Instrumentation & Measurement Magazine
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Complete Columns

From the Editor's Bench by Kim Fowler

Solving Problems

Problem solving is a unique and universal characteristic among people. Most activities within engineering deal with people issues – what we do, say, and think. In past editorials, I have written about specific issues in solving engineering or scientific problems – simulation, optimal and suboptimal analysis, cooperation, and people problems. But I have not yet connected these separate concerns together; I'll attempt to do so in this editorial by giving a "50 thousand foot view" (15000 meters) to connecting stages of problem solving together.

Life is not neatly interwoven like a Dickens novel. We seldom ever see various threads and story lines all tied up and resolved in the end. Likewise, life, engineering, and scientific endeavor are all far too complex to expect everything to fit seamless in our understanding. Still, there are basic stages that allow us to begin to understand the bigger picture and how we might be able to tie together subsets of issues. Some of these stages include problem presentation, matching expertise with requirements, problem solving approaches, tools and techniques, and integration. (Remember, this is the 50 thousand foot view!)

My family and I have vacationed near the ocean. During walks on the beach, I noticed phenomena outside my everyday experience. One such phenomenon is walking on wet sand just washed by the retreating surf. The sand has a uniform sheen of wetness but stepping on it instantly generates a radiating pattern out from the footprint of "dryer" sand – or at least that is what appears to my eye. I immediately began wondering how to study those wet footprints to understand why they looked drier. That was the presentation of a problem. I have a colleague in electrical engineering who likes to nap at a beach nearby his work. One of his research projects has been measuring water scour of the sand and rock around ocean front piers. I am guessing his time at the beach may have sparked some of his interest in that type of research. In both of these cases, curiosity could lead to addressing and eventually solving a problem or understanding a phenomenon.

Where do we find problems to solve? I think that they are either offered to us (maybe thrust upon us would be a better way to say it) or we search them out. If you are working in the commercial world, you cannot just follow your whimsy and pursue any interest that arises; you have to take on the next project and problem given you by your management or customers. Gratification for solving these types of problems comes when you solve them with innovation or cleverness. On

the other hand, the two beach scenarios are examples of searching out a problem. While I am not suggesting academic research allows you to "follow your whimsy and pursue any interest," our colleagues in universities often have a bit more latitude to pursue different types of problems. Regardless of the situation, we first have a presentation of a problem before beginning its solution.

The next step is to understand the overlap between our expertise and the requirements of the problem. Usually, we do not have a perfect match between our interests and expertise and the requirements of the problem. Many interesting problems cross disciplines, which immediately generates a mismatch between expertise and problem requirements for most of us. We then need to enlist the help and sometimes the collaboration of other people. Understanding the mismatch and overlap directly feeds into choosing the approach and tools that we will use to solve the problem.

After presentation of the problem and understanding the expertise and the requirements of the problem, you can select an approach to solving the problem. My impression is that most of us do not explicitly or consciously select an approach – it's just what we have always done. In most cases, this leads to a more ad-hoc approach, which has the advantage that it might more quickly uncover a solution. An ad-hoc approach has the downside that it does not necessarily cover all possibilities. You can take a more controlled approach that defines how you solve problems; it can be top-down, bottom-up, waterfall process, or spiral development. A controlled approach may seem to take more time but in the end provides greater assurance of covering all the bases.

After selecting the approach, then you have to select the tools you will use. Remember, I am talking high-level view; tools are the basic methods and techniques that you use, not a specific software package. The tools I am talking about are the following: native intelligence, capabilities, intuition, experiences, lessons learned, analytical techniques, and synthetic techniques. These are individual tools. You can also use "group tools" such as cooperation and collaboration. Finally, everyone on the project can learn as they go. Yes, learning is a tool, you need to understand a sufficient number of aspects of the problem to solve it.

The last stage is integrated use of problem presentation, matching expertise, methods, approaches, and tools. We have all been taught how to use tools and analytical techniques. Unfortunately, not all of us have been taught how to use them together; many of us, for instance, do not have a good understanding of synthesis, which is very different from analysis, even though both are important.

If you are reading technical magazines and journals, then you are performing one important step towards improving your understanding and problem solving. Hopefully, this magazine is helping you towards more effective problem solving.

Kim

President's Perspectives by Stephen A. Dyer
December 2007

A Few Moments' Reflection

Over and over, reflection proves itself an important activity in life. That activity is a requisite, in one sense or another, to growth. As individuals, we regain a sense of perspective on ourselves and our lives whenever we set aside time to reflect upon what we devote our time and energy to, what we have been able to accomplish, the relative worth of those accomplishments, and what seems left undone or forgotten. The same applies to organizations—the IEEE Instrumentation and Measurement Society, for example. It is all too easy to slog away at today's tasks, merely hoping for enough wherewithal to make it through until tomorrow, and often forgetting, at least temporarily, what our vision and mission are—and why we had them in the first place. But resources—time and energy—are limited, which makes the act of reflection all the more critical. Lives are at stake—both ours as individuals and those of the organizations with which we associate.

This is not a bad time for me to take out a few moments to reflect. I am at the close of my two-year term as President of the IEEE I&M Society. This was my third term as President. I really didn't have in mind to return to this position. It was my intent two years ago, as I completed my term as Sr. Past President, to devote my efforts during my upcoming term as a newly re-elected AdCom Member-at-Large to the publications aspect of our Society's operation—an aspect in which I have some experience and interest.

However, the past presidents of our Society met with me in the fall of 2005, shared some issues, concerns and dreams with me, and asked that I consider having my name put on the slate for the upcoming election of Society officers. I agreed, recalling that my past duty as President didn't seem all that rigorous. Five to ten hours per week, along with 30-or-so days of travel and meetings per year—I could probably handle that again.

This time around, though, it was different. The job turned out to be a roughly halftime commitment, which ballooned to well past full-time during one particular period of a few months. Having a sabbatical leave from my university position during 15 months of that time turned out to be fortuitous from the standpoint of being able to do volunteer work for the Society, although I had to put aside most of my goals originally set for the sabbatical.

Was it all "worth it" over the past two years? From a purely personal standpoint, I'll

leave it for time to tell. What I *can* claim is this: It has been an amazing experience to work with the members of the Administrative Committee of the I&M Society. This is the main revelation gained from my moments' reflection.

The AdCom is a phenomenal group of very interesting, interested, caring, and hardworking folks who devote their personal time and energy to leading the I&M Society toward to electronic form, the more nearly complete achievement of its vision and mission, its goals and objectives. Indeed, every individual member of that body, if asked to reflect, could recall the many hours and days that she or he has spent on activities and tasks meant to better our Society.

Most of what we as the Administrative Committee spend our time on, you as a typical member of the I&M Society don't see. As it is with good instrumentation, the complexity has been hidden; the user sees only the important results. But as part of my exercise in reflection, I have decided to include, in a bulleted list, some of what the AdCom has spent its time over the past two years. (I've made note of some of the items in previous columns.)

- In February 2007, our Society underwent and successfully completed its five-year peer review with IEEE.
- In June 2007, our Society underwent and successfully completed the five-year peer review of its publications.
- Our *IEEE Instrumentation & Measurement Magazine* became a bi-monthly publication in 2006.
- We moved the publication of the *I&M Magazine* to Allen Press, beginning with the June 2007 issue. Our Society expects to realize an annual savings of over US$100,000 through this move, and the quality of the product has improved. (We fully subsidize the Magazine, providing it to members of the I&M Society at no extra charge. Thus, the money saved by this move will allow us to undertake additional initiatives for the Society's benefit.)
- We moved the advertising for the Magazine to Allen Press, resulting in further net revenue through substantial savings in commissions.
- We are in the planning stages for increasing further the page count for the Magazine. We should be able to realize this increase within the next year. The added space within the Magazine will allow for expanded reporting of Society news, as well as additional feature articles and columns.

- We now have a superb online manuscript-tracking system for the IEEE TRANSACTIONS on Instrumentation and Measurement. The system, called AllenTrack, is provided by Allen Press. It came on line 1 January 2007.
- We are converting the TRANSACTIONS from bi-monthly to monthly publication, beginning with 2008.
- We completely redesigned our Society's public website. The new site came on line in September 2007. Visit it at www.ieee-ims.org.
- We have set up an extremely effective conference-management team comprising Conference Catalysts, LLC; Ms. Janet Liddiard; and Ms. Sue Kingston. This team is under the direct supervision of the Conference Management Committee, formed in 2006 and one of the committees within our AdCom.
- We have converted the management of our AdCom and the archiving of its important documents from a paper-based system to an electronic, web-based management and archival system. Our AdCom Management Website (AMW) began as an experiment in early 2006; today it holds over 500 megabytes of information pertinent to the management of the I&M Society.
- In early 2007, we hired Ms. Judy Scharmann as our Society's Executive Assistant. Although the original intent was strictly for her to handle the organization of our archival records and their conversion to electronic form, she immediately proved herself capable beyond our greatest expectations, and she has grown to become indispensable in helping us carry out the day-to-day operations of the Society.
- We have enjoyed and made very effective use of our Student Representatives appointed to the AdCom. The concept of including Student Representatives was suggested by Bob Rassa during his tenure as Society President and unanimously approved by our AdCom. The first year of service was 2005. Tim Osedach, Justin Dyer, Joe Lopez, and Kristen Mu˜noz have, during their appointments, provided exemplary service to the AdCom and our Society. They have variously served as Guest Editors of the Magazine; helped develop and oversee student design contests; aided in developing the AdCom Management Website; worked on projects, such as student paper contests, to enhance membership growth; worked on awards; and contributed countless ideas during AdCom meetings. Their effectiveness has been the center of attention of

discussions within the IEEE Technical Activities Board (TAB), as the presidents of the various societies within IEEE have struggled to find ways to engage the younger members of our profession. Our Society has been pleased to be able to offer hope and solutions.

- We have added the Sensors Applications Symposium to our list of conferences, symposia and workshops, with SAS-2006 being the first offering.
- We have implemented student paper contests as part of IMTC (now I2MTC) and SAS, beginning in 2006, and we have continued the student paper contest at AUTOTESTCON, first included in 2005.
- We have undertaken many other membership-related activities. Besides initiating the student paper awards and student travel awards associated with some of our conferences, we have started several new chapters and have aided some of our existing chapters in revitalizing themselves. We have begun a concerted, organized effort to grow our membership in IEEE Regions 8, 9, and 10. We have increased our involvement in regional student conference activities. And we have put chapter awards in place to provide recognition for work well done within our I&M chapters.
- We have improved our internal budgeting procedures to allow our vice-presidents more flexibility within, and more-direct control over, their various areas of responsibility.
- We are strengthening our Society's connection with the National Institute of Science and Technology (NIST) within the US, as well as connections with various other national laboratories throughout the world.

The list goes on. The accomplishments are great. But it's the people who make it all happen.

I'm reminded of a remark made by Arthur M. Young, one of my heroes and one of the most brilliant and creative minds of the 20th century. Among other endeavors, Young designed the Bell Model 47, the first helicopter in the world to be granted commercial certification. At the close of the introductory chapter of his book, *The Bell Notes: A Journey from Physics to Metaphysics,* Delacorte Press/Seymour Lawrence (1979), he wrote the following in describing the design effort, accomplished by his so-called "Gardenville group" at the Bell Aircraft Corporation, on the Bell 47:

> "Throughout, the Gardenville group remained dedicated and continued to keep in touch, even when we had to work underground because individuals in management tried to break up the group. It was the loyalty and dedication of the Gardenville group and their successors, not the helicopter itself, that I think of as the main accomplishment, for it is not making a helicopter that counts, it is the process by which it is made, and this resides in people."

Those are words well-spoken. Adapted to the I&M Society, those words would become: "It is the loyalty and dedication of our AdCom and certain other of our Society's members that is the main accomplishment. The growth and improvement of the Instrumentation and Measurement Society is important, but even more so is the process by which it is led to grow, and this resides in people."

Thank you, members of the AdCom. Thank you, members of our Society. It has been good to reflect.

Steve

In Memoriam
Robert M Myers
March 21, 1931 – June 22, 2007

It is with great sadness that we announce the passing of the I&M Society's long-time Executive Director, Bob Myers, whom the Lord took from us earlier this summer after a lengthy bout with a congenital heart condition and renal failure.

Bob and his charming wife Lee had served the Society for well over two decades, handling AdCom meeting arrangements, coordinating registration and arrangements for our Conferences & Workshops, keeping files and records, and generally providing us with the all-important "corporate memory" that we needed to manage ourselves successfully.

Bob and Lee were always ready to assist the Society, no matter what the task. Bob was indeed a friend to all, including all of the important folks at IEEE HQ in New Jersey.

Bob also served as the Executive Director for several other IEEE Societies including Power Electronics Society (PELS) and Industry Applications Society (IAS) during his long career serving IEEE, which began in the late 70's. Prior to that, Bob was a correspondent for the

Associated Press. Bob also served as the Executive Agent for the I&M and AES major joint conference known as AUTOTESTCON, the premier conference for automated test systems topics for the US military. He was co-founder of the association management firm of Myers-Smith, Inc, under whose auspices his IEEE duties were performed.

Bob received his BS degree from the University of California, Los Angeles, and was, of course, a diehard Bruin fan.

Bob is also survived by a son, Bruce, who had worked with Bob and Lee on their Society management duties.

Written by Robert (Bob) C. Rassa

TC News
Spring 2007 reports for TC-10 through TC-36

By Richard Hochberg

TC-10 Waveform Generation, Measurement, and Analysis: by **Thomas Linnenbrink**

- TC-10 is actively developing four major standards: The revision of IEEE Std 1057-1994 (Standard for Digitizing Waveform Recorders); the revision of IEEE Std 1241-2000 (Standard for Terminology and Test Methods for Analog-to-Digital Converters); the development of IEEE Std P1658 (Standard for Terminology and Test Methods for Digital-to-Analog Converter Devices; and, the development of IEEE Std P1696 (Standard for Terminology and Test Methods for Electronic Probes). Effort continues to persuade the IEC to adopt IEEE Std 181-2003 (Standard on Transitions, Pulses, and Related Waveforms). The committee members reviewed the latest version of the working drafts of 1057, 1658, and 1241 at our October 2006 meeting in Albuquerque. The inaugural meeting on 1696 which was conducted as part of the October 2006 TC-10 meeting. Progress continued on all four active standards in our February meeting in Gaithersburg, MD. A tutorial on ADC fundamentals, selection, test, and calibration will be presented at IMTC 2007 in Warsaw, Poland on April 30, 2007. The spring 2006 TC-10 meeting is scheduled for May 14 - 17, 2007 in Tucson, AZ (sponsored by Texas Instruments). The fall meeting is tentatively scheduled for October/November 2007 in Boston, MA. Specific actives of the four subcommittees are described below.
- **Subcommittee on Pulse Techniques (SCOPT) (181) (Nick Paulter, Chair):** SCOPT is still seeking adoption of the IEEE Std 181-2003 by the IEC, as it did for the 181-1977 and 194-1977 standards. However, it seems the only path promising some likelihood of success is for at least two members of TC-10 to join the appropriate ANSI US Technical Advisory Group (TAG) to the appropriate IEC technical committee, which is TC-85 for this case. To date, only one person has volunteered. The Std 181-2003 will be due for a maintenance action (revise, reaffirm) by the end of 2008. SCOPT will likely opt to revise because there is interest in including parameters for impulse-like pulses and in correcting an error discovered in one of the figures. SCOPT is in the process of

developing numerical methods for generating reference waveforms for use in pulse parameter algorithm characterization.

- **Waveform Measurement Subcommittee (1057) (Bill Boyer, Chair):**
  The Waveform Recorder Subcommittee of TC-10 is actively working on an updated version of IEEE Standard 1057 on testing waveform recorders. The final version of the draft was completed in February and was submitted to the IEEE Standards Association (SA) for initial editorial review. Changes requested by the SA have been made and the revised version has been submitted for balloting, which is expected to be completed by the end of April. We are on schedule to have the draft published by the end of 2007.
- **ADC Subcommittee (1241) (Steve Tilden, Chair):**
  The committee met on February 21, 2007 in Gaithersburg, Maryland and continued aggressive editing and re-writing the maintenance draft update. It will meet again in May, in Tucson, Arizona where further progress will be made to the draft. The committee also participates in IMTC quite widely and ADC Forum conferences. During the past year it also published several tutorials on ADC Architectures and test methods in the I&M Magazine. A three-hour tutorial will be presented at the IMtc2007 in Warsaw, Poland. Further publication is planned for future conferences and publications to spread the word about the standard and solicit input from non-members. This committee is also trying to increase its working membership to speed the process.
- **DAC Subcommittee (P1658) (Steve Tilden, Chair):**
  The committee met on February 19, 2007 in Gaithersburg, Maryland and made significant progress towards creating the initial draft. It will meet again in May in Tucson, Arizona to continue that work toward creating an initial draft for ballot before the PAR deadline. This committee is also aggressively recruiting new working members to gain momentum toward draft completion.
- **Subcommittee on Probe Standards (SCOPS) (P1696) (Nick Paulter, Chair):**
  SCOPS held its second meeting in February 2007 during the TC-10 meeting. It was agreed that the format of the 1696 standard will emulate that of the 24 January 2007 unpublished revision of the IEEE Std 1057. The SCOPS home page has been developed, is consistent with that of the other TC-10 working groups, and is expected to be launched before the end of March 2007. SCOPS has developed its private page, and this will contain a description of discussion topics and a compilation of section drafts and written technical contributions to facilitate comment and discussion. The private page will be launched with the SCOPS home page.

TC-11 SCC-20 Coordinators: by **Joe Stanco**

- Activity has continued within SCC20 to incorporate Automatic Test Markup Language (ATML) activities and accomplishments into appropriate SCC20 initiatives and standards.
- Work on the active Project Authorization Requests (PARs) has been ongoing since the last report. The status of these efforts will result from the next SCC-20 meeting, which I plan to report on.
- I plan to attend the upcoming full SCC-20 meeting which will be held in Madrid Spain on April 16-20, 2007. The Hardware Interfaces (HI), Diagnostic and Maintenance Control (DMC), Test Description (TAD) and Test Information Integration (TII) committees will all be meeting.

TC-13 Wireless and Telecommunications in Measurement: by **Reiner S Thomä**

- The TC will be looking for a new chairperson as Professor Thomä is having increased responsibility in his faculty and has become a coordinator of a large nation-wide project. This is not an urgent action but a change should be made soon. Volunteers are being solicited.
- Recent activities:
    - Convened a session on "Measurement of Wireless Channels" at the 29th General Assembly of URSI (Intl. Union of Radio Sciences) to be held in Chicago, August 07-16, 2008. Sponsored by IEEE Antennas and Propagation Soc. http://www.ece.uic.edu/2008ursiga/
    - Served as an Overseas Corresponding Committee Member of 2007 International Symposium on Antennas and Propagation, August 20-24, Niigata, Japan http://www.isap07.org/
    - Serving as a reviewer to IEEE Vehicular Technology Conference VTC Spring/Fall 2007
    - Serving as Chairman of the German research program on "Ultra-Wideband Radio Technologies for Communications, Localisation and Sensor Applications (UkoLoS)" sponsored by "Deutsche Forschungsgemeinschaft" (comparable to NSF). The project cluster contains 12 locally scattered joint projects in the field of UWB technology. http://www-emt.tu-ilmenau.de/ukolos/

TC-15 Virtual Systems in Measurements: by **Emil Petriu**

- Organized, in collaboration with TC-27 Human-Computer Interfaces and Interaction and TC-28 Instrumentation and Measurement for Robotics and Automation, the ***HAVE'2006 - IEEE International Workshop on Haptic Audio Visual Environments and their Applications***, Ottawa, ON, Canada, 4-5 November 2006.
- Organizing, in collaboration with TC-27 Human-Computer Interfaces and Interaction and TC-28 Instrumentation and Measurement for Robotics and Automation, of the ***2007 IEEE International Conference on Virtual Environments, Human-Computer Interface, and Measurement Systems - VECIMS'2007***, Ostuni, Italy, 25-27 June 2007.

TC-16 Laser and Optical Systems in Measurements: by **Thierry Bosch**

- TC-16 has organized the 5th edition of ODIMAP (Optoelectronic Distance/Displacement Measurements and Applications) in Madrid (Spain, 2-4 October 2006).
- We are co-organizing the 15th International Conference on Advanced Laser Technologies (ALT'07) in Levi (Finland, September 3-7 2007).

TC-17 Materials in Measurements: by **Jacob Scharcanski**

- Devendra Misra has requested to be replaced by Prof. Jacob Scharcanski of the Instituto de Informatica UFRGS - Universidade Federal do Rio Grande do Sul, Porto Alegre, RS, Brasil.

TC-19 Imaging Measurements: by **George Giakos**

- The Committee has been actively involved in the Organization of a Special Session on "Imaging Systems and Techniques", for the IMTC 2007.
- The Committee organized a Workshop on Imaging Systems and Techniques that will take place in Kracow, May 4-5. So far, it has attracted more than 50 high-quality papers.
- George Giakos and George Zendai (Varian) started organizing, under the encouragement of Steve Adam, an Industrial Cooperation and Standards Forum within the TC-19 Technical Committee. The purpose of this Forum is to promote industrial participation in

the Committee, develop new measuring methodologies and standards, identify and develop technical areas of significant interest, promote and enhance technical knowledge, enhance the engineering profession, inspire a shared leadership, enhance the mission of the IEEE. Some funding will be needed so that to keep the First Meeting, in Fall 2007.

TC-20 Transportation Systems in Measurements: by **Frans C.A. Groen and Georg Brasseur**

- Organized, in collaboration with TC-27 Human-Computer Interfaces and Interaction and TC-30 Security and Contraband Detection, of a **special session on "Sensor Networks for Environmental Protection"** at the **"IMTC/2007 - IEEE Instrumentation and Measurement Technology Conference**," May 1-3, 2007, Warsaw, Poland.
- Organizing a **special session on "Flow Sensors"** at the **"IMTC/2007 - IEEE Instrumentation and Measurement Technology Conference**," May 1-3, 2007, Warsaw, Poland. Probably we will have more than one session as around 20 papers were received for review and much more than five papers passed the review process.
- Continuing contributions to the organization, in collaboration with TC-15 Virtual Systems, TC-27 Human-Computer Interfaces and Interaction, TC-28 Instrumentation and Measurement for Robotics and Automation and TC-30 Security and Contraband Detection, of the ***ROSE 2007 - IEEE International Workshop on Robotic and Sensors Environments***, Ottawa, ON, Canada, fall 2007 (tentative)**.**
- Supporting Emil Petriu as a member of the Technical Program Committee of VECIMS 2007-International Conference on Virtual Environments, Human-Computer Interfaces, and Measurement Systems, to be held in Ostuni, Italy, 25-27 June, 2007, http://www.ewh.ieee.org/soc/im/vecims/vecims2007/organizers.html .
- The work on establishing a new Master of Engineering study at TU-Graz called "Automotive Software and Electronics" with a new chair plus department called "Embedded Automotive Systems" is almost finished. The Master study will start in the fall term 2007 on October 1st, 2007. This work is totally in compliance with the views of "Transportation Systems".

TC-21 Built in Test (BIT): by **Robert Gao and Dennis Hecht**

- Served on the program committee of the International Conference on Smart Machining Systems, and provided reviews of papers submitted to the conference, which was held in Gaithersburg, MD, in March, 2007.
- Served as an Associate Editor for the IEEE Transactions on Instrumentations and Measurement and managed reviews of various papers.
- Served on the technical committee of the 2007 IEEE/ASME International conference on Advanced Intelligent Mechatronics and provided reviews on papers submitted to the conference.
- Continued collaboration with the National Institute of Standards and Technology on developing a sensor-integrated "smart spindle" with built-in self-diagnostic capability. A poster on the design of a software package that enables a virtual instrumentation-based graphic user interface for interactive operational spindle health diagnosis was presented at the International Conference on Smart Machining Systems.
- Held three committee meetings with regards to the Diagnostic activity with the NDIA System Engineering Division, whereby diagnostic and prognostic theories and lessons learned were shared between Industry and DoD participants. In addition, three ID sessions were conducted and six papers presented at the NDIA Systems Engineering

Conference held in October in San Diego. The Electronics Prognostics Workshop II was conducted as well. A white paper on the Workshop was submitted to Bob Rassa, Chairman of the Systems Engineering Division in November. Bob Rassa has given the authorization to publish the Electronic Prognostic Workshop white paper. (This effort is in work.)

- Presented results of the electronics Prognostics Workshop II during the System Engineering planning conference held in San Francisco.
- Participated in a NDIA meeting in February 2007 of the Life Cycle Support Committee Action Items from that meeting included writing reviews for various projects and determine how to proceed on recommendations for BIT to compute FOM values for each recommendation.
- For 2007, the NDIA Integrated Diagnostic Committee will:
    - Continue to serve as a clearing house for DoD and Industry and provide a Network Centric Diagnostic's sounding board.
    - Identify areas for future research/study in electronics prognostics.
    - Reengage with the NDIA Life Cycle Support Committee and their DoD Component.

TC-22 Intelligent Measurement Systems: by **Cesare Alippi and Mel Siegel**

- The Committee is promoting:
    - basic research on computational intelligence (soft computing and composite technologies) in instrumentation and measurement systems and their applications;
    - research on intelligent distributed sensing networks based on soft-computing components;
    - research on computational intelligence methodologies and techniques for adapting processing systems;
    - the use of computational intelligence technologies in instrumentation and measurement for intelligent manufacturing applications, homeland protection and personal safety.
- The Committee is organising and coordinating:
    - 2007 IEEE INTERNATIONAL CONFERENCE ON COMPUTATIONAL INTELLIGENCE FOR MEASUREMENT SYSTEMS AND APPLICATIONS, 27-29June 2007, Ostuni – Italy.
    - This conference is sponsored by the IEEE Instrumentation and Measurement Society and the IEEE Neural Networks Society. The committee is also collaborating in the organization of the co-located IEEE INTERNATIONAL CONFERENCE ON IEEE INTERNATIONAL CONFERENCE ON VIRTUAL ENVIRONMENTS, HUMAN-COMPUTER INTERFACES, AND MEASUREMENT SYSTEMS (VECIMS) 25-27 June 2007.
    - Within the "Intelligent measurement systems" Task Force of the Intelligent Systems Applications Technical Committee (IEEE Computational Intelligence Society), TC-22 has organised the *"Computational Intelligence for Intelligent Measurement Systems"* at the IEEE International Joint Conference on Neural Networks, Orlando, FL USA August 12-19, 2007
    - These activities have undertaken to promote the committee's research areas within other IEEE societies.

TC-23 Education in Instrumentation and Measurements: by **Theodore Laopoulos**

- TC-23 is organizing two special sessions at the next IMTC-2007 following the series of successful special sessions on educational issues at the previous IMTCs. This year the session is focused on “WEB-based Educational Tools and Labs” and due to the large number of contributions we have a second session with the title “Distributed Measurements Systems for Educational Labs”. A total of 10 papers will be presented in these two sessions coming from 8 different countries. These sessions will be used as a gathering opportunity for TC members and friends that will be attending the conference. We also plan a meeting of the TC members in the time between these two sessions, and invite all interested IMTC’07 attendees to participate.
- TC-23 members participate in the educational and experimental research activities of the “Laboratorio Didattico Remoto” (LADIRE) an innovative educational environment realized at the University of Sannio (Italy). In charge of the LADIRE Lab is TC member Pasquale Daponte, while other members of the TC have agreed to use the services and evaluate the educational outcome of this approach.
- TC members are actively engaged in the organization of the 4rth International Workshop on "Intelligent Data Acquisition and Advanced Computing Systems" – IDAACS’07, scheduled for September 6-8, 2007, Dortmund, Germany, and also in a special issue of the International Journal of Computing devoted on Virtual Instrumentation (VI) and Virtual Laboratories (VL) - Prof. W. Winiecki from Poland is co-editor of this issue.

TC-26 Radar Cross-Section Measurements: by **Mark Yeary**

- Dr. Yeary has been appointed as the Principle Manager of a new radar laboratory on the University of Oklahoma's research campus. The new 4000 sq.ft. lab has been instrumented with the latest test instrumentation capable of supporting experiments up to 50 GHz. The lab is part of a nationally recognized research program devoted to radar, especially weather and hard target detection. The lab specializes in the complete cycle of innovation from design to prototyping. Under its new Visiting Interdisciplinary Scientist Arrangement (VISA), external scientists are welcome to use the facilities on a short time basis. This will promote collaborative publications and other ventures. For more information, contact him at yeary@ieee.org .

TC-27 Human Computer Interface and Interaction: by **Mel Siegel**

- Our goals are to develop methods for interfaces and interactions between humans and computers in measurement systems; advance the state of the art in this field; conduct workshops as appropriate in the field; and initiate articles and publications involving the technology and the processes involved.
- The boundary between the fields of Human-Computer Interfaces and Interaction and Human-Robot Interfaces and Interaction, covered in part by TC-28, Instrumentation for Robotics and Automation, is fuzzy (TC-22), hence many of their activities are organized jointly. To date this has been primarily via organizing and presenting conferences, symposia, workshops, and conference special sessions on the fields in general, as well as on specialized subtopics of the field. These include the ROSE (Robotic and Sensors Environments) conference series and the HAVE (Haptic, Audio, Visual Environments and Applications) conference series:
    - (ROSE) http://www.oru.se/
    - (HAVE) http://www.discover.uottawa.ca/have2006
- The 2006 editions of both conferences were highly successful. This edition of ROSE, held in Orebro, Sweden, was financially sponsored by the Robotdalen (the “robot valley”

association of central Sweden) and the Swedish Knowledge Foundation, focused on the SHARE concept for integrated Symbiotic Human and Robotic Environments, which was articulated and developed primarily by IEEE I&M Society members active in TC-27. Complementing this topical focus, HAVE 2006, held in Ottawa, Canada, and sponsored by the University of Ottawa School of Information Technology and Engineering, in 2006 had a broad focus, with representation from researchers worldwide on all the named sensory modalities, at a variety of depths from low-level sensing devices to high level sensor network architectures and modeling tools.

- An additional 2007-2008 focus for TC-27, in collaboration with TC-22 and other technical committees, is to establish a closer working relationship with the IEEE Robotics and Automation Society (R&S) TC on Instrumentation and Measurement. Our goal is to evolve ROSE into a conference that will be organized and operated jointly by the I&M and R&A Societies.
- TC-27 is chaired by Mel Siegel (Carnegie Mellon University, Pittsburgh, PA, USA, mws@cmu.edu) and Peter Wide (Orebro University, Orebro, Sweden, peter.wide@tech.oru.se). The chairs would be delighted to expand and enlarge the participation of I&M Society members in our activities. We strongly encourage the interested – or even the just-curious – to contact either of us by email or face-to-face at the upcoming IMTC in Warsaw.

TC-28 Instrumentation and Measurement for Robotics and Automation: by **Mel Siegel and Emil Petriu**

- Organized, in collaboration with TC-15 "Virtual Systems in Measurements" Technical Committee and TC-27 Human-Computer Interfaces and Interaction, of the ***HAVE'2006 - IEEE International Workshop on Haptic Audio Visual Environments and their Applications***, Ottawa, ON, Canada, 4-5 November 2006.
- Organizing, in collaboration with TC-15 "Virtual Systems in Measurements" Technical Committee and TC-27 Human-Computer Interfaces and Interaction, the ***2007 IEEE International Conference on Virtual Environments, Human-Computer Interface, and Measurement Systems - VECIMS'2007***, Ostuni, Italy, 25-27 June 2007.
- Organizing, in collaboration with TC6 - Emerging Technologies, TC22 -Intelligent Measurement Systems, and the TC on Industrial Systems Applications - Task Force on Intelligent Measurement Systems of the IEEE Computational Intelligence Society, the ***2007 IEEE International Conference on Computational Intelligence for Measurement Systems and Applications CIMSA'2007***, Ostuni, Italy, 27-29 June 2007.

TC-30 "Security and Contraband Detection": by **Emil Petriu, Vincenzo Piuri, and Mel Siegel**:

- Organized, in collaboration with the IEEE TAB Committee on Biometrics , the ***2006 IEEE International Workshop on Measurement Systems for Homeland Security, Contraband Detection and Personal Safety - IMS2006***, Alexandria, VA, USA, 18-19 Oct. 2006.
- Organizing, in collaboration with TC-20 Transportation Systems and TC-27 Human-Computer Interfaces and Interaction, of a **special session on "Sensor Networks for Environmental Protection"** at the **"IMTC/2007 - IEEE Instrumentation and Measurement Technology Conference**," May 1-3, 2007, Warsaw, Poland.

- Contributions to organizing, in collaboration with TC-15 Virtual Systems, TC-20 Transportation Systems, TC-27 Human-Computer Interfaces and Interaction, and TC-28 Instrumentation and Measurement for Robotics and Automation, the ***ROSE 2007 - IEEE International Workshop on Robotic and Sensors Environments***, Ottawa, ON, Canada, Fall 2007 (tentative)

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

- Sensor Standards Harmonization:
  - Kang Lee organized and conducted two Sensor Standards Harmonization Working Group meetings on Nov 28, 2006 and Feb 27, 2007, respectively at NIST. These working group meetings aimed to coordinate sensor-related standards activities in industry and government in support of the Science and Standards Directorate of DHS for their interest in sensor data and information interoperability.
- Homeland Security Session at SAS 2007
  - During the planning of the SAS 2007, Kang Lee suggested a session on homeland Security. At the conference Kang presented a paper on smart sensor standards at the Homeland Security session.
- OGC OWS-5 planning meeting
  - Kang Lee participated in a planning meeting organized by the Open Geospatial Consortium (OGC) on their OWS-5 effort to demonstrate sensor integration with the enterprise and different application software packages from various vendors in support of the first responder and homeland security applications. Kang and his team proposed an integration of IEEE 1451-based smart sensors via the Sensor Web Enablement (SWE) thread to the overall demo using the Smart Transducer Web Service interface that they have developed. As an example, the last OWS-4 demonstrated a simulated chemical attack in New York/New Jersey area and how the various chemical sensors, hardware, and application software were integrated together based on standard interfaces. The demonstration illustrated the interoperation of various systems in order to notify the proper authority and coordinate effort in containing the attack.
- Planned Activity for the next 6 months:
  - The next Sensor Standards Harmonization Working Group meeting is planned to be held on May 22, 2007 at NIST. Interested party can contact Kang at kang.lee@nist.gov.

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

- In cooperation with Prof. Sunil Das the Committee has proposed and developed a very substantial Special Session SS-11 “Reliable Design and Test of System-on-Chip - Instrumentation and Measurement Perspectives” for the forthcoming IMTC-2007 (May, 2007, Warsaw, Poland). The Special Session comprises 15 technical papers plus and an introductory plenary technical talk (S. Demidenko and N. Park)
- The TC-32 has been working towards a special session on Fault-Tolerant Design at the 22nd IEEE International Symposium on Defect and Fault Tolerance in VLSI Systems (DFT' 07), September, 2007, Rome, Italy (N. Park)
- The TC-32 is preparing the Call for Papers for the special issue on Fault-Tolerance in Electronics Systems for the IEEE Transactions on Instrumentation and Measurement, planned submission for approval in May, 2007 (N. Park)

- TC-32 is planning to organize a Special Session on Fault-Tolerant Sensing Systems at the 2nd International Conference on Sensing Technology, November, 2007, Palmerston North, New Zealand (S. Demidenko)
- Among other plans is assistance is creation of the IEEE I&M Chapter in New Zealand (S. Demidenko)

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

- In its ongoing effort to strengthen the nonlinear rf measurement activities in the I&M society, TC-33 was organizing a track of nonlinear measurements at the IMTC07 conference. The success for the sessions was high, as we had enough papers for 3 sessions, which is a big success compared to the first organization of last year in Sorrento.
- TC-33 is also making further efforts to try to gather a number of actors for a discussion on the phase calibration of analyzers for nonlinear RF and microwave systems on a dense spectral grid.
- TC-33 members will participate in different workshops at the EUMC2007 conference. The goal of these contributions is to "spread the word" for the calibration and measurement of nonlinear rf and microwave systems.

TC-34 Nanotechnology in Instrumentation and Measurement: by **David Rivkin**

- TC-34 had its 3rd meeting in Feb 2007 in Fort Lauderdale Florida. Topics of discussion focused on Standardization Efforts to be undertaken by the Working Groups and clarifying their roles. 5 people attended in person and 3 via the internet.
- We hope to use the internet more for meetings and so that we can bring in more people to our TC.
- We are seeking a new webmaster and would appreciate any volunteers.

TC-35 Net Centric Operations & Interoperability: **OPEN**

- ***NEW Chairperson needed***!

TC-36 Industrial Inspection by **Zheng Liu**

- **New TC** that will focus the research and development on non-destructive inspection, machine vision based inspection systems, and other inspection techniques.
- Dr. Liu is a Research Officer with the Institute for Research in Construction National Research Council Canada**,** Ottawa, Canada.

Membership Notes by Ruth Dyer

Distinguished Lecturer Program

The I&M Society Distinguished Lecturer Program (DLP) is one of the most exciting programs offered to our chapters. It provides I&M chapters with talks by experts on topics of interest and importance to the I&M community. It, along with our conferences and publications, is a way we disseminate knowledge in the I&M field. The chapters incur low cost in making use of this

program. Each chapter can request a maximum of two visits per year by our Distinguished Lecturers.

All distinguished lecturers are outstanding in their fields of specialty. Collectively, the Distinguished Lecturers possess a broad range of expertise within the area of I&M. Thus, the chapters are strongly encouraged to use this program as a means to make their local I&M community aware of the most recent scientific and technological trends.

Chapters are strongly encouraged to make use of the I&M DLP to enhance their member benefits. Although lectures are mainly organized to benefit existing members and Chapters, they can also be effective in generating membership and encouraging new chapter formation. Interested parties are encouraged to contact the I&M DLP Chair (link) regarding this type of activity.

Contact Mr. Kim Fowler (kimf@ieee.org), the I&M DLP Chair, to arrange a DLP to visit your chapter or organization.

Ruth

To Request an I&M Distinguished Lecturer

1. Contact the desired Distinguished Lecturer directly to set a date
2. After the date is set, the chapter and distinguished lecturer should contact the I&M DLP Chair to discuss arrangement of the lecture.
3. The chapter and lecturer should discuss if any funding is necessary to perform the lecture prior to the lecture (see funding guidelines below)
4. See the society's website for more information.

To Request funding

1. The chapter normally covers all local expenses for the Distinguished Lecturer (honorarium, hotel, taxi, food, incidentals).
2. If the Chapter cannot cover local expenses or if the lecturer needs additional funding (e.g. airfare), the chapter and Distinguished Lecturer should fill out a DLP Funding Request Form and send it to DLP Chair for funding approval. Funding approval occurs prior to finalizing the arrangements for the lecture. General guidelines are:

    - Up to US$1800 for travel (this figure may be periodically revised)
    - More money might be negotiated with the DLP Chair if travel covers long distances

- For new chapters or revitalized chapters returning to active status and without funds, the DLP might offer more assistance. The DLP Chair determines funding on a case-by-case basis.

3. The event must be announced as "sponsored by the IEEE Instrumentation & Measurement Society under its Distinguished Lecturer Program" and the lecturer should be referred to as an I&M Distinguished Lecturer.
4. The chapter is expected to publicize the event by special mailings to all members of the chapter/section.

After the lecture is over

1. The Distinguished Lecturer should email a completed IEEE expense report along with original receipts for up to the approved amount to the I&M Society Treasurer (Mel Siegel, mws@cmu.edu) and copy the DLP Chair. A check will be cut and sent to the lecturer for reimbursement.
2. If the chapter needs reimbursement as previously agreed with the DLP Chair before the lecture, the chapter must submit an expense report to the I&M Society Treasurer and copy the DLP Chair.
3. The Chapter Chair should send a summary report to the DLP Chair including information on the date and title of the lecture, event announcement/publicity, attendance, and comments on the effectiveness and usefulness of the lecture.

Instrumentation and Measurement Society Distinguished Lecturers

Abed (Abdulmotaleb El Saddik
University of Ottawa, Ontario, Canada
abed@mcrlab.uottawa.ca
Area of expertise: Haptics Technologies: Theory and Applications

Kang Lee
National Institute of Standards and Technology, Gaithersburg, MD, USA
kang.lee@nist.gov
Area of expertise: IEEE 1451: Empowering the Smart Sensor Revolution

Pawel Niewczas
University of Strathclyde, Glasgow, UK
p.niewczas@strath.ac.uk
Area of expertise: Advanced Optical Sensors for Power and Energy Systems' Applications

Instrumentation and Measurement Society New Senior Members

January- September2007

Mitchai Chongcheawchamnan, Gabriele D'Antona, Mustafa Guvench, Adrian Keating, George Zentai, Reljin Branimir, Sylvain Martel, Wendy Van Moer, Mohammed Ansari, Jon Martens, Rafik Goubran, Reinhard Joho, Vitaliy Babak, Ovidiu Stan, Lee Globus, Antonio Ginart, Michael Dewey, Cesare Svelto, Fang Xu, Rini Akmeliawati, Ali Mehrabi

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Column Summaries

A Letter to the Editor from John M. Nightingale- (summary)

"The article of Warwick and Nasuto, "Historical and Current Machine Intelligence", (*IEEE Instrumentation and Measurement Magazine*, vol. 9, No. 6, pp 20-26, Dec. 2006) was wide-ranging and informative.

The article contains a distressing fundamental error. That such a flaw has been accepted as axiomatic in a periodical of stature merits exploration and some examination of its implications….

It is not too early for all of us to begin thinking in much more depth and more widely about the fundamental assumptions in AI and distributed systems. The authors are invited to lead that change in assumptions."

Authors' Response to the Letter to the Editor from Kevin Warwick and S.J. Nasuto- **(**summary)

"We wish to thank the correspondent for his detailed reading of our paper [1] which attempted to deal with the complex, yet vitally important, topic of intelligence.

One of the key drivers in our article was an attempt to clean out the cobwebs of the old definitions of artificial intelligence which were concerned merely with an attempt to limit machines to perform in a human-like way…"

By the Numbers – **(**summary)

Stephen A. Dyer and Justin S. Dyer

Approximations to Error Functions

"In this instalment, we discuss briefly some useful approximations to the so-called "error functions" related to a Gaussian random variable. Gaussian random variables appear often

in the sciences and engineering, particularly when modeling the effects of noise in various types of systems, including those associated with instrumentation and measurement."

Instrumentation Notes – (summary)

by Shlomo Engelberg

Sigma-Delta Converters: Theory and Simulations

"One of the most important pieces of instrumentation used to make measurements is the analog-to-digital converter (ADC). There are many families of ADCs, and each family has its niche and its advocates. The sigma-delta ($\Sigma\Delta$) converter is quite accurate and reasonably popular but somewhat slow. In terms of how it works, it may be the most *interesting* of all of the ADCs. We give an introduction to the sigma-delta ADC, and we show how to use an Excel spreadsheet to simulate and analyze the ADC."

Book Review- (summary)

By Slawomir Tumanski

Sensors and Actuators – Control System Instrumentation
Clarence W. de Silva
CRC Press, 2007
ISBN-13: 978-1-4200-4483-6
Reviewed by Slawomir Tumanski

"This new book by Clarence W. de Silva is a good gift for the engineer who has de Silva's other book on the shelf, as I do. It can be particularly recommended for students as it is one of the best written textbooks on the subject, with clear and precisely presented aspects of measurements and control. Practicing engineers should also find this book as a useful guidebook due to the large number of examples and good advice."

New Products – (summary)

By Robert Goldberg

New Software Platform for RF Waveform Generation, by Keithley Instruments, SignalMeister™ Waveform Creation,
http://www.keithley.com/products/rfmicrowave/?mn=290101.

MicroGyro™ Uses MEMS Technology for Automotive Safety, by Systron Donner Automotive www.systronauto.com

LabVIEW 8.5 Delivers Power of Multicore Processors to Engineers and Scientists; the latest version of the graphical system design platform for test, control and embedded system development, www.ni.com/labview85.

New Workplace Electrical Safety Tester, by the Seaward Group USA, Primetest 100; a battery powered hand held tester, www.seaward-groupusa.com.

Digital Radio Test Set for Emerging Markets, by Aeroflex, the entry-level Aeroflex 6113 Digital Radio Test Set, www.aeroflex.com

New Service Pack for ATEasy 6.0, by Geotest-Marvin Test Systems, Inc., Service Pack 1 (build 134) with ATEasy software, http://www.geotestinc.com/downloads/index.asp?sct=1 or www.geotestinc.com.

Next Generation 8-bit High-speed Digitizers, by GaGe, Cobra™ ,www.gage-applied.com.

PCI Express Board Offers 16 RS-232 Ports, by Sealevel Systems, Inc, www.sealevel.com

Motorized Potentiometer Features Special Clutch and Spring Return, by Spectrum Sensors and Controls, a motorized rotary potentiometer, www.specsensors.com

Diffuse Reflectance Laser Pump Reflectors Assure Beam Stability and Uniformity, by Labsphere, the Spectralon® Laser Pump Reflectors, www.labsphere.com.

New Free Field ICP® Array Microphone, by PCB Piezotronics (PCB®), Model 130D22, a combined ICP® free field response pre-polarized array microphone and preamplifier, www.pcb.com.

New Brochure Features Ultrasonic Piezo Motor Actuators for Automation, by PI (Physik Instrumente) A new brochure on Ultrasonic Piezo Linear Motors, Actuators and Precision Positioning Stages.
http://www.physikinstrumente.com/en/products/piezo_motor/index.php.

New RF Power Amplifier Module Covers Military Communications Band, by AR Modular RF, Model KMW2025/M11 for OEM or embedded communications applications that require high reliability, www.ar-worldwide.com

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A Look Back and Now – (summary)

By Bernie Gollomp

Engineered Materials were Driven by the Industrial Evolution

A brief history around the demands for materials with assured properties from the Industrial Revolution to the 20th century is described. Toward the end of the 19th century, this demand fostered investigations and the growth of scientific knowledge. Five founding United States engineering societies created the Materials Properties Council out of their recognition of the need for an authoritative source for material properties. A description of the emergence and growth of engineered materials, the place of raw shellac as a raw material and late 20th century materials concludes the column.

Feature Articles (*Summaries)*

Applying Test Driven Development to Embedded Software *(Summary)*

James Grenning

"Test Driven Development (TDD) is increasing in information technology applications and product development; however, it has not been widely applied in embedded software development. Embedded developers face many challenges. TDD can help overcome some of these challenges but TDD has to be adapted for embedded systems development".

The author covers these topics: the TDD development cycle, the essence of TDD; Unit test versus acceptance test; TDD skepticism; Winning over some skeptics; the target hardware bottleneck; embedded challenges in adopting TDD; the embedded TDD cycle; tailoring the cycle; when hardware is not available; development system/target compiler compatibility; testable design; testing with hardware; testing in limited-memory environments and shortening the compile-test loop.

The contact for this feature is James Grenning (grenning@objectmentor.com) who is the Director of Consulting at Object Mentor, Inc.

Genetic Algorithms for Autonomous Robot Navigation *(Summary)*

Theodore W. Manikas, Kaveh Ashenayi, and Roger L. Wainwright

A mobile robot that goes into an environment and records data can also be autonomous if it has machine intelligence to allow it to navigate obstacles. Genetic algorithms are used in applications for robot navigation. They are heuristic optimization methods that have mechanisms analogous to biological evolution.

This article discusses the elements necessary for autonomous robot navigation; how a robot senses the environment; the path-planning approach; solving path-planning using genetic algorithms; and the importance of testing the methods in simulations and in the actual robot to pinpoint modifications to ensure acceptable real-time navigation performance.

The contact for this article is Theodore Manikas (theodore-manikas@utulsa.edu) Ph.D., P.E., Assistant Professor, Dept. of Electrical Engineering, University of Tulsa, Oklahoma 74104-3189 USA

Tutorial # 11

An Introduction to FFT and Time Domain Windows

Sergio Rapuano and Fred Harris

“This article includes a brief tutorial on digital spectrum analysis and fast Fourier transform, FFT, related issues to form spectral estimates on digitized signals. Some review of the discrete Fourier transform, DFT, is presented and some discussion on the computational advantages of the FFT calculation. Finally, the main considerations on windowing and window characteristics are briefly discussed.”

The contact for this article is Sergio Rapuano (rapuano@unisannio.it), Università del Sannio, Facoltà di Ingegneria, Corso Garibaldi, 107, 82100 Benevento, Italy.