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INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS

Power and Energy

Essential Technologies for Energy Efficiency & Management

Gurshan Sidhu
Consultant
Thursday 28 May 1200 - 100pm
BC Hydro Edmonds - Aud'm Centre Room
6911 Southpoint Drive, Bby

In 2003, a widespread blackout affected 50 million people in eight U.S. states and two Canadian provinces. The following year, the U.S. Department of Energy, Office of Electric Transmission and Distribution, formed a group of stakeholders in the electric industry to design "GRID 2030." The aim of this workshop was to develop a road map that represented the critical GRID architecture, accelerate technology acceptance, strengthen the electric market, and develop private/public partnerships. GRID 2030 requires the addition of an "intelligent layer".

This "Smart-Grid" must be able to identify and repair problems, see disturbances in real-time and permanently monitor the system giving it the ability to transform data into information and make decisions. A combination of advanced data acquisition, signal processing, control algorithms, and integration from National Instruments will allow the complex convergence of this system. During this session we will discuss how through programmable automation controllers (PACs) we are able to combine all of the capabilities of several platforms to address this need for a convergence of technologies.

Speaker: Gurshan Sidhu graduated with a mechanical engineering degree from the University of Victoria and a diploma from Columbia Institute of Technology. Gurshan joined National Instruments in August of 1998 as an Applications Engineer where he had the opportunity to work with different virtual instrumentation applications across various industries, platforms, and vendors. Since May of 1999, Gurshan has been based in the British Columbia area as a field engineer, working to help local companies evaluate, design, and implement solutions for their measurement and control applications. Prior to joining NI in 1998, Gurshan was a senior systems engineer at Honeywell Measurex.

Info: For more information on upcoming events for the IEEE PES Vancouver Chapter, please visit our website at:
http://vancouver.ieee.ca/powereng
or contact the Chapter Chair, Glen Tang, at glen.tang@bchydro.com

Message from the Chair

What is IEEE?

One response might be that IEEE is the world's leading professional association for the advancement of technology, has over 375,000 members, publishes over 140 periodicals and hosts over 800 conferences annually, and has an active portfolio of nearly 1,300 standards and projects under development.

True enough, but one can make a good case that IEEE is really about opportunity. It's about the opportunity to meet others with similar interests, the opportunity to pursue special interest projects under the aegis of a trusted technology brand, the opportunity to develop management and leadership skills in a technology-oriented setting and the opportunity to make our community a better place.

As the new chair of IEEE Vancouver Section, I invite you to become more involved with Section activities during the coming year. Whether you attend a Section event, suggest a potential speaker to a Chapter Chair or take on more formal duties as a Chapter or Committee Chair, you'll be taking an important step to realizing the full value of your IEEE membership. If you have any questions or would like to become an IEEE volunteer, please don't hesitate to contact me. In the meantime, have a great summer! *Dave Michelson*

Joint Communications

Zigbee Smart Energy and the Smart Grid

Chris Tumpach
Rainforest Automation

Monday 08 June 7-9pm
BCIT SW3-1750

The Smart Grid promises a more reliable and energy efficient means of delivering power. The Zigbee wireless standard will be an integral part of the smart grid for communicating information from the utilities to the end-users.

Until recently, Zigbee was primarily used in home automation and sensor networks where its low power and mesh capabilities were an ideal fit. Now with the Zigbee PRO and Smart Energy profile additions, Zigbee has found a new application in Home Area Networks (HANs) for managing energy. This standards oriented approach allows utilities to reduce a home's energy consumption and allows residents to be more aware of the energy they use. With a certification process in place, suppliers can build products that will integrate seamlessly with other products to form the HAN. Many of the 40 million smart meters that will be installed across North America in the next 5 years will have Zigbee radios built-in.

This presentation will go through the Zigbee standard, the Smart Energy profile, and our experience with integrating Zigbee into products for energy management.

Speaker: Chris Tumpach is VP of Hardware Engineering at Rainforest Automation. Prior to co-founding Rainforest Automation, Chris was a senior design engineer with PMC-Sierra's Communications Products Division where he architected and implemented a wide array of communications ICs. In addition, he has held product design positions at Raytheon Systems, Alcatel, and Mindspeed Technologies. His experience in the areas of Hardware Engineering, Integrated Circuit Engineering, Software Engineering, and Web Design put him in a unique position to architect solutions that integrate these various disciplines seamlessly.
Chris received his Bachelor of Applied Science in Electrical Engineering from the University of British Columbia.

Info: Alon Newton - anewton@ieee.org

Power and Energy

Unsafe Temporary Over-voltages from Self Excited Large Machines

Dr. Mukesh Nagpal
BC Hydro

Monday 15 June 1200 - 100pm
BC Hydro Edmonds - Aud'm Centre Room
6911 Southpoint Drive, Bby

Large industrial motors, when isolated from the grid can behave as self-excited generators as long as their inertia keeps them spinning and there is enough charging current from system to maintain air-gap flux. Charging currents are produced by long line effects or shunts for network voltage support. If these motors, operating as self-excited generators, back energize an isolated capacitive and lightly loaded sub-network, a near fundamental frequency L-C resonance condition can be created. Under these conditions, the network can be subjected to dynamic over-voltages until machine speed slows-down and self excitation can no longer be sustained.
This presentation will provide insight to this phenomenon from a factual study using simple 60-Hz analysis of simplified network model, which is then confirmed by a detailed study using an electro-magnetic transient program. A protection solution to avoid back-feed to safeguard the system against these over-voltages will be discussed.

Speaker: Mukesh Nagpal received the Ph.D. and M.Sc. degrees in electrical engineering from the University of Saskatchewan, Canada in 1990 and 1986, respectively. Dr. Nagpal is a senior member of IEEE and registered member of Association of Professional Engineers and Geoscientists of British Columbia (BC), Canada.
Currently, he is a Principal Engineer/Manager with the Protection and Control Planning Group within BC Hydro Engineering. He is also an Adjunct Professor with the University of British Columbia and was a Part-Time Instructor with the British Columbia Institute of Technology. He has more than 21 years of experience in electrical consulting, utility research and power system protection. Dr. Nagpal has written about 40 technical papers on power system relaying or related topics. His presentation received "Best-of-Show" award at BC Hydro's 2007 P&C Telecom Annual Technical Conference. Recently, BC Hydro conferred him with a prestigious "Mentorship Award" for his commitment to training and development of new engineers within and outside the organization.

Cosponsor: Industry Applications Society
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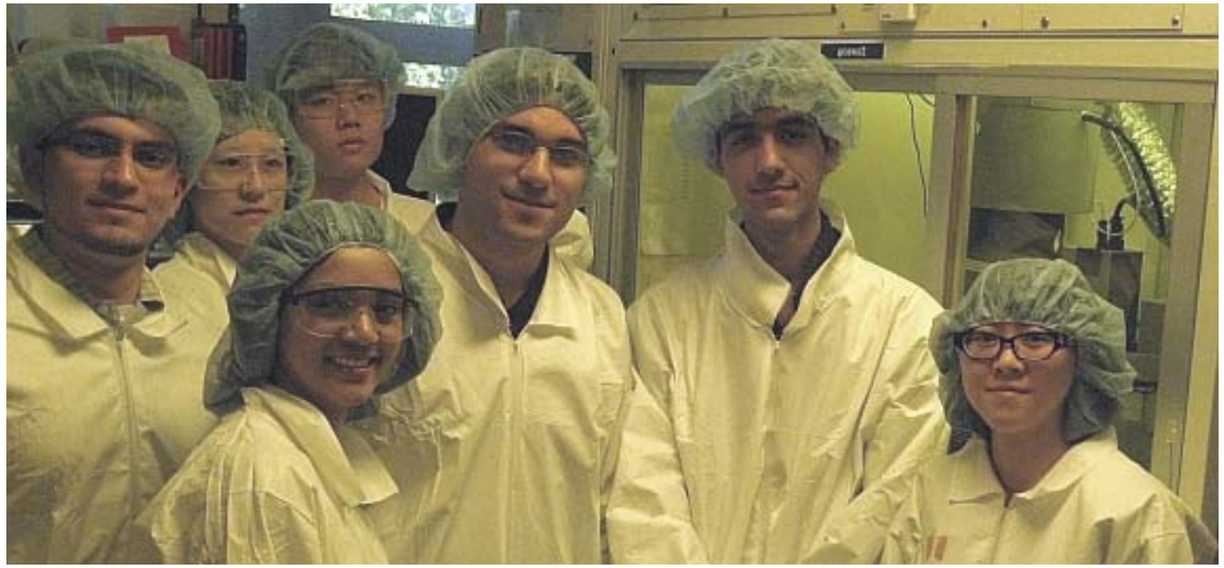
Sitting: Keith Mah, Mustafa Abousaleh, Milad Mohammadi, Tiffany Wang, Ian Wong (Stanford IEEE Student Branch Chair), Hooman Rashtian. Girls holding the flag: Manasi Kulkarni, Ashita Anand, Ashley Bardal, Maryam Kashi. Back: Matthew Farough, Aman Bhatia, Frankie Angai, Seyed Mohammad Mirvakili, Samiul Islam, Tracy Liu, San Sanghera, Ryan Parappilly, Gurjeez Singh, Yuan Chen Chao, Jayjeet Sanghera, Clive Lin, Stanley Lee.

UBC IEEE Student Branch – Silicon Valley Field Trip

The field trip from April 30 to May 8 was organized by UBC IEEE Student Branch. The goal of this field trip was for students to become more familiar with the recent technologies being used in industry and university laboratories. UBC IEEE Student Branch executives contacted companies and IEEE student branches in Stanford University and University of California, Berkeley, to get in touch with laboratory technicians to arrange tours to their facilities. 24 students registered for the trip and registration fee was $600 for non-IEEE members and $500 for IEEE members. The following cities were visited: Seattle April 30-May 2; San Francisco May 2-3; San Jose May 3-8. The following companies, schools and locations were visited and tours to facilities were given by staff and engineers: Microsoft, Google, Sun Microsystems, Anritsu, Cisco, Intuitive Surgical, Lick Observatory, Intel Museum, Museum of Flight, Stanford University, UC Berkeley . Each company arranged a discussion panel with the students and their engineers. Students were all satisfied with the management and scheduling of the trip. The tours in all companies were also informative and gave students an overall picture of what to expect after graduation. The UBC IEEE student branch thanks UBC Applied Sciences, IEEE Canadian Foundation, and IEEE Vancouver Section for sponsoring this field trip. Also many thanks to students who oranized this event: Stanley Lee, Faye Limbo, Aman Bhatia, Salma Farzim, Edwin Jaury, Andy Tsai, Chen Yan, and Branch Chair (and able photographer) Aryan Navabi. *(more photos on page 2)*

Aryan Navabi



...more photos
UBC IEEE Student Branch – Silicon Valley Field Trip

Five-Dimensional DVD Could Store 1.6 Terabytes

By Prachi Patel. First Published in IEEE Spectrum May 2009, Reprinted with permission from IEEE Spectrum Online

Data is held in multiple layers, wavelengths, and polarizations

20 May 2009—To cram more data on DVDs than the high-density Blu-ray format allows, manufacturers will have to go three-dimensional and stack data in multiple layers. Researchers at the Swinburne University of Technology, in Hawthorn, Australia, have now found a way to add two more dimensions to optical-disc recording: wavelength and polarization. The technique could pack 1.6 terabytes of data on a standard-size DVD, the researchers say—the equivalent of 30 Blu-ray discs. What's more, it could be compatible with today's disk-drive technology.

DVDs and Blu-ray discs store data as tiny bumps stamped or burned into the aluminum veneer on a plastic disc. The bumps and flat spots on the aluminum reflect laser light differently, to represent the 1s and 0s of digital data. Microphotonics researcher James Chon and his colleagues describe their high-density alternative to traditional optical data storage in the 21 May issue of the journal Nature.

They began by making a new kind of disc. They dispersed gold nanorods of three different sizes in a polymer solution, coated thin glass films with the solution, and then used glue to assemble a stack of three of the films, one on top of the other.

To record on the disc, the researchers focused a tunable laser onto 750-nanometer-wide spots on a gold nanorod layer. The tiny rods have a tendency to collapse into spheres when they absorb light and are heated to a certain threshold. But the rods are selective. Nanorods of a specific size absorb a specific wavelength and then only if they are aligned with the direction of the light's polarization. Under those conditions, the energy waves traveling along the rods' surface—called surface plasmons—resonate with the light's frequency. So when the laser beam is focused on the bits, only some of the rods turn into spheres. "There are many different sizes of rods in random orientation," Chon says. "Light impinging with a certain color and polarization will only target a subpopulation of gold nanorods, leaving the remaining rods for the next recording."

That means each bit area can hold multiple bits—six in Chon and his colleagues' test of three different wavelengths and two different polarizations. To demonstrate the technology, they created six patterns on each of the three nanorod layers by focusing light on a grid of 75-by-75 bits. Chon says they could have fit 1.1 terabits per cubic centimeter on the disk. The volume of their disk is about 12 cm3, which gives a total data capacity of 1.6 terabytes.

Reading the bits involves focusing light from the same laser on the bits but with much lower energy. The nanorods shine when they absorb the dim light, which must be of the same wavelength and polarization that could change their shape during recording.

"They've really done something very clever," says Robert McLeod, an electrical and computer engineering professor at the University of Colorado, Boulder. People have been thinking about 3-D optical data storage for a while, but this is the first time data has been recorded and read in five dimensions, he says.

However, "making a commercial data-storage device has an extremely long laundry list of requirements. It has to be extremely high density, it needs a very high data transfer rate, and it has to be cheap," says McLeod. The researchers have so far shown high data density, he says. But the large, expensive titanium-sapphire femtosecond laser they use is not practical.

Lambertus Hesselink, an electrical engineering professor at Stanford, says it is crucial that the researchers show that their technique works with conventional digital storage. That is, they would have to convert analog data into digital bits, put them on the disc, and read them out quickly. "You have to show you have a very high capacity at a very high transfer rate at a high signal-to-noise ratio so you can faithfully detect the data and reconstruct it".

The Australian researchers are optimistic about the technology. They say that data recording could be done with a cheaper laser diode and that high-speed recording and readout should be possible. They have signed a research agreement with Samsung and believe that the technology will be available commercially in 5 to 10 years.