the institute

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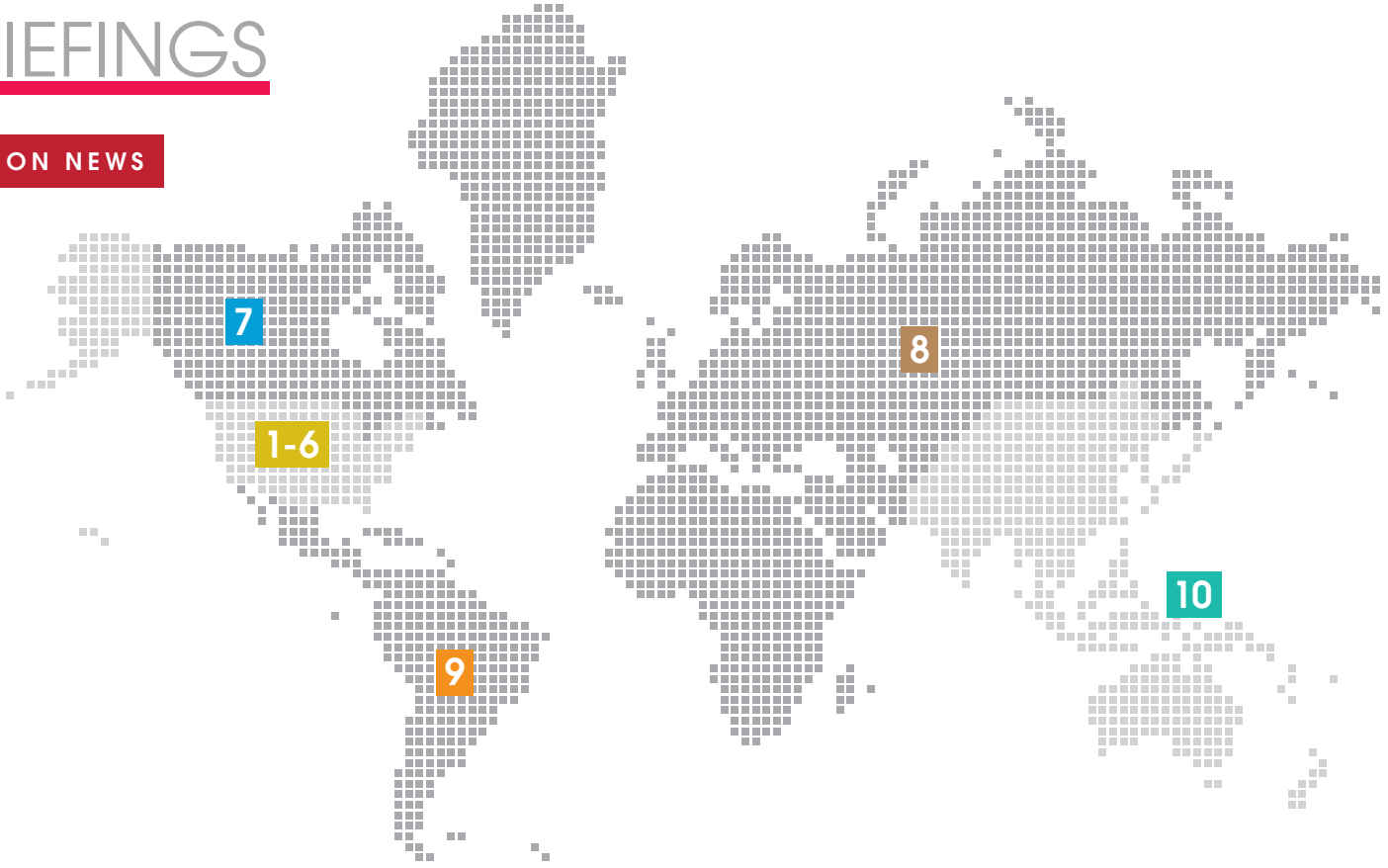
Improving Lives With Technology

Several members are working on quality-of-life applications

IEEE

REGION NEWS



REGION 1 NORTHEASTERN UNITED STATES

■ Student branch at the **University at Buffalo, the State University of New York,** forms IEEE Robotics and Automation Society chapter.

REGION 3 SOUTHEASTERN UNITED STATES

■ **Memphis (Tenn.) Section** forms IEEE Women in Engineering (WIE) affinity group.

■ **Melbourne (Fla.) Section** forms joint chapter of IEEE Aerospace and Electronic Systems, Computer, and Geoscience and Remote Sensing societies.

REGION 5 SOUTHWESTERN UNITED STATES

■ Student branch at the **University of Texas, El Paso,** forms IEEE Robotics and Automation Society chapter.

■ Student branch formed at the **University of North Texas, Denton.**

REGION 6 WESTERN UNITED STATES

■ Student branch formed at **Keck Graduate Institute, Claremont, Calif.**

REGION 7 CANADA

■ **London (Ontario) Section** forms joint chapter of IEEE Broadcast Technology and Communications societies.

REGION 8 EUROPE, MIDDLE EAST, AND AFRICA

■ Student branch formed at the **University of Nicosia, Cyprus.**

■ Student branch formed at **Al-Azhar University, Cairo.**

■ Student branch at **Alexandria University, Egypt,** forms IEEE Nuclear and Plasma Sciences Society chapter.

■ Student branches formed in France at the **University of Picardie Jules Verne, Amiens,** and **University of Technology, Belfort-Montbéliard.**

■ Student branch at the **University of Central Greece, Lamia,** forms IEEE Computer Society chapter.

■ Student branch formed at the **University of Peloponnese, Greece.**

■ Student branch at **University College Dublin** forms IEEE Power & Energy Society chapter.

■ **Kenya Section** forms Graduates of the Last Decade affinity group.

■ **London Section** forms joint chapter of IEEE Broadcast Technology and Communications societies.

■ Student branch formed at **Covenant University, Ota, Nigeria.**

■ **Poland Section** forms IEEE Solid-State Circuits Society chapter and WIE affinity group.

■ Student branch at **University Institute of Lisbon** forms IEEE Robotics and Automation Society chapter.

■ **Russia Section** forms IEEE Magnetics Society chapter.

■ Student branch formed at **King Saud University, Riyadh, Saudi Arabia.**

■ **Sweden Section** forms IEEE Robotics and Automation Society chapter and joint chapter of IEEE Circuits and Systems and IEEE Solid-State Circuits societies.

■ Student branches formed in Turkey at **Istanbul Bilgi University, Karabük University,** and **Mersin University.**

REGION 9 LATIN AMERICA

■ Student branch at **Universidade Federal do ABC, Santo André, Brazil,** forms IEEE Aerospace and Electronic Systems Society chapter.

■ Student branch formed at **Universidad Nacional Abierta y a Distancia, Bogotá.**

■ Student branches formed in Mexico at **Centro Universitario UAEM, Tecnológico de Estudios Superiores de Villa Guerrero, Universidad Tecnológica de Tlaxcala,** and **Instituto Tecnológico de Mexicali.**

■ Student branch at **Instituto Tecnológico Superior de Coatzacoalcos, Veracruz, Mexico,** forms IEEE Industrial Electronics Society chapter.

■ **Nicaragua Section** forms IEEE Industry Applications Society chapter.

■ Student branch at the **National University of San Marcos, Lima, Peru,** forms IEEE Power & Energy Society chapter.

REGION 10 ASIA AND PACIFIC

■ Student branch at **Delhi Technological University, India,** forms IEEE Engineering in Medicine and Biology Society chapter.

■ Student branch at **Regency Institute of Technology, Yanam, India,** forms IEEE Education Society chapter.

■ Student branch at **Sachdeva Institute of Technology, Mathura, India,** forms IEEE Antennas and Propagation Society chapter.

■ Student branch at **Saintgits College of Engineering, Kottayam, India,** forms IEEE Solid-State Circuits Society chapter.

■ Student branch at **Sri Eshwar College of Engineering, Kinathukadavu, India,** forms chapters of IEEE Computer and Communications societies.

■ **Indonesia Section** forms chapters of IEEE Aerospace and Electronic Systems and IEEE Geoscience and Remote Sensing societies.

■ **Malaysia Section** forms IEEE Power Electronics Society chapter.

■ **Singapore Section** forms joint chapter of IEEE Aerospace and Electronic Systems and IEEE Geoscience and Remote Sensing societies.

■ Student branch at **National Tsing Hua University, Taipei, Taiwan,** forms IEEE Industry Applications Society chapter.

SEND US YOUR NEWS The Institute *publishes announcements of new groups once they've been approved by IEEE Member and Geographic Activities. To send us local news, like student branch events and competitions, WIE or preuniversity outreach efforts, or other IEEE group activities, use our form on the Region News page at http://theinstitute.ieee.org/region-news.*

COVER: WILLOW GARAGE; THIS PAGE: ISTOCKPHOTO

CALENDAR

June

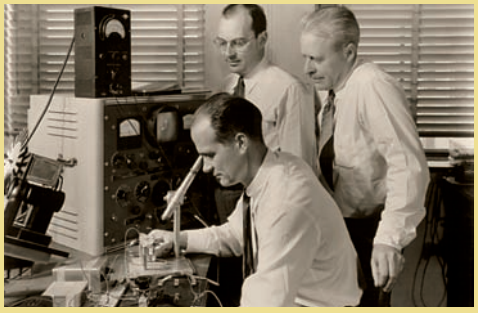
2 1883: The **first elevated electric train in the United States** takes its initial trip, in Chicago.

7 1900: Birthdate of **Frederick E. Terman**, 1940 Institute of Radio Engineers president. Terman received the 1950 IRE Medal of Honor for his contributions to radio and electronics.

13 1934: Birthdate of computer scientist **Leonard Kleinrock** [below], an IEEE Fellow who received the 2012 IEEE Alexander Graham Bell Medal for his contributions to ARPANET, a precursor of the Internet.

19 1902: Birthdate of **Wallace J. Eckert**, an astronomer who predicted the orbits of the planets using IBM electric tabulating machines and punched cards.

26–1 July: IEEE Meeting Series in San Diego.



30 1948: Bell Telephone Labs, in Murray Hill, N.J., announces the **invention of the transistor**, developed by William Shockley, John Bardeen, and Walter Brattain [above].

July

8 1900: Birthdate of composer **George Antheil**, who worked with actress Hedy Lamarr to patent a technique that led to frequency-hopping communications.

15 1965: Mariner 4, an unmanned NASA spacecraft, transmits the **first close-up images of Mars**, taken 9846 kilometers from the planet.

17 1850: Harvard College Observatory takes the **first photograph of a star**.

19 1900: The **Paris Metro subway** [top] goes into operation.

29 1888: Birthdate of Vladimir K. Zworykin, a pioneer of television technology.

August

3 1926: **England's first traffic lights** [above] are installed at Piccadilly Circus, in London.

15 1998: Apple begins shipping its **iMac personal computer**. Nearly 800 000 units are sold in the first four months.

24 Region 1 meeting in Providence, R.I.

Historical events provided by the IEEE History Center. IEEE events indicated in red.

CLOCKWISE FROM LEFT: REED SAXON/AP IMAGES; MUSÉE CARNAVALET/ROGER VIOLLET/GETTY IMAGES; ALCATEL; HILARY MORGAN/ALAMY

NEWS

Members: Remember to Vote

LOOK FOR YOUR annual election ballot package to arrive in August via first-class mail. The envelope will contain a paper ballot and a postage-paid reply envelope. Members will also receive an e-mail with instructions on how they can access the ballot electronically, instead of by mail.

Those eligible to vote include new members as of 30 June and those elevated to member or graduate student member grades on or before that date. Associate members are not eligible.

The member grade requires that you be regularly employed in IEEE-designated fields and have a combination of education and work experience of at least six years. To apply for transfer to member grade, visit http://www.ieee.org/membership_services/membership/grade_elevation.html.

To be eligible to vote, student members graduating between 1 January and 30 June must update their education information online to be elevated to member or graduate student member grade.

To help ensure you receive the ballot package, confirm your contact information, member preferences, and education information at http://www.ieee.org/go/my_account.

—Carrie Loh

JIRI KABELE/ISTOCKPHOTO

Online

Available 7 June at theinstitute.ieee.org

STUDENTS
Student members receive an IEEE award for their home health-monitoring system.

BOOKS OF INTEREST
Free e-books cover topics relating to quality-of-life technologies.

Election Deadlines

15 AUGUST
IEEE annual election ballots are mailed to all voting members by this date. Electronic ballots are also accessible.

1 OCTOBER
Last day that members' marked ballots can be accepted by IEEE, by noon CDT USA/17:00 UTC.

11 OCTOBER
Last day for ballots to be tallied by the IEEE Tellers Committee.

24–25 NOVEMBER
IEEE Board of Directors acts to accept the report of the Tellers Committee. Annual election results are made official.

—C.L.

CORRECTIONS

"Shining a Spotlight on Female Engineers" [March, p. 8] incorrectly stated the total number of IEEE Women in Engineering members. The correct figure is 14 000.

In "Introducing the 2013 Fellows" [March, p. 18], these new IEEE Fellows were inadvertently omitted:
Michael A. Savageau, Carsten W. Scherer, John Schneider, Robert C. Scully, Erchin Serpedin, André Seznec, L. Dennis Shapiro, Gaurav Sharma, Weiming Shen, Prashant Shenoy, William Shieh, Subhash L. Shinde, Claudio T. Silva, Pradeep Kumar Sinha, Kevin Skadron, J. Charles Smith, Stefano Soatto, Mary Lou Soffa, Sang Hyuk Son, John Warren Spargo, Marc Stubbe, Craig B. Stunkel, Dennis Michael Sullivan, Ron Sun, Francesco Svelto, Hirotaka Tamura, Masayuki Tanimoto, and Valerie E. Taylor.

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ELECTION

Where Durrani and Michel Stand on Top IEEE Issues

The two candidates for 2014 president-elect talk about their priorities and IEEE's future

BY ANIA MONACO

WITH THE ANNUAL IEEE election right around the corner, do you know whom you will choose for 2014 IEEE president-elect? To help you decide, *The Institute* asked the candidates, who were nominated by the IEEE Board of Directors—Fellow Tariq S. Durrani [far right] and Senior Member Howard E. Michel [left]—to weigh in on important IEEE issues. The ballots will be be mailed out in August.

Durrani is a research professor in the electronic and electrical engineering department at the University of Strathclyde, in Glasgow. He joined the university as a lecturer in 1976 and headed its electronic and electrical engineering department from 1990 to 1994. Durrani was deputy principal of the university from 2000 to 2006.

He is a Fellow of the United Kingdom's Royal Academy of Engineering, the Royal Society of Edinburgh, and the Institution of Engineering and Technology. In 2003 he was awarded the Order of the British Empire by Queen Elizabeth II "for services to electronics research and higher education."

In 2010 and 2011 Durrani was vice president, IEEE Educational Activities, and in 2003 and 2004 he was vice chair of technical activities for Region 8. He served as president of the IEEE Engineering Management Society in 2006 and 2007 and president of the IEEE Signal Processing Society in 1994 and 1995. He was also the IEEE Communications Society region director for Europe, Middle East, and Africa from 2009 to 2011.

Michel is an associate professor of electrical and computer engineering at the University of Massachusetts in North Dartmouth. His research interests include artificial neural networks and distributed-intelligence sensor networks. Michel is also a consultant to the U.S. Navy on embedded instrumentation and system architecture.

He retired from the U.S. Air Force in 1994 as an engineering manager. During his Air Force career, he was also a pilot and a research engineer, launching seven satellites and directing launch-base tests of booster, satellite, and range hardware. Michel supervised two launches in the People's Republic of China and helped develop engineering processes for mission-critical Defense Department computer systems.

He was vice president, IEEE Member and Geographic Activities (MGA), in 2011 and 2012 and Region 1 director in 2008 and 2009. Michel was the 2009 and 2010 chair of the IEEE Public Visibility Committee, and he served on the IEEE-USA Board of Directors in 2008 and 2009.

The following responses to *The Institute*'s questions were submitted via e-mail and are presented with minimal editing.

What do you see as the IEEE of the future and, as president, how would you influence that?

DURRANI

My vision for IEEE is:

- A worldwide, irresistible magnet that draws professionals, practitioners, academics, and students to its fold—through excellent opportunities and services.
- A home for life for the engineering and technology community and indeed for individuals from cognate disciplines, thus leading to membership retention and growth.

Beyond this, I want IEEE to be seen as:

- The trusted international resource for sharing and advancing knowledge through excellent publications and conferences.
- The leader in setting the pace for technological advances and for maintaining global visibility and adoption of IEEE standards.
- An authoritative

DARREN CARROLL

source of independent advice on technology policy and developments, called upon by decision makers worldwide.

IEEE should make a real difference for our members and for society, all around the world. To achieve this we must make transformative advances that will deliver a transformative impact in all aspects of our work as members, volunteers, and staff.

This vision will be delivered—if I am IEEE president—by giving strategic directions, establishing effective teams and task forces, and overseeing implementation of initiatives focused on meeting specific goals.

MICHEL

IEEE will be the platform for an integrated web of knowledge. While not abandoning our current publishing and conference activities, we need to provide an individualized, real-time way to communicate information, not just for academics but also for all professionals working in our technical areas.

This platform needs to work across our technical disciplines and allow people working in a multidimensional "problem space" to find answers and contribute solutions in a manner they are comfortable with.

I want IEEE to be the respected portal—and our members the respected experts—for all discussions in our technical areas. We can accomplish this by taking the lead with other associations and developing partnerships with other organizations and companies.

If elected, what would be your top two priorities?

MICHEL

- To provide products and services for working engineers to give them the opportunity for career security through career growth, as we now do for academics.

With respect to career security, nobody can give you job security, but IEEE can provide professional networking, continuing education, and platforms (both physical and virtual) where engineers can interact and stay current. IEEE volunteers can learn and practice soft skills. We should do a better job using the IEEE Technology Time Machine event [a symposium for emerging technologies] to guide practicing engineers on new growth opportunities.

- To create an integrated web of knowledge (as I described in my response to the previous question).

DURRANI

My priorities would be:

- To provide members with opportunities to realize their full potential by delivering effective products and services for enhancing their skills base. Thus, ready availability of resources for continuing education and professional development in support of lifelong learning will be a high priority—initiatives that I had promoted as vice president, IEEE Educational Activities.
- To seek greater engagement with industry. To achieve this, I would establish a panel of chief executive/technology officers to advise IEEE on strategic issues. Encourage practitioner-driven and practitioner-oriented products and services.

All this reflects a strong commitment to ensuring that through its activities, IEEE contributes to the enrichment of members' lives and the advancement of society.

What new benefits should IEEE offer its members?

DURRANI

In these turbulent times, there is a compelling need for IEEE to support career development of its members. Thus, the increased and integrated provision of continuing education and professional development of skills, as well as related opportunities, is a key benefit that should be enhanced.

Another benefit should be mass customization of technological information—offering members information products constructed from the whole range of IEEE publications, customized to their needs and suited to their requirements. This additional model for publications is customer-needs driven and user focused.

We should also encourage multilingual publication in IEEE journals and magazines, initially through technical translations, to serve members worldwide and open new markets for IEEE products.

And we must drive toward affordable member rates worldwide through new membership models and progressive benefits.

MICHEL

IEEE currently offers more than 100 benefits. As vice president of MGA, I looked at survey data on what our members want. While many members wanted more benefits, a significant number thought we had too many. But not all benefits are available everywhere. We need to bring all our benefits to all our members within the limits of local laws.

I think the real answer is that we need to do a better job of advertising what we currently offer and concentrate on improving the benefits that members say are of highest value but poorest in delivery. We need to focus on improving them while not impacting delivery of our highly rated products. Benefits that fall into that category are professional networking, continuing education, and online career resources.

In which technical areas should IEEE be more involved?

MICHEL

IEEE should take the lead in big data, including remote sensing and health care data. The world is awash with data that is not useful as information or in providing knowledge. We "own" the technology components; we need to take the lead in bringing technologies together to harness this data so we can advance technology for humanity.

We also need to look at areas that blend our traditional core competencies with technologies that traditionally belonged to others, such as biology, nanotechnology, and green technologies.

DURRANI

There are two roles that IEEE plays in terms of areas of technology development. First, it offers support, dissemination, and popularization. Second, IEEE is very good at identifying emerging areas of technology and their benefits and nurturing these by bringing to bear the key assets that IEEE has in its members—in the form of information, knowledge, and expertise. In this case, the two abiding principles of IEEE are important: "Advancing Technology for Humanity" and "Engineering the Future."

Thus, in the pursuit of these principles, I would advocate that IEEE advances technologies that have a transformational impact through new knowledge, sustained economic growth, jobs, and prosperity worldwide.

Hence, I would suggest focusing on clean and green technologies and renewables, the big-data revolution, energy-efficient computing, cybersecurity, contributing to world health and well-being, and food science.

Is it important to attract more women to engineering?

DURRANI

The answer is an emphatic "Yes." Women offer an important, rich, and diverse perspective. They bring added creativity, enhanced performance, and innovation to a team. In addition, in several countries there is a dire shortage of engineers, and to meet this demand there is a need to attract more women into the engineering profession. If we do not tap the majority of the world's population, engineering will miss out on a huge talent pool.

IEEE has a role in taking the lead to increase women in engineering through the IEEE Women in Engineering (WIE) group. I have been a fervent promoter of the cause of women in engineering and technology. Some of my research with colleagues at the University of Strathclyde is concerned with women's career issues. For more, please read an article I coauthored, "The Glass Ceiling: Is It a State of Mind?" [*WIE Newsletter,* October 2012].

Working with WIE, I will encourage the establishment of a high-level IEEE prize for the "Outstanding Woman Engineer of the Year," who will act as a role model and catalyst for women engineers.

MICHEL

Yes. To paraphrase Glenn Ellis, 2007 U.S. Professor


Michel

of the Year, engineers literally create the world that we live in. This is too important a task to leave to a subset of society and, in my opinion, any subset. Our greatest strength as a society is our diversity.

In some countries, engineering lacks gender diversity. Other parts of the world lack ethnic and religious diversity. We should work to attract a full representation and full participation of all the people of the world. This must be a top priority worldwide, and IEEE should lead the way.

What can IEEE do to help its unemployed members?

MICHEL

IEEE currently provides career security for academics and researchers through our conferences and journals. For long-term solutions, we need to do the same thing for practicing engineers. By creating a suite of products such as the Smart Tech Metro Area workshops [which focus on cutting-edge technologies] for practicing engineers, our members can add to their skill sets and become more valuable as engineers. In the short term, we should make sure every unemployed member knows about the services that we currently provide, such as the IEEE Job Site.

DURRANI

In these turbulent times, there is a compelling need for IEEE to support the career development of its members. Thus, increased and integrated provision of continuing education programs and professional development for new skills and related opportunities are key benefits that should be enhanced.

IEEE-USA has implemented important initiatives to support unemployed members through specific programs, such as those launched by former MGA Vice President Barry Shoop, including the Smart Tech Metro Area workshops. Similarly, job fairs at IEEE conferences and new ways of supporting the networks of consultants are vehicles to be explored.

The establishment of a panel of industry experts, as I proposed in the response to the second question, would bring greater industry engagement with the additional benefit of direct advice to support engineering careers.

How can IEEE retain student members after graduation?

DURRANI

Student members are the lifeblood of IEEE; the future of the organization depends on them. It is clear that IEEE needs to improve its value proposition to students after graduation—through greater engagement, networking opportunities, improved career guidance and support, and through enhanced vehicles for professional development, as well as considering reduced membership fees upon graduation from school.

We should also look at the overall membership fee structure. I believe there can be a gradually escalating fee structure as members advance in their careers. These approaches need to be tested against robust financial modeling of the options available and an associated strong business case.

MICHEL

IEEE loses 75 percent of our undergraduate student members and 50 percent of our graduate students after their first year of membership. As vice president, MGA, I charged our Student Activities Committee and Graduates of the Last Decade (GOLD) committee to come up with a 12-year road map—specific products and services to deliver in each of a new member's first 12 years—to transition new student members into senior members.

I envision IEEE partnering with universities and local industry, probably at the section level, to provide students with networking, résumé writing, and interviewing skills, followed by one-on-one mentoring programs for junior engineers.

We should have a program to let our GOLD members learn and practice soft skills and obtain continuing education—after all, our technologies advance so rapidly that half of what we learned five years ago is dated. Our GOLD members may want to mentor recent graduates and take leadership roles in IEEE activities.

The idea is to provide the network and skills recent graduates need to succeed professionally and get them to see true value in IEEE membership.

Does IEEE need to expand its global reach? If so, how?

MICHEL

Global reach is a vague concept. IEEE had, for the first time in 2011, more members from outside the United States than from within. We have members in 184 countries and offices and staff in 6 countries. Currently, more than 50 percent of our IEEE Xplore digital library downloads are from Asia. Three-quarters of our conferences are held outside the United States.

Does that mean we can't be more global? No.

As president, I'd look for opportunities to expand our ability to impact public policy and public sentiment with respect to our technical areas of interest. But we need to think globally and act locally; we need to involve local volunteers.

Additionally, I would look to grow membership in countries where we have the greatest potential for growth and increase our influence in standards development and educational accreditation.


Durrani

DURRANI

To maintain its role as a global organization, IEEE needs to expand its reach both in terms of depth of activity and breadth of vision. This is as true in North America as it is in other parts of the world.

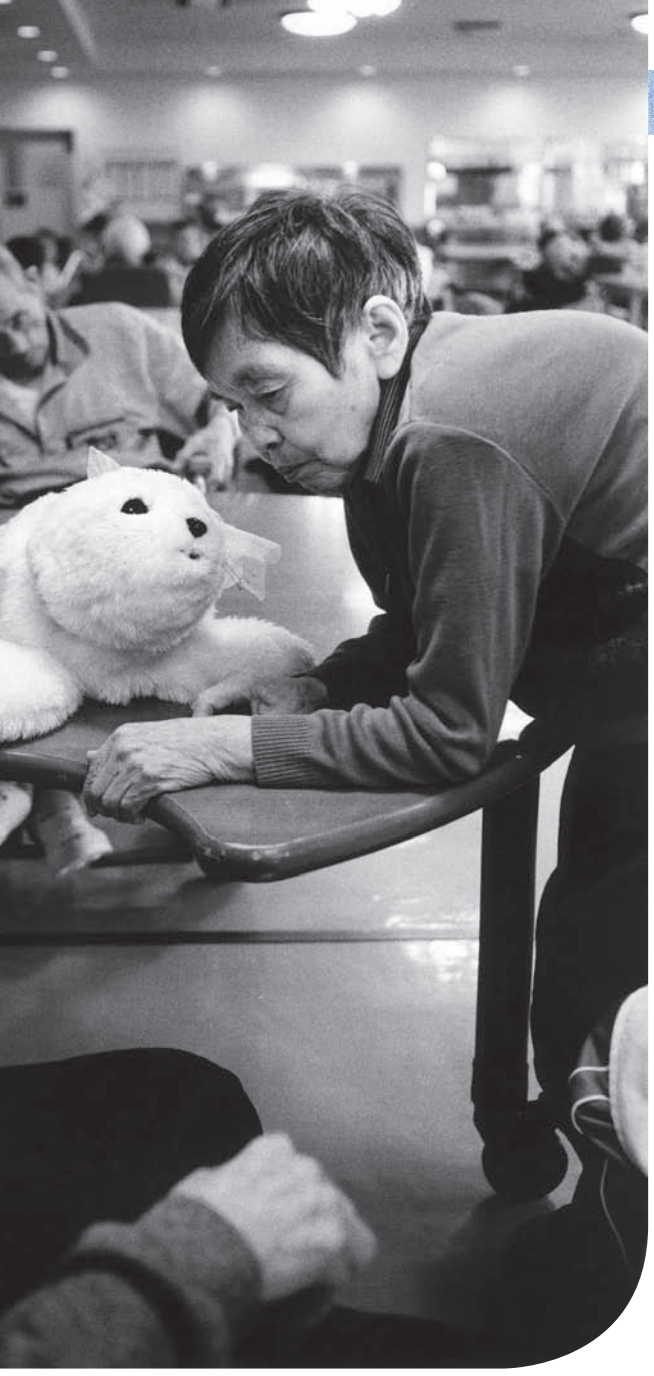
There are two approaches that IEEE needs to take. In some countries, we need to reinforce our presence and attract more members as well as support existing ones through improved and attractive services. In others we need to establish a key role for IEEE.

A key role could be as a provider of independent, authoritative, unbiased and nonpartisan policy advice to decision makers—on areas of technology growth and development and on issues of policy and strategy related to the core competencies and expertise of IEEE members. Emerging economies of the BRIC [Brazil, Russia, India, and China] countries and others, such as South Africa, Turkey, Indonesia, Colombia, and Vietnam, are a case in point.


PARO, an interactive robotic seal, is used as a therapeutic tool for patients with cognitive and psychological disorders, at a nursing home in Nanto, Japan.

DARREN CARROLL (2)

ICON PHOTO: WILLOW GARAGE; THEODOR BARTH/LAIF/REDUX



TECH TOPIC

Technologies Improve Quality of Life

IEEE members are working on robots and smart wheelchairs to help those in need BY ANIA MONACO

AS PEOPLE live longer, the number of those with disabilities will rise significantly. About 15 percent of the world's population today lives with some form of disability, up from 10 percent in the 1970s, according to the World Health Organization. Many disabled people are hard-pressed to do such household chores as cleaning and cooking or even simply moving around. But innovative technologies are being developed to help, and IEEE members are at the forefront of these efforts.

In this special issue, *The Institute* takes a look at the work of several IEEE members concentrating on quality-of-life technologies. Member Kimitoshi Yamazaki and his colleagues have developed a life-size humanoid robot that sorts laundry, sweeps floors, and performs other chores. Member Moritz Tenorth is working on a humanoid for cooking and other household tasks. Member Takanori Shibata has developed a furry, robotic seal (see photo) used therapeutically for patients with cognitive and psychological disorders.

And still more helpful technologies are in the works. Senior Member Hung Nguyen is developing a wheelchair steered by brain waves, while Senior Member Mahesh Krishnamurthy is building a motion-detection system with infrared sensors that makes a wheelchair more aware of its surroundings [p. 11].

There's also the work of IEEE Fellow Takeo Kanade [p. 16] in Pittsburgh at the Carnegie Mellon University Quality-of-Life Technology Center. Plus, several IEEE standards and conferences [p. 14] tackle topics related to improving people's lives.

CHORE BOTS

In Japan, the number of people older than 65 is expected to balloon: from 20 percent of the population in 2005 to 40 percent by 2055. Such statistics inspired Yamazaki to develop a robot to help with household tasks. The assistant professor at the University of Tokyo and his colleagues have built a 1.5-meter-tall, two-armed robotic housekeeper on wheels. Its onboard computer accepts commands from the patient that tell the robot to perform any number of chores, including picking up a tray and taking it to the kitchen, putting dirty clothes in the washing machine, and sweeping the floor with a broom.

To perform its chores, the robot must know about the world around it. "One of the biggest challenges is teaching the robot about real objects and programming it to recognize and manipulate them," Yamazaki says. His robot uses cameras and sensors to map an environment such as a kitchen. It then produces a database of objects in the house—together with their movable parts, grasping points, and other task-related information—so it will know what to manipulate to perform a chore.

"We use a 3-D geometrical simulator to define a virtual world in which the objects are arranged," Yamazaki explains. With this information, he and his team programmed the robot to perform each task.

Although such robots have been in development for decades, Yamazaki notes that recent advances have paved the way for them to become a reality.

"A combination of higher CPU power and more reliable hardware has allowed for the development of life-size robots with human-like bodies that can perform daily tasks," he and his colleagues wrote in "Home-Assistant Robot for an Aging Society," which appeared in *Proceedings of the IEEE* in August. The issue, dedicated to quality-of-life technologies, is available in the IEEE Xplore digital library.

PERSONAL COOKS

Tenorth, a postdoctoral scholar at the University of Bremen Institute for Artificial Intelligence, in Germany, is working on a similar robot.

"A key motivator for my team was helping elderly and disabled people stay independent," he says. "While personal and social contact is crucial—and cannot be replaced by robotic assistants—we believe robots can serve as tools that give autonomy to people." One of the robots he is working with, PR2, came from Willow Garage, a company in Menlo Park, Calif., that develops robots and open-source software.

PR2 has been programmed to perform a number of kitchen tasks, including making pancakes, boiling sausages, and preparing sandwiches. It can unload a shopping basket and fetch items from drawers, too.

"Our two key developments are the cognitive robot abstract machine [CRAM] plan-based control architecture and the KnowRob knowledge base," Tenorth says. "CRAM is a framework for specifying and executing cognition-enabled robot control programs. KnowRob is a processing system that provides autonomous robots with knowledge they need to competently perform everyday manipulation tasks. Together, they allow programmers to quickly develop cognition-enabled robot control

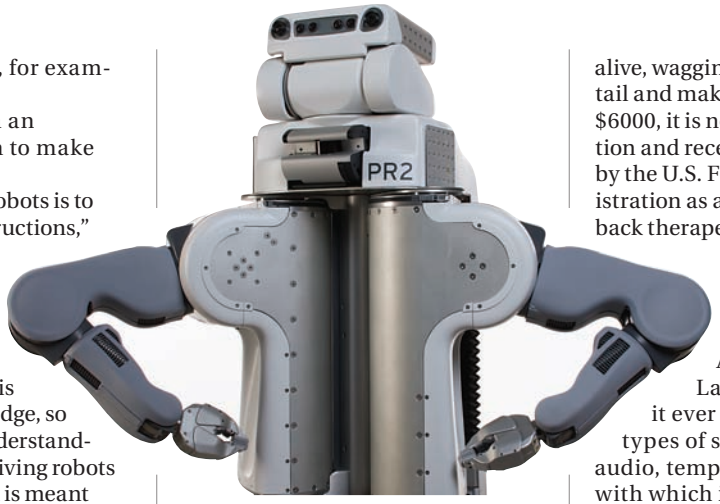
programs for making, for example, a sandwich."

The robot relies on an inference mechanism to make decisions on the fly.

"A big challenge for robots is to understand vague instructions," Tenorth says. "When humans explain a task to each other, they omit important information that is obvious. Robots lack this common-sense knowledge, so they have problems understanding vague directions. Giving robots the ability to infer what is meant from what is said is a huge research challenge that we started to address in different projects, for example, in the EU's RoboHow project."

Much work lies ahead before PR2 moves out of the laboratory.

"Apart from the daunting price tag [about US $400 000], such robots are not yet robust and useful enough to operate autonomously in real human households," Tenorth says.



The PR2 robot is designed to assist humans with various household tasks, such as fetching coffee, folding clothes, and even making pancakes.

THERAPUTIC HELPERS

Pets have been used for years to help patients suffering from depression and stress or as a way to increase brain activity and encourage communication. Inspired by such therapy, Takanori Shibata, a chief senior research scientist at Japan's National Institute of Advanced Industrial Science and Technology, in Tsukuba, built a robot that resembles a cuddly animal. PARO looks like a furry seal, is about the size of a real baby harp seal, and responds as if it were alive, wagging its head, flippers, and tail and making sounds. Selling for $6000, it is now in its eighth generation and recently became certified by the U.S. Food and Drug Administration as a neurological biofeedback therapeutic device.

Shibata, who developed PARO in 1998 as a visiting research scientist at MIT's Artificial Intelligence Lab, has been refining it ever since. PARO has five types of sensors—tactile, light, audio, temperature, and posture—with which it can perceive people and its surroundings.

For example, with the tiny tactile sensors that cover PARO's entire body, it feels when it is being stroked or hit or is merely being held, thanks to a posture sensor that determines the orientation of the patient's body. With its audio sensor, PARO can recognize some words and the direction a person's voice is coming from, as well as learn its own name (if the patient gives it one.) It can also sense expressions of kindness, such as words of praise, because it can interpret the tone of a person's voice.

Since 2003, PARO has been used in hospitals in Australia, Europe, Japan, and the United States for patients with cognitive disorders such as dementia, autism, and Down syndrome, as well as brain injuries and psychological problems. The robot seal was used to help victims psychologically traumatized by the 2011 earthquake in Japan.

PARO can learn to behave in a way the user prefers. If gently stroked, for example, PARO will remember what it did just before the stroking began and learn to repeat the action. And if the robot is smacked, PARO takes that as a disciplinary action, remembers what it did just before the reaction, and tries not to do it again.

Shibata says he hopes to create other versions of his seal suited for particular disorders, including the teaching of social skills to children with developmental problems.

"Those who use PARO seem to be very happy with it," he says. "I hope to see more make their way into medical facilities and even people's homes."

TECH TOPIC

Building Smarter Wheelchairs

Making life a little easier for people who can't walk BY KATHY PRETZ

TWO IEEE senior members are working on technologies that could give wheelchair users more independence and a better quality of life. Hung Nguyen has developed a chair that can be steered by brain waves to help people with severe spinal cord injuries. Mahesh Krishnamurthy has designed an environmental-adaptive system to make a robotic wheelchair more aware of its surroundings, which is meant for those who are parapalegic.

HARNESSING THOUGHTS

Severely disabled individuals currently have limited ways of operating wheelchairs. People who can't move their bodies send movement signals through a chin stick, and those who can't move their heads control the wheelchair by blowing air onto a sensor. Realizing that both methods can be exhausting, Nguyen, the dean of engineering and information technology at the University of Technology, Sydney, and his team at the Centre for Health Technologies there came up with what they say is a better hands-free wheelchair, dubbed the Aviator.

The patient thinks about where the Aviator is to go, and then it heads in that direction. The system relies on a brain-computer interface based on electroencephalography (EEG). It translates brain signals into commands to drive the chair.

Two electrodes serve as the thought sensors. They are fastened to the head near the visual cortex and parietal cortex and connected to a sensitive EEG amplifier. The electrodes are worn in a headband, and the amplified signals are sent wirelessly to a laptop, which will be replaced in the next version, Nguyen says, by a microcontroller housed in a box on one side of the chair. A guidance system relying on cameras allows the chair to avoid obstacles and navigate through crowds.

Users steer their wheelchair with four separate thought commands. To move forward, they visualize a Rubik's cube or a die rolling forward. To turn left, they mentally write a letter. To turn right, they perform a simple arithmetic problem, such as a series of one-digit multiplications. To stop, they close their eyes.

"The chair is easy to control," Nguyen says. "Users can even control the wheelchair from a distance—for example, signaling the wheelchair to roll to them and then transferring themselves into it."

Hung Nguyen [right] and two of his students show off a prototype of their Aviator wheelchair.

SENSING SURROUNDINGS

Krishnamurthy, a professor of electrical and computer engineering at the Illinois Institute of Technology, in Chicago, was asked to create a low-cost, power-assisted wheelchair that could sense its surroundings and would be simple to operate. A local wheelchair user made the request to the university's Institute of Design, which came to Krishnamurthy's research group for technical help.

Krishnamurthy began with a widely used conventional manual chair and added an electric power boost. He then combined a classic motor control method with a novel approach that lets the wheelchair adapt to the driving conditions. It uses motion detection that relies on a pair of infrared sensors to recognize hand and arm movements and a three-axis gyroscope combined with an accelerometer.

Power to each motor depends on commands received from the user combined with feedback collected by the sensors. The drive includes a brushless DC hub motor and a Hall Effect sensor for each wheel, which measures the motor's speed and acts as a position sensor to drive the motor. In addition, a motion sensor detects uphill and downhill angles as well as left- and right-leaning slopes to increase the left and right motor's torque. It's all driven by a 36-volt, 10-ampere-hour lithium-ion battery.

One challenge for a wheelchair user is caused by the moderate changes in a sidewalk's center-to-street grade. In conventional power-assist chairs, such banking can cause the chair to veer toward the street unless additional force is applied to the street-side wheel. Another problem occurs when a wheelchair going uphill needs to turn left or right. More force must be applied to just one wheel. Such variations require extra muscle effort and could cause the chair to tip over.

Krishnamurthy's chair combines a motion sensor and gyroscope with the two motor drives. Using an environmental adaptive-control strategy, the system controls the two motors with feedback from the sensor regarding the incline of the pavement. The torque automatically increases as the chair goes uphill. On a banked sidewalk, the system automatically distributes torque between the wheels.

"No matter what the driving circumstances—uphill, downhill, or banking—from the user's perspective, ideally we want nothing to change," Krishnamurthy says. "They should be able to push equally on both sides so that one arm does not feel any more tired than the other."

Even better, he says, there are no buttons to push or levers to adjust. "It's not meant to be technologically intense," he explains. "You don't have to predict too far in advance about when you will have to ramp up or push really hard. The wheelchair senses conditions and, after a small delay, starts applying the right amount of torque to each wheel."

The other component the team developed relies on a push-and-go strategy. This approach also controls the speed of the two motors with the infrared sensors. These are critical components, responsible for detecting the user's intended motion and then acting as pulse generators to control the motor's speed. Much cheaper than torque-and-speed sensors, the system senses arm movements when the user pushes the wheels, triggering the motors. When the arm motion stops, the sensors signal the controller to turn off the motors.

Other input comes from the gyroscope, which reacts to road conditions. The system can distinguish between traveling uphill and hopping over a curb, allowing the user to apply the same amount of "push" to the wheels independent of conditions.

"We are trying to reduce stress on patients' muscles while at the same time avoiding muscle atrophy," Krishnamurthy says. "We hope that people who use this chair find it to be a simple yet effective addition to their daily lives, whether it is for a short or long period of time, without having to learn to use it."

ICON PHOTO: WILLOW GARAGE; MATTHEW DUCHESNE

QUESTION OF THE MONTH

Has Technology Made Your Life Better?

IEEE members continue to work on ways to improve the quality of life for the elderly and for people with disabilities. For example, they're developing robots to help with chores around the house and assist in rehabilitation [p. 9] and smart wheelchairs that can be steered by brain waves or sense their surroundings [p. 11]. And older technologies have for years enhanced the daily lives of many.

If you're disabled, which technology has most improved your quality of life, and how?

Respond to this question by commenting online at http://theinstitute.ieee.org/opinions/question. A selection of responses will appear in the September issue of The Institute *and may be edited for space. Suggestions for questions can be sent to institute@ieee.org.*

RESPONSES TO MARCH'S QUESTION

What Are Computing's Biggest Problems?

IEEE has launched the Rebooting Computing initiative [see "The Future of Computing," March, p. 6] to explore challenges facing high-performance computers. In turn, the Rebooting Computing Working Group is examining efforts under way to cram ever more performance into smaller chips, improve computers' performance while making them more energy efficient, and tackle the problems with data centers, which run on enormous amounts of electricity.

What do you believe is the greatest challenge facing high-performance computers, and what can be done to overcome it?

The following responses were selected from comments that appear at http://theinstitute.ieee.org/opinions/question/what-are-computings-biggest-problems.

SOFTWARE SLOWDOWN

The biggest challenge facing high-performance computing is that software is unable to keep up with hardware enhancements. System performance depends enormously on the quality of the software being run. At some point, adoption of new hardware improvements will come to a halt until groundbreaking software is developed.

Prakash Joseph

CODING PROBLEMS

Over the last 40 years or so, the tremendous increase in computing power has been quickly absorbed by improvements in software, interfaces, and more.

On the other hand, software developments such as automatically generated code, language constructs, and the constantly increasing automation applied to software creation have produced code that runs inefficiently. Critical examination of the efficiency of the most frequently used portions of code and careful recoding would solve some of these problems.

Bob Niemi

MULTITHREADS

With multicore computers becoming a standard even for embedded systems, it is important to develop tools that handle multithreaded execution. Unfortunately, few colleges offer courses in multithreaded programming.

Threading models vary greatly and are not part of most computer languages. Ideally, a threading model would translate seamlessly to cloud computing instead of requiring custom application programming based on the cloud service. Security cannot be excluded, nor should it be an afterthought in any software design. Code signing, encryption, and including stack-guard bytes should be standard practice.

Howard Hobbes

SPEED THINGS UP

The biggest challenge facing high-performance computing in the United States is the lack of incentive for Internet service providers to make significant upgrades to the Internet infrastructure. If ISPs created a faster connection, we could increase the distribution options of our workloads all across the country—or even the world—by reusing the computers that already exist, instead of centralizing our computing in special high-power clusters.

John Mick

OPEN SOURCE

One of the biggest challenges is closing the gap between central processing units and input/output. We need to be able to push massive amounts of data into computing nodes. Hadoop (an open-source software framework that supports data-intensive distributed applications) has addressed many of these challenges, and that's why it has become so popular.

Ismail Ari

FAULT-TOLERANT DESIGN

We need more solutions to problems that do not require absolute precision and can tolerate errors in calculations. This would reduce the need for error-free operation in most computer hardware and result in a dramatic increase in available computing power.

Fred Stentiford

ICON PHOTO: WILLOW GARAGE; ROGER RESSMEYER/CORBIS

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PRESIDENT'S COLUMN

"Futurecasting" IEEE

IEEE needs to anticipate changes in technology and business landscapes that might disrupt its operations

IMAGINE YOU AWAKE from a very deep sleep and it's the year 2030. IEEE is now the best organization of its kind—not just better than today but the absolute best. What do you see?

That is precisely the question the IEEE Board of Directors wrestled with at its January and February meetings. With the help of IEEE Member Brian David Johnson, an Intel futurist, the board engaged in "futurecasting," an exercise in envisioning an organization's future. Some examples of the ideas that emerged include: Half of all IEEE members will be women; IEEE will be No. 1 in bio- and healthcare engineering; and IEEE will be a household name.

Whether those 2030 forecasts come true or not, a key strategic priority that emerged from the discussions is that IEEE needs to anticipate changes in the technology and business landscapes that might disrupt our operations.

In a recent *Harvard Business Review* article, Larry Downes and Paul F. Nunes discuss "big bang" disrupters of business: innovations, new products, and even new markets created in brief spans of time that capture enormous attention from consumers and wreak havoc on ill-prepared businesses.

Perhaps the best example the two cite is the pinball machine—an entertainment staple from the 1950s to the 1990s. In 1993, pinball machine sales were among the highest they had ever been. A few years later sales plummeted nearly to zero, forcing pinball-machine manufacturers to dramatically rethink their businesses or shut their doors.

What was the big-bang disrupter that took down the electromechanical pinball machine? I daresay you, your children, or your grandchildren are all too familiar with it: the Sony PlayStation. Where pinball machines sold for thousands of U.S. dollars, the PlayStation cost hundreds. Where pinball machines offered but a single game, a PlayStation offered many. Where playing pinball meant having to leave home, the PlayStation console was ubiquitous and instantly available beside your TV.

IEEE recently took steps to mitigate a potential big-bang disrupter to its publishing operation: open access. We now provide authors with an open-access publishing option. Upon acceptance of their article, authors have the option of paying a fee to have that article published and to allow anyone who wants to read it to do so without charge. This action reflects IEEE's responsiveness to changes in the publishing landscape and a willingness to meet significant changes to traditional business models head on. Although we have been proactive in responding to this potential disrupter, we must continually ask ourselves: What's next?

EVERYBODY'S BUSINESS

IEEE members have contributed to the discovery, development, and delivery of almost every technology in our world today. It's also a pretty good bet that IEEE members will be involved in the invention of a technology that will prompt IEEE to reinvent the way it operates. So, how does IEEE anticipate disruptions to our operations?

Our community must envision what IEEE could be like by 2030—and then each and every one of us needs to actively engage in anticipating disruptions and fine-tuning that dream. Once that is accomplished, we ought to set our sights on 2050.

As IEEE continues to write its future, disruptions to our efforts must not only be anticipated but also subsumed into our ongoing endeavors. What were once seen as disruptions will merely become variables to consider as we move forward.

With almost 430 000 members from nearly every corner of the world, our organization is unparalleled in terms of collective backgrounds, skill sets, and experience. If our entire community turned its focus to this strategic priority—even briefly—I believe significant, creative possibilities would emerge.

Our collective thinking has never been more important. And it starts with you. In the coming months, whether on your own or at an IEEE meeting, engage in an hour or so of futurecasting.

Then, when you have time, share your thinking with me on your vision for IEEE in 2030 and the next potential big-bang disruption. You can reach me at president@ieee.org or through my blog, http://sites.ieee.org/pstaecker.

We all need to participate in charting the path of IEEE's future.

Peter Staecker
2013 IEEE President and CEO

CONFERENCES: JUNE–SEPTEMBER 2013

Upcoming IEEE conferences that cover topics related to quality-of-life technologies

IEEE International Conference on Rehabilitation Robots

SEATTLE; 24–26 JUNE

TOPICS: Assistive, diagnostic, medical, rehabilitation, and therapeutic robots; neuroprosthetics; robotic wheelchairs; robotics for motion analysis; human-machine interaction; robots for improving social interaction; and mechatronics in prosthetics.

SPONSORS: IEEE Engineering in Medicine and Biology and IEEE Robotics and Automation societies
VISIT: http://www.icorr2013.org

International Conference on Human-System Interaction

GDANSK, POLAND; 6–8 JUNE

TOPICS: Robot-human interaction, wireless network systems for telemedicine, e-health, diagnostic systems, remote health care, wearable sensors, and security systems for the disabled.
SPONSORS: IEEE, Illuminating Engineering Society
VISIT: http://hsi.wsiz.rzeszow.pl

Workshop on Design Challenges in Mobile Medical Device Systems

NEW ORLEANS; 24–27 JUNE

TOPICS: All aspects of mobile medical device systems, including hardware platforms and architectures, drug delivery systems, automatic control systems, energy harvesting and sustainability, security and privacy concerns, and regulatory issues.
SPONSOR: IEEE Communications Society
VISIT: http://dc-mmds.cs.wpi.edu

International Workshop on Robot Motion and Control

WASOWO, POLAND; 3–5 JULY

TOPICS: Neural networks in robot motion and control; control, modeling, and parameter identification of robots and manipulators; and trajectory planning and collision avoidance for mobile and medical robots.
SPONSORS: IEEE Control Systems and IEEE Robotics and Automation societies
VISIT: http://romoco.put.poznan.pl

International Conference of the IEEE Engineering in Medicine and Biology Society

OSAKA; 3–7 JULY

TOPICS: Biomedical imaging, bioinstrumentation, wearable sensors, cardiovascular and respiratory systems engineering, neuromuscular rehabilitation technology, medical robots, health-care information systems, and telemedicine.
SPONSOR: IEEE Engineering in Medicine and Biology Society
VISIT: http://embc2013.embs.org

International Conference on Health-Care Informatics

PHILADELPHIA; 9–11 SEPTEMBER

TOPICS: Health-care delivery in developing countries, information technology for health-care workflow management, telemedicine, medical data management, computer-aided diagnosis, biomedical modeling and simulation, biometrics, and medical robotics.
SPONSOR: IEEE Computer Society
VISIT: http://www.ischool.drexel.edu/ichi2013

STANDARDS

Quality-of-Life Standards

Several IEEE standards focus on health-device communication

BY ANIA MONACO

IEEE 11073-10441

RELEASED MARCH 2013

The "Standard for Health Informatics—Personal Health Device Communication Part 10441: Device Specialization—Cardiovascular Fitness and Activity Monitor" supports interoperable communications among devices that measure both a person's activity and physiological responses, and compute engines, such as cellphones, computers, and set-top boxes.

ISO/IEEE 11073-10417

RELEASED JANUARY 2012

The "Standard for Health Informatics—Personal Health Device Communication—Part 10417: Device Specialization—Glucose Meter" supports plug-and-play interoperability between personal glucose meters and compute engines.

ISO/IEEE 11073-10407

RELEASED MAY 2010

The "ISO/IEEE Standard for Health Informatics—Personal Health Device Communication—Part 10407: Device Specialization—Blood Pressure Monitor" defines communications between personal telehealth blood pressure monitors and compute engines in a manner that enables plug-and-play interoperability.

The following standard is under development. If approved by the IEEE-SA Standards Board, it will be added to the IEEE 11073 family.

IEEE P11073-10419

The "Draft Standard for Health Informatics—Personal Health Device Communication—Device Specialization—Insulin Pump" specifies the possibilities of information exchange between interoperable insulin pumps and compute engines.

For more information on these and other standards, visit https://standards.ieee.org.

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PROFILE

Takeo Kanade: Partnering With Robots

Help for the elderly and disabled

BY SUSAN KARLIN

IEEE LIFE FELLOW Takeo Kanade is no stranger to high-profile engineering projects. He has helped develop robots for military, space, and entertainment applications. But during the past decade, he turned his attention to what he calls the less glamorous but more fulfilling development of quality-of-life robots.

Kanade, a professor at the Carnegie Mellon University Robotics Institute, in Pittsburgh, is the founder of the university's National Science Foundation Engineering Research Center and served as its director from 2006 until last year. The ERC develops quality-of-life technologies such as robots that perform household chores. Kanade was guest editor for the August 2012 *Proceedings of the IEEE* special issue on the subject.

His specialty is computerized vision recognition—software and hardware that enable computers to "see" by electronically acquiring, processing, and analyzing images. Kanade's 40-year career has focused on several areas of robotics, including manipulators, sensors, and autonomous mobile robots, as well as multimedia applications that rely on a large number of cameras to model the environment.

His work overseeing ERC projects has made him revise his whole approach to robotics, he says: "In the past, robots were designed for autonomy in manufacturing, space, and military industries. The idea was to reduce human involvement and, by doing so, decrease production costs and increase safety. Quality-of-life robotics is the opposite. Humans are now part of the system. But humans are the most difficult and least understood part of it—that's the challenge."

It's an interdisciplinary research area. Clinicians and caregivers are involved, describing patient needs and giving feedback on prototypes. "Instead of starting out with engineers saying, 'Let's build this cool robot and see if people like it,' you need to start with what people want and how they'll accept working with a robot," Kanade says.

A HELPING HAND

Kanade has overseen a variety of projects at the ERC, including cellphone apps that tell you when the next bus is coming and robots that prepare meals. The Home Exploring Robot Butler is a two-armed robot on wheels that can pick up objects, like cups and milk cartons. The Personal Mobility and Manipulations Appliance is a wheelchair with arms that can be controlled by the rider or remotely by a caregiver.

First-person vision is another ERC research area. One project applies a wearable camera that captures the point of view of the user to better understand the person's interaction with the environment and determine whether cognition and motor skills are deteriorating. Camera data is sent to a computer, which analyzes the images. Once the system understands what the person is doing and needs, it can offer the appropriate advice by voice or display.

FINDING INSPIRATION

Kanade discovered his calling as an undergraduate electrical engineering student at the University of Kyoto. He found a mentor in Toshiyuki Sakai, a professor at the university and a pioneer of real-time speech recognition. "I thought, 'If we can teach a computer to recognize speech, why not make it visually recognize objects such as faces?'" Kanade says.

Graduating in 1968, he continued at Kyoto for his master's degree (in 1970) and Ph.D. (1973) in electrical engineering, pioneering a computer face-recognition system. He then joined the university as an assistant professor of information science during an exciting time in his country's technological history. "It was the dawn of computer science in Japan," he says. "Computers were moving from number-crunching machines to ones used for what was then called non-numerical information processing, or what today is called multimedia."

After a guest-researcher stint at Carnegie Mellon, in Pittsburgh, in 1977, Kanade joined its Robotics Institute in 1980, where he focused on autonomous systems. In 1984, he initiated and led the Defense Advanced Research Projects Agency–funded Autonomous Land Vehicle project to develop a self-driving, all-terrain vehicle with computers, cameras, and 3-D sensors on board. Kanade's group also developed 3-D vision systems for planetary exploration, as well as a robot that moves along trusses like an inchworm.

He gained some notoriety when his project, EyeVision,

ICON PHOTO: WILLOW GARAGE; CARNEGIE MELLON UNIVERSITY

an instant-replay system inspired by the movie *The Matrix*, was developed for CBS TV and used in its 2001 Super Bowl coverage—earning him an interview during the network's game coverage. "I'm the only professor who ever appeared on the Super Bowl," he says, laughing. He later had a cameo in *Surrogates*, a 2009 science fiction movie starring Bruce Willis. The movie used archived TV footage of Kanade talking about robots becoming smarter than humans.

By 2000 he began thinking about robotics in more symbiotic terms and, five years later, he landed a US $5 million annual grant from the NSF to start the ERC. The grant ends in 2015, by which time the center is expected to be self-sustaining through patent royalties and other funding.

An impetus for Kanade's focus on quality-of-life technologies was his aging mother's rapid decline after an accident that significantly decreased her mobility. Kanade was visiting her frequently in Japan, and he wanted to monitor her between visits. He wondered whether robotics could help. "My mother died before I got the grant," he says, adding that her spirit propels his work.

"As a young engineer, I think I was romantic about the future of robotics," he says. "I believed that robots and computers would be smarter than humans. Now, I believe that robots and humans enhance each other's performance. I see them as having a beautiful friendship."

ANTONIO ORLANDI (4)

PART-TIME PASSIONS

Aviators of IEEE

BY SUSAN KARLIN

THEY'RE A SMALL but hearty bunch. Accomplished amateur pilots and members of the IEEE Electromagnetic Compatibility Society (EMC), they discovered one another at society meetings and formed a squadron of their own: the EMC Aviators Club.

Whenever any of the club's 10 members are attending the same IEEE conference, they try to find time to fly together and discover the countryside from above. The members hail from five countries.

Late last year, four of them—IEEE Fellows Andy Marvin and Antonio Orlandi and Senior Members Richard Perdriau and Ghery Pettit, who is also the society's president—entered the spotlight.

Marvin wrote an article for *IEEE Electromagnetic Compatibility Magazine* (Vol. 1, Issue 4) about their September flight from the EMC Europe 2012 Conference, held in Rome, to L'Aquila, in central Italy, where Orlandi teaches. "We wanted to see from the sky how the city is rebuilding after an earthquake destroyed it in April 2009," Orlandi says.

Marvin and Orlandi launched the club after they met at the 2007 EMC Symposium in Honolulu. A few months later, Marvin recruited Perdriau at a society conference in Detroit. Perdriau met Orlandi at a conference in Switzerland, and so it went.

"Flying is the best fun you can have with your clothes on," Marvin says with a laugh. "It's a buzz, and there's an element of risk."

Marvin, a professor of applied electromagnetics at the University of York, in England, is the club's lone glider pilot, a 44-year veteran of the sport and a glider aerobatics instructor. The others fly mainly two- and four-seat, single-engine Cessnas and Piper Arrows. Marvin took up the hobby at age 18, when color blindness kept him from becoming a military pilot. Gliders might seem an odd alternative to jet fighters, but "you really have to be able to fly well," Marvin explains. "You can't stay in the air for hours and cover hundreds of kilometers without an engine unless you know what you're doing."

When a medical condition sidelined Perdriau and his plans for a commercial aviation career, he opted 15 years ago to fly the single-engine planes for fun. Now a professor of electronic engineering at the ESEO Group Graduate School of Engineering, in Angers, France, He flies some 15 to 20 hours a year and teaches flying to keep his skills sharp. For Perdriau, who loves weekend jaunts to Spain and the Channel Islands, flying is about speed and freedom and being able to look down smugly at the snarled traffic headed to the beach.

Orlandi, a professor of electrical engineering at the University of L'Aquila, was introduced to flying by IEEE Life Fellow Clayton Paul when the two worked together at the University of Kentucky, in Lexington. Returning to Italy, Orlandi earned his pilot's license in 2001 and now flies twice a month from his home field at the Urbe Airport, in Rome. "I like the discipline of flying, to stick with the rules," Orlandi says, "and making the effort in doing the right things, at the right moment, in the right way."

Like the others, Pettit, an EMC regulatory compliance manager at Intel in Olympia, Wash., dreamed of flying as a child. His dream became a reality in 2001, and he now logs 25 to 50 hours each year flying light aircraft across his home state.

Naturally, the four men's engineering backgrounds enhance their flying experience. "I have a better understanding of what I'm doing; it's more fun when you know the physics behind it," Perdriau says.

It's also relaxing. "Flying takes all the care and stresses of the day and puts them on the back burner," Pettit says. "You're totally focused on what you're doing, and your other cares cease to be of concern."

The four expect to reunite in August at the IEEE EMC Symposium in Denver and again in September at EMC Europe, in Bruges, Belgium.

"It'll be an excuse to get together, do some flying, and enjoy some good Belgian beer," Pettit says, "but not all at the same time."

Andy Marvin

OCCUPATION
Professor of applied electromagnetics

HOMETOWN
York, England

Richard Perdriau

OCCUPATION
Professor of electronic engineering

HOMETOWN
Angers, France

Antonio Orlandi

OCCUPATION
Professor of electrical engineering

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Ghery Pettit

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IEEE James L. Flanagan Speech and Audio Processing Award
For an outstanding contribution to the advancement of speech and/or audio signal processing.
SPONSOR: IEEE Signal Processing Society

IEEE Fourier Award for Signal Processing
For an outstanding contribution to the advancement of signal processing, other than in the areas of speech and audio processing.
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For outstanding contributions to solid-state devices and technology.
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For exceptional contributions to the advancement of Internet technology for network architecture, mobility, and/or end-use applications.
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For outstanding contributions to information storage systems, with emphasis on computer storage systems.
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For outstanding contributions in electrical measurements.
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For an outstanding contribution to the fundamentals of any aspect of electronic circuits and systems that has a long-term significance or impact.
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For outstanding contributions to the integration of computers and communications.
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For outstanding contribution(s) to the advancement of power electronics.
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For outstanding contributions to emerging technologies recognized within recent years.
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For outstanding accomplishments in the management of research and development resulting in effective innovation in the electrical and electronics industry.
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