either as stand-alone devices or as components of more complex measurement systems. Common applications of E-field sensors are in monitoring fields generated by atmospheric phenomena, particle detectors, mass spectrometers, scanning microscopes and electrophoresis systems, and the assessing of phenomena involving static charges either in processing and storing inflammable materials or in producing electronic devices. In the automotive industry, active and passive safety systems (e.g. air bags) and occupant sensing systems are equipped with E-Field sensors. Other interesting applications of E-field sensors are in security and surveillance systems to remotely detect weak biological E fields generated by humans or animals.”

“In general, the measurement of electrostatic fields requires no contact with a surface to avoid surface discharging and electrical potential changes. This article presents a novel approach to this measurement. The approach is extremely interesting due to the low cost of the technology and the simplicity of the architecture. The purpose of the article is to highlight the strategic role of behavioral models in the development and design of E-field sensors, and the importance of detection reliability.”

This summary includes text from the article

My Favorite Experiment

(Summary)

John Witzel

Power Factor Correction: Can It Lower Your Electric Bill?

Everyday as consumers, companies and advertisers bombard us with promises of working wonders for our health, happiness, and wallets with their new products. We’ve all bought into a

few of them at some point – remember that work out video that required minimal time for optimal results? Or those books that promise readers the ultimate secrets to becoming millionaires? If you had been given a free and honest diagnosis of how well the products would actually work just for *you*, you might have decided against a few of the “miracle workers” you bought in the past.

In this article, John Witzel breaks down the Power Factor Corrector, a product intended to lower a user’s monthly electric bill. The problem with the corrector is that while it performs the tasks it promises to, it won’t necessarily save you money. Here, Witzel offers a simple at-home experiment anyone can perform that reveals whether or not the corrector is worth your money. If you run the experiment and it turns out the product isn’t for you, you have no loss other than about fifteen minutes of your time. If it turns out it does work for you, the corrector could be saving you quite a bit on your electric bill!

This summary was written by Caitlin Woody

Sensor Survey Results

(Summary)

Kim Fowler

Sensory Survey: Part 2 Sensors and Sensor Networks in Five Years

Over the summer of 2008, I&M Executive Vice President Kim Fowler created and distributed a sensors survey to members of the IEEE I&M Society, the Sensors and Transducers Journal, and Sensorsmag.com. The survey discussed the current state of sensors and networks as well as their expected progression in the next five years. Part 1 of the column, published in February 2009, covered participant’s thoughts on the current state while part 2, published in this month’s issue, looks at the sensors’ expected progression. More specifically, Fowler focuses on how sensor and network parameters are expected to change, as well as the rate at which we might see wired, wireless, and optical networks increase. This survey of 330 industry insiders provides useful insight as to what improvements we should expect to see in the coming years.

This summary was written by Caitlin Woody

Departments

New Products

Robert Goldberg

Cost Effective Component Test Solution

Keithley Instruments announces ACS Basic Edition, characterization and curve tracer software, for component test applications. The latest addition to Keithley's Automated Characterization Suite (ACS) family, Keithley claims the ACS Basic Edition integrates with the industry's broadest range of source-measure units, the Keithley's SourceMeter® Instrument family. ACS Basic Edition, paired with Keithley's proven line of SourceMeter Instruments, replaces obsolete curve tracers with a solution that performs both basic curve tracing as well as parametric test while providing significant cost breakthrough. ACS Basic Edition is available immediately;

Unlike other test systems, ACS Basic Edition provides an extensive library of pre-configured component test routines to shorten start-up time, reduce programming code development and simplify the process of test. ACS Basic Edition combines the ease-of-use of a curve tracer with the analytic capabilities of a parametric analyzer. With ACS Basic Edition, anyone can test a semiconductor component in seconds and compare the characteristic curves with reference curves immediately.

ACS Basic Edition provides a variety of tools that makes it simple to reconfigure for different component types. The technician simply selects the graphical icon of the desired component type and selects the desired test, and moments later the characteristic curve is displayed. ACS Basic Edition performs with the ease-of-use of a curve tracer, but also provides the tabular data in spreadsheet form. This additional functionality is complemented by a "formulator" that allows mathematical or parametric extractions to be performed on the raw curve tracer data. This advanced capability means that parametric characterization is as easy as using a curve tracer. In those cases when more than a single test is needed, ACS Basic Edition provides a powerful multi-test capability that allows the user to string together a number of different tests on a single device.

ACS Basic Edition not only supports Keithley's line of System SourceMeter Instruments, it also supports a wide range of switching solutions, popular LCR meters, and component test fixtures.

To learn more, please visit <http://keithley.acrobat.com/acsbasic/>.

Serial Data Equalization Software Enables Oscilloscope Users to Test High-Speed Serial Designs

Agilent Technologies Inc. announces serial data equalization software for its Infiniium 90000A Series oscilloscope. This software is ideal for testing devices based on high-speed serial data technologies such as PCI Express(r) 3.0, USB 3.0, SATA 6 Gbps, and SAS 6 Gbps. It provides equalization tools for real-time analysis that help engineers significantly reduce receiver errors.

Serial signals consist of a transmitter sending a signal over a medium to a receiver. As data rates increase, the signal quality decreases. This may result in the partial or complete closing of the real-time eye, which will cause the receiver to get corrupt data. Equalization is a technique that allows designers to open real-time eyes at the receiver, which can eliminate bit errors. The Agilent Infiniium serial data equalization software is now a part of the Agilent 90000A Series real-time oscilloscopes and digital signal analyzers. The new software helps engineers quickly model their decision feedback equalization (DFE) and feed-forward equalization (FFE) designs to verify their simulations when it is not possible to probe the transmitter.

This new software reduces complexity and makes testing more convenient. Engineers can select from a list of DFE and FFE options to see how various techniques will affect the eye at the receiver, and they can even compare DFE and FFE in the same window. Users can input tap values (bit-level voltage correction factors) they have created or have the serial data equalization software calculate optimized tap values for them, saving time compared with manual calculations. Agilent's serial data equalization software provides complete analysis of the equalized eye, including full cursor control for measuring eye height of the equalized eye.

The Infiniium serial data equalization software is fully integrated into the 90000A Series oscilloscope software, allowing it to take advantage of the oscilloscope's industry-leading noise

floor specifications. The 90000A's low noise floor is critical, as equalization techniques attenuate noise, adding unnecessary errors.

Additional information about the N5461A is available at www.agilent.com/find/SDE.

New 2 and 4 channel 50 MS/s 14-bit digitizer cards for PCI Express

Strategic Test Corp. has announced two new 50 MS/s 14-bit digitizer cards for PCI Express. The UF2e-4032 has 4 analog inputs and the UF2e-4031 has 2 input channels. Unique features include the options for dual-timebase sampling, synchronous digital inputs, asynchronous digital I/O and the possibility to synchronize hundreds of channels.

Key specifications include:

- 128 mega samples memory --- expandable to 2 G samples
- Continuous streaming to host PC > 120 M samples/s
- Effective Number of Bits > 11.4
- Signal-to-Noise Ratio > 70.5 dB
- Total Harmonic Distortion < -73.0 dB
- The standard -3dB bandwidth is > 25 MHz

Each channel has its own 50 MHz ADC for true simultaneous sampling, together with six voltage ranges from ± 200 mV to ± 10 V, a programmable offset of 200% and input impedances of 50 Ohm or 1 MOhm, allowing each channel to be individually configured for the signal source.

Like all UltraFast boards, the UF2e-403x scope cards can be customized with hardware options to best match the application:

- Onboard memory: 128, 256, 512, 1024 or 2048 mega samples
- Multiple Recording: memory segmentation
- Gated Sampling: output clock controlled by external TTL signal
- Timebase: records time of trigger events or Gates
- ABA Mode: slow-fast-slow recording on trigger
- Star Hub: synchronization of up to 5 or 16 boards, or 5 to 16 PC's to a maximum of 271 boards. Can be used with Digitizer, AWG and Digital I/O boards to create mixed-mode systems
- Digital Inputs: adds 8 synchronous digital inputs
- BaseXIO: adds 8 asynchronous digital I/O lines

Please find more information at www.strategic-test.com.

VX Innovator – High-End CAD/CAM within Reach

VX Corporation announces the release of a new product targeting the entry level CAD market with a truly scalable solution. One dilemma facing CAD/CAM users trying to make do with low-end software is that it doesn't take long before they are faced with an insurmountable design challenge that requires more computing horsepower.

Often, the solution can't be found within the same product line, so users are forced to buy a more expensive product with the additional burden of learning yet another new interface. The same

predicament holds true for low-end CAM buyers who settle for inferior CAD tools. Later on, they're forced to purchase a more capable CAD system.

VX is changing all of this with the Innovator product. VX Innovator was designed to put high-end CAD/CAM within reach from a cost, learning and scalability standpoint. Innovator is value-priced, comes pre-loaded with built-in tutorials and can be upgraded to any level of CAD/CAM including full mold & die, design and manufacturing.

VX Innovator is a true hybrid modeler using modeling tools which work seamlessly with surface and solid geometry. No Solid Required. The product can import and work with poor geometry. Healing and surface editing tools are available to work with non-solid geometry. VX Innovator allows you to add style to your models with complex sweeps, lofts and domes. VX Innovator includes an entire suite of detailing and layout tools, important for communicating design concepts for manufacturing and quoting.

VX Innovator provides the most popular assembly tools for top-down and bottom-up design allowing users to ensure assembly part fit and range of motion.

More information is available at www.vx.com.

Forward Flux Lamp Standards for Light Measurement System Calibration

Manufacturers of LEDs, light fixtures and displays can now calibrate their spectral or luminous flux measurement systems quickly and accurately with Forward Flux Lamp Standards from Labsphere. This entirely new technology, available only from Labsphere, provides an exceptional artifact for maintaining and verifying 2π integrating sphere spectrometer calibration with a highly reliable standard calibrated directly to the National Institute of Standards and Technology (NIST) lumen.

Available in 400 and 1000 lumen models, Forward Flux Lamp Standards can be used to calibrate integrating sphere spectrometers for total forward spectral radiant flux responsivity from 350 nm to 1050 nm. The lamp standards are designed to meet the recommended practices of the Engineering Society of North America (IESNA) LM-79 for 2π measurements of solid state lighting.

Each lamp standard is carefully seasoned, screened, and calibrated. All lamp standards are first seasoned for 1% of their rated life, and then screened for stability and repeatable performance, before transferring the lumen directly from a NIST lumen reference. The result is an accurate and reliable system calibration with a lamp standard distribution similar to the light sources being tested.

Lamp standards include a calibration certificate and calibration data on CD-ROM. Labsphere is an ISO 9001: 2000 Certified company.

For more information on Labsphere's Forward Flux Lamp Standards visit www.labsphere.com.

Oscilloscope with Deep Memory

New oscilloscopes from Pico Technology are available with either 2 or 4 channels and they are suitable for general, scientific and field-service use. Their 12-bit resolution (adjustable up to 16

bits in enhanced resolution mode) and 1% accuracy also make them an excellent choice for noise, vibration and mechanical analysis. A well-matched combination of 20 MHz analog bandwidth and 80 MS/s real-time sampling rate allows them to sample high-frequency analog and digital waveforms, and input ranges from ± 50 mV to ± 100 V full-scale ensure that the scopes can handle small signals from sensors as well as higher voltages from power supply circuits and motor drives. Another benefit is the deep 32M-sample memory, which allows the scopes to capture over 400 milliseconds of data at the maximum sampling rate.

The new scopes are powered by nothing more than a standard USB 2.0 port, so no batteries, power adapter or interface cards are required.

The PicoScope 4000 Series oscilloscopes include the PicoScope 6 software for Windows PCs, which gives you the benefits of your PC's processing power, storage, graphics and networking capabilities. The user interface is easy for novices to learn, but professional users will find many advanced features and options including spectrum analysis, persistence display, automatic measurements, advanced triggers and channel math. Users can download software updates, feature extensions and improvements free of charge with no time limit. They can also contact Pico's technical specialists for support by web, email, phone or Skype at no extra charge.

PicoScope 6 can save waveform data in a range of text and binary formats including CSV, PNG, BMP and MATLAB, ready for export to other applications.

More information on Pico Technology can be found at www.picotech.com.

Two Technologies Introduces Safari Rugged Hand Held Computer

Two Technologies, Inc.[®] introduces the Safari™ rugged hand held computer designed for a multitude of environments.

IP65 rated for protection against dust and water; Safari is ideal for outdoor use in harsh environments. The case is molded from Cycloy[®], an ABS/Polycarbonate blend plastic offering extreme resilience to environmental stresses, as well as to a wide variety of chemical substances. The housing features superior drop and shock protection. For added brand recognition, the case can be molded in a variety of custom colors.

Safari also offers a 240 X 320 QVGA transfective display with integral touch screen, providing excellent readability, both outdoors and indoors. A tethered stylus with integrated storage pocket is provided on the device.

Safari can be equipped with either a 26 key or a 41 key alpha numeric keypad providing seamless integration into a wide variety of applications. Keypads can be tailored to a specific application allowing for an intuitive user experience. An integrated speaker provides audio feedback specific to an application via the use of .WAV files. To extend Safari's time in the field, an optional 4000mAh high capacity battery is available.

A powerful computer featuring 128MB SRAM, 128MB internal FLASH, as well as a user accessible SD card slot for additional mass storage, Safari uses Microsoft[®] Windows[®] CE .NET 5.0 operating system and a Marvell PXA270 processor operating at 520 MHz. All of this is available in a package that fits comfortably in the hand and weighs in at a trim 14 oz.

Safari offers wireless computer communications and networking capabilities via

Bluetooth[®], WLAN 802.11b/g, and GPRS. RS-232, USB, and IR ports are available for connection to peripherals and accessories that extend the product's utility. Safari is also equipped with an expansion port allowing the addition of RFID, GPS, as well as other industry or application specific modules. An integrated 1D barcode scan engine provides the ability to read a wide variety of symbologies.

With its rugged design and wide array of available features, Safari is well suited for a broad range of outdoor and indoor applications where durability and flexible operations are mandatory.

For more information on Safari, visit the company web site at <http://www.2t.com>

Thermal Wind Tunnel

Omega's new WT-2000 thermal wind tunnel with its portable bench-top design is made of clear polycarbonate and PVC for a durable and transparent assembly. It is designed to provide highly accurate, uniform and repeatable air flow up to 1000 fpm. The included control box allows for open loop full scale operation of individual fans, groups of 2 fans, or all fans at a time. The large test chamber with a hinged access door and access panel allows for fast comparison testing or different size heat sinks and circuit boards. This proprietary product is CE compliant and ideal for lab use.

For more information, go to the OMEGA Engineering Inc. web site at www.omega.com/pptst/WT-2000.html.

High-Performance USB Data Acquisition Devices

Measurement Computing announces 14 new high-performance, multifunction, and special purpose USB-based data acquisition products, targeting applications requiring high-accuracy, measurement repeatability, and high throughput. The list includes: high-channel-count and high-accuracy analog input and thermocouple measurement devices; several high-speed, simultaneous sampling, multifunction devices; and an eight-channel, simultaneous input quadrature encoder counter.

As with all Measurement Computing data acquisition products, the new devices are supported by the Universal Library[™], programming libraries and drivers for most popular Windows-based programming languages. This complete function library saves the user time by simplifying the configuration and operation of the measurement board, and reducing human errors by eliminating detailed, low-level functions. The Universal Library requires little disk storage, making it ideal for integration into multiple instrument systems and OEM products.

In addition to the Universal Library, all the new USB DAQ modules listed above ship with an impressive array of software, including TracerDAQ[®], a full-featured, data logging, viewing, and analysis application; Universal Library for LabVIEW[™], VIs and program examples for LabVIEW; InstaCal installation, calibration, and test utility; and support for DASyLab[®], icon-based data acquisition, graphics, control, and analysis software, and Measurement Studio MCC Edition, Visual Studio 2005/2003 components and controls optimized for test, measurement, analysis, and presentation—powerful software solutions for programmers and nonprogrammers alike.

For more information on these new USB-based devices, please visit www.mccdaq.com/perform.

Small Surface Mount Filtered GPS Low Noise Amplifier

Spectrum Microwave introduces its new line of Surface Mount filtered GPS Low Noise Amplifiers (LNAs) offering multiple gain stages of 26 to 38 dB with more than 35 dB of out-of-band rejection at 1575.42 MHz. This new small surface mount design exhibits a low noise figure of 1.8 dB, and operates from a 5 to 32 volt supply while only consuming 77 mA.

These filtered amplifiers offer a 4 pin design for easy mounting and customer selected 26 dB, 32 dB or 38 dB gain options while still maintaining a low 1.8 dB noise figure from 0°C to 70°C. Spectrum also offers these filtered LNAs in connectorized hermetic packages for in-line booster applications or other harsh environments.

Spectrum Microwave's high isolation, Filtered LNAs are ideal for a wide range of applications including Avionics, Satellite Navigation, Marine Navigation, or Surveying and Mapping systems.

Find more information at www.SpectrumMicrowave.com.

Signal Conditioners Support Universal Input, Facilitate Programming via Detachable Display

Red Lion Controls, Inc. introduces the IAMS series of universal signal conditioners. These DIN rail mounted signal conditioners provide complete isolation and conversion capability to satisfy almost any application. The universal input can accept RTD, TC, Ohm, potentiometer, mA, VDC and process input signals, allowing the units to be connected to most common sensors. They also feature a detachable LCD display/programming module, providing simple push-button programming without the need for difficult-to-use DIP switches or PC tethering.

The signal conditioners feature well over 100 possible input-to-output combinations and are available in three models. The setpoint model allows dual setpoint control capability through dual Form A relays. The analog model provides a retransmitted analog signal. A third model provides both an analog output and relay control capability.

The detachable LCD module can store programming from one unit and load it to a second unit, reducing set-up time for multiple installations. When the programming module is not being used for programming, it can remain attached to a module and indicate the input parameters, just like a panel meter.

The IAMS series universal signal conditioners provide removable terminal strips for simple set up in a wide range of applications. Plus, the flexible signal conditioners feature a universal power supply that accepts 21.6 to 253 VAC or 19.2 to 300 VDC. The detachable programming display additionally offers guided configuration in 7 on-board languages.

In addition, several features of the IAMS series universal signal conditioners make them particularly easy to set up and use:

- Provides complete isolation and conversion capability to satisfy a broad range of applications
- Accepts universal input for greater application flexibility
- Features a detachable, easy-to-use LCD display/programming module

- Allows over 100 possible input-to-output combinations
- Includes three models: setpoint, analog, analog output and relay control

For more information please go to www.redlion.net.

Analog Panel Meters for Harsh Environments

Yokogawa Corporation of America has released the new ToughMeter™ series 270. The ToughMeter™ series of analog panel meters is designed to operate in harsh environments. The 2½ " and 3½ " ToughMeter™ with an accuracy of 2% DC and 3% AC have all metal cases and polycarbonate windows, gasket -sealed bezels, terminals, and zero regulators to ensure dust and moisture protection. Made in the USA and IP66 approved, the meter mechanisms have a history of lasting durability and performance within specification. Either pivot and jewel or taut band suspension is available.

Please visit the web site at www.yokogawa.com/us for more information.

Technical Committee News

Rich Hochberg

IMS Technical Committee Reports 31-38 from the Spring of 2008 (continued from the October 2008 issue)

TC-31 I&M for Homeland Security: by Kang Lee and Brian Wadell.

- Activities in the last six months:
 - Sensor Standards Harmonization meetings: Kang Lee organized and conducted two Sensor Standards Harmonization working group meetings on Oct 16, 2007 and April 30, 2008 respectively, at NIST. The meetings aimed to coordinate sensor-related standards activities in industry and government in support of DHS Standard Office for their interest in sensor standards and interoperability.
 - Participated in the 9th Annual Technologies for Critical Incident Preparedness Conference and Expo 2007: Kang Lee participated in the Technologies for Critical Incident Preparedness Conference and interacted with the people implementing technologies to protect the nation from terrorist attacks. He helped to promote the IEEE smart and wireless sensor standards to these technology implementers and users.
- The next Sensor Standards Harmonization meeting is planned to be held on August 12, 2008 at NIST. Interested party can contact Kang at kang.lee@nist.gov.

TC-32 Fault Tolerant Measurement Systems: by Nohpill Park and Serge Demidenko

1. The special session on "Design, Manufacturing and Test of Reliable System-on-Chip (SoC) and System-in-Package (SiP) for the forthcoming I2MTC 2008 has been proposed and developed. The session description is available on the web - http://imtc.ieee-ims.org/imtc_2008.php
2. Session on Dependable Sensors was organized at the 2nd International Conference on Sensing Technology, November 26-28, 2007, Palmerston North, New Zealand.

3. The extended versions of the papers presented at the session on Dependable Sensors as well as some of the selected papers from the International Conference Sensing Technology in the special issue of the International Journal of Intelligent Systems Technologies and Applications (IJISTA) - the call for papers has been released in March 2008.
4. Discussions were held with the organizers of the 2009 IEEE Sensors Conference on organizing a Special Session on Fault Tolerant and Dependable Sensing Technology within the program of the Conference (October 2009). The preliminary results of the discussion are positive.

TC-33 Characterization of Electrical HF and Optical Nonlinear Components: by Marc Vanden Bossche and Yves Rolain

- Co-organization of a series of special sessions at IMTC07 entitled: 'advances in microwave measurements. We had 3 sessions in Warsaw, and the attendance level was normal when compared to the other sessions. The attendance was even good for even for the last session that was held in the afternoon of the last day of the conference. We are repeating it in 08 in Canada, for the third year on a row. I think that if we can continue at this pace, we can contribute to more RF and microwave measurement activity in I & M.
- Joint organization of a TC-33 Target Network of Excellence workshop at the EUMC2007 conference held in Munich. This is really the core business of TC-33. We are trying to get people together to obtain a traceable phase standard that can be shared by more than one National Metrology Institution. We were happy to bring NIST, NPL and PTB around the table, and there was an interest to try to set the first steps in the direction of an international comparison for phase measurements. As also major industry players as Agilent and R&S have shown interest and are willing to participate, we will continue this effort.
- Liaison function to the MTT-11 TC on microwave measurements. We also try to keep a strong link with MTT-11 the measurement TC of MTT. I think that this goes quite well, and it allows us to match the activities, so that there is no overlap and that we are promoting microwave measurements in a similar way.

TC-36 Industrial Inspection by Zheng Liu and David Forsyth

- Dr. Pradeep Ramuhalli (<http://www.egr.msu.edu/ndel/members/current/ramuhalli>) from Michigan State University will join our TC.
- The other thing is a survey on standards of nondestructive inspection data is being planned. We want to get the responses from industries on a plan for data format standards for nondestructive inspection.

TC-37 Measurements for Networking by Claudio Narduzzi and Abdulmotaleb El Saddik

- The TC encouraged participation in I2MTC 2008 by disseminating information on the conference and promoting the organization of a special session on measurement and networking at I2MTC2008. From conference submissions over ten papers were short listed for the special session; the composition has now been finalized with four papers.
- TC-37 was also a co-sponsor of the IEEE Workshop on Haptic Audio Visual Environments (HAVE 2007) held in Ottawa, Ontario, Canada, 12-14 October 2007 and is now planning to sponsor HAVE 2008 too.

TC-38 Space Measurements by John Schmalzel

- Sponsored a "IEEE 1451.1 Plug Fest" at the 2008 IEEE Sensors Applications Symposium in Atlanta, GA. Event was run by Dr. Deniz Gurkan, Univ. of Houston. Participants included Mobitrum, NASA Stennis Space Center (SSC), Rowan University,

and included a sensor from NASA Kennedy Space Center. This was an opportunity to demonstrate plug and play capabilities of .1 sensors that adhered to an on-the-wire format updated by SSC.

- Co-sponsoring with TC-9, updates to IEEE 1451.1 to include on-the-wire descriptions and definitions of health electronic data sheets (HEDS).

Society News

Shreekanth Mandayam

Report on IMU 2008: The 1st Annual International Measurement University

The Instrumentation & Measurement Society is pleased to announce that the 1st Annual offering of the International Measurement University (IMU) took place in Sardagna, Trento, Italy, from 14-19 July, 2008. The IMS has initiated this new program to support educational activities in its areas of interest and is directed particularly towards students. The IMU intends to serve:

- Ph.D. candidates undertaking a course of study and research in measurement needing to build and sustain momentum in the field, and
- Entry-level engineers working in the measurement area needing to quickly master the fundamentals of this multidisciplinary field.

During a week-long immersive experience at the picturesque Conference Center Panorama in Sardagna, 23 students from all over the world (Germany, Italy, Poland, Portugal, Republic of Macedonia, Romania, Spain, Sweden, and the USA) had the chance to interact with a distinguished slate of speakers who addressed fundamental and emergent measurement topics. Participants found the in-residence conference center to be conducive to formal and informal interaction with faculty and their fellow students. The close proximity of the town of Sardagna and city of Trento also provided numerous opportunities to experience the cuisine and culture of this unique mountainous region. The student participants were especially appreciative of their experience during this first offering of the IMU. Jon Morris, an engineer in the Test Operations Group at NASA Stennis Space Center in the United States, said, "The IMU is a truly amazing opportunity meet with and learn from experts and other students from around the world. I was able to immediately adopt the techniques and methodologies I learned and apply them toward Stennis Space Center's mission to provide world-class aerospace engine testing in support of NASA's Constellation Program."

The IMU is planned to be offered on a 3-year rotation of topics to encourage the student cadre to return annually in order to obtain the full range of content and strengthen their networking ties to other participants. This year, the focus was mainly on theoretical issues and the fundamentals of modern instrumentation. In particular, the following topics were addressed: legal metrology, scientific metrology, the new international system of units, the use of digital-analog and analog-digital converters, smart sensors, and digital signal processing.

IMU 2008 was coordinated by Dr. Alessandro Ferrero, from Politecnico di Milano, Italy, and Dr. Dario Petri, from the University of Trento, Italy. Other speakers included: Dr. Attilio Sacconi, Science Director of the Italian National Metrology Institute, Torino, Italy; Dr. Terry Quinn CBE FRS, Sèvres, France, Director Emeritus of the BIPM;

Dr. Ian Mills, Professor Emeritus of the University of Reading, UK, and Appointed President of the Comité Consultatif des Unités at the BIPM;
Dr. Shreekanth Mandayam, Rowan University, USA;
Mr. Kim Fowler, Cool Stream, USA;
Dr. Claudio Narduzzi, University of Padova, Padova, Italy;
Dr. Alessandra Flammini, University of Brescia, Brescia, Italy; and
Dr. Gerd Vandersteen, Vrije University of Brussels, Brussels, Belgium.

IMU 2009 will be held in Trento, Italy, 20-24 July, 2009. Please make plans to attend and pass on the information to all interested students! More information is available at <http://imu.ieee-ims.org/>.

Tutorial Video Clips on IMS Website

The I&M Society's website, <http://www.ieee-ims.org>, is now hosting short, <20min, tutorial video clips for:

- Undergraduate students and faculty;
- Graduate students and faculty;
- Practitioners in IMS-related areas;
- Practitioners/hobbyists in non-IMS-related areas.

Some of the proposed topics of the video clips include:

- Fundamentals of instrumentation technology and measurement science
- Systems of units and standards
- Signal conditioning and data acquisition
- Laboratory instrumentation basics
- Characterizing a 2-, 3-, 4-port device.
- Ground loop – introduction to EMC
- IEEE 1451 Basics

A distinguished cadre of experts from academia, industry and graduate schools will present these tutorials. In addition to the actual video-clip, the web portal will feature –

- The presence of affinity links to related topics and categories to maximize the availability of existing and future IMS content;
- Social networking links (e.g. e-mail this, blog this) to provide links to the IMS community.

The video clips will be available for a nominal fee for IMS members; will be competitively priced for others; and free to student members.

If you are interested in participating in this exciting project, please e-mail Shreekanth Mandayam at shreek@ieee.org.