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- Nanowire-based computing systems
- Model-driven embedded software generation: a generative approach to safety
- Understanding and managing interference in wireless networks
- Development of an ice-penetrating radar: a system integration approach
- AGM highlights
- New frontiers in revitalizing the power grid
- PES Plain Talk - Power System Basics
- Calculating MIMO performance in urban microcells using ray tracing
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- Congratulatory letter from IEEE HQ

## Message from the chair

IEEE Vancouver Section has been named the Outstanding Large Section of 2009!

To put this in perspective, there are 330 IEEE Sections world-wide, 178 of which have more than 500 members. IEEE Vancouver Section's performance during 2009 has been judged to be the best of all 178 Large Sections.

For reference, the congratulatory letter from IEEE and a list of our key accomplishments in 2009 are given in the pages that follow.

Every month, CONTACT informs you of the many technical,

professional and social events organized by the Section and its many volunteers. Given that the Section has offered a remarkably consistent high level of activity over the years, it's easy to take all of this for granted. This Award reminds us that we shouldn't!

If you would like to contribute to the Section or become more involved in organizing or supporting events in 2010, please don't hesitate to contact me at [dmichelson@ieee.org](mailto:dmichelson@ieee.org). Dave Michelson



## Welcome..! new arrivals to the best IEEE Section on Earth

|                               |    |                               |    |                          |    |
|-------------------------------|----|-------------------------------|----|--------------------------|----|
| Alankar Khara .....           | GS | Greg Dwernychuk .....         | M  | Navdeep Toor .....       | ST |
| Aminreza Ahari-Kaleibar ..... | GS | Hamid Reza Vaezi Joze .....   | GS | Philippe Pasquier .....  | M  |
| Ana Ineyda Namburete .....    | ST | Hossein Badakhshannoory ..... | GS | Piraj Fozoonmayeh .....  | GS |
| Arbind Koul .....             | M  | Jeff Liu .....                | GS | Raafat Megahed .....     | M  |
| Artem Efremov .....           | ST | Jennifer Coote .....          | ST | Robert Stirling .....    | M  |
| Ashgan Fararooy .....         | GS | Jiaqi Gui .....               | GS | Ryan Arnason .....       | ST |
| Bogumila Kwiatkowska .....    | M  | Joanne Lim .....              | M  | Samith Pathigoda .....   | M  |
| Chamith Liyanage .....        | ST | John Glover .....             | M  | Simon Howkins .....      | M  |
| Chi Zhang .....               | GS | Karnvir Athwal .....          | ST | Sonia Sadeque .....      | ST |
| Christopher Roberts .....     | ST | Kevin Ou .....                | GS | Tomas Martin .....       | M  |
| Daniel Crawford .....         | M  | Kim Shearer .....             | ST | Udit Pareek .....        | GS |
| Daniel Tiang .....            | ST | Luyan Mei .....               | GS | Vladimirka Pereula ..... | M  |
| Fan Bai .....                 | ST | MANSI TANDON .....            | ST | Wilbur Yu .....          | ST |
| Gouri Bhuyan .....            | M  | Marc Rutishauser .....        | M  | Yong Huang .....         | M  |
| Graham Cunliffe .....         | M  | Masoud Tasharofi .....        | ST | Youry Khmelevsky .....   | M  |
|                               |    | Milad Gougani .....           | GS |                          |    |

AF Affiliate - AM Associate Member - F Fellow - GS Graduate Student Member - LF Life Fellow  
LM Life Member - LS Life Senior - M Member - SM Senior Member - ST Student Member



Sandeep K. Shukla  
Virginia Tech

## Model-driven embedded software generation: a generative approach to safety

Avionics, automotive, power plant control, and many other safety-critical embedded systems require safe, predictable, and statically analyzable software. Moreover, as the complexity of these applications mounts, performance and safety both become increasingly important. This increasing performance requirement drives the current market trend of multi-core processors (single chip multiprocessors) in the desktop market. However, recently embedded processors have started to surface with multiple homogeneous or heterogeneous cores. Multi-threaded or concurrent applications seem to be the best way to exploit these available parallel processing resources.

Those with any experience with multi-threaded programming would admit that design and implementation of multi-threaded programs is extremely difficult and prone to subtle concurrency and synchronization bugs, even without the use of advanced techniques such as speculative threading, or wait-free synchronization etc are. The inherent synchronization and dependency issues and the possible non-determinism are difficult to resolve without extremely skilled programmers, and possibly with the help of extensive static analysis. Static analysis and/or formal verification of large concurrent applications are again capacity limited by today's state-of-the-art tools and techniques. Nevertheless, given the importance of safety in the target application domains, one has to produce absolutely correct code which is deterministic or predictable, and no non-deterministic execution behavior should lead to disastrous consequences.

Correct-by-construction multi-threaded program generation is therefore our methodology of choice. For this, we need a formal specification language with well defined semantics and proper characterizations as to when it is safe to generate guaranteed deterministic code. We have chosen Polychronous or multi-rate specification language borrowing from the French synchronous programming languages. Synchronous languages have so far proven useful for generating sequential (single-threaded) code for safety-critical applications. A particular characterization of polychronous specifications called the 'endochrony' is a sufficient condition for correct sequential code generation. Therefore, one could generate multiple sequential threads separately from 'endochronous' specification fragments, and compose them by generating the synchronization glue code. Unfortunately, 'endochrony' is not compositional, and therefore, the synchronization code generation becomes non-trivial.

We show that a particular generalization of 'endochrony' called the 'weak endochrony' is sufficient for directly generating multi-threaded code from such specifications. Moreover, 'weak endochrony' is compositional and hence provides us with a modular code generation technique from polychronous specification.

In this talk, first, we elaborate on multi-rate specification formalism Polychrony. Then we explain the difficulties of deterministic and semantics preserving code generation from such specifications. Then we discuss endochrony, inadequacy of which leads to the weak endochrony concept, and how this provides a sufficient condition for safe multi-threaded code generation. Finally, we discuss future directions in our work on deterministic multi-threaded code generation for safety-critical applications.

**Speaker:** Sandeep K. Shukla is an associate professor of computer engineering at Virginia Tech. He is also a founder and deputy director of the center for embedded systems for critical applications (CESCA), and director of his research lab FERMAT.

Sandeep was awarded the Presidential Early Career Award for Science at Engineering (PECASE) award for his research in design automation for embedded systems design, which in particular focuses on system level design languages, formal methods, formal specification languages, probabilistic modeling and model checking, dynamic power management, application of stochastic models and model analysis tools for defect-tolerant system design, and reliability measurement of defect-tolerant systems.

Sandeep has published more than 125 articles in journals, books and conference proceedings. Sandeep co-authored four research monographs, and five edited volumes. Sandeep has been elected as a College of Engineering Faculty Fellow at Virginia Tech. In 2008 Sandeep was awarded the Alexander Humboldt Foundation's Bessel Award. Sandeep also chaired a number of international conferences and workshops, edited a number of special issues for various journals, and are on the editorial board of IEEE Design & Test, IEEE Transactions on Computer, IEEE Embedded Systems Letters, and Elsevier Journal on Nano Networking.

Sandeep is a senior member of the IEEE and the ACM. He is also an IEEE Computer Society Distinguished Visitor, and an ACM Distinguished Speaker.

### Distinguished Lecturer

Friday 30 July  
1100am

Kaiser 2020  
2332 Main Mall

Department of Electrical &  
Computer Engineering

University of British  
Columbia

### Information

Computer Society Chair  
Sathish Gopalakrishnan  
sathish@ece.ubc.ca





# Calculating MIMO performance in urban microcells using ray tracing



Larry J. Greenstein  
Rutgers University

Urban areas can be served by using outdoor microcells with small, low-cost base stations. MIMO techniques can be used in these microcells to provide fading diversity (for better link quality), spatial multiplexing (for higher throughputs) or beamforming (to combat co-channel interference). To evaluate different MIMO approaches in such environments, channel models are needed to estimate the gain matrix from the serving base to any point in the coverage area. This talk provides a comprehensive evaluation of MIMO in microcells using a site-specific ray-tracing tool to predict the channel gain matrices.

In Part I of the talk, we consider the case of just one base station and derive achievable downlink data rates for various conditions: Array size, array orientation, polarization, city street, MIMO mode, and others. Our primary metric is the cumulative distribution function (CDF) of achievable data rate along a particular trajectory of the mobile station.

In Part II, we consider the case of multiple bases in an urban neighborhood. We present a novel technique for minimizing the number of bases needed—under a specified coverage criterion—and for determining their optimal locations. We then present neighborhood-wide CDFs of the downlink achievable rate for different array sizes (1x1, 2x2, 3x3, 4x4) and for different frequency reuse factors  $r = 1, 2, 3, 4$ . We show that  $r = 1$  gives the best results, despite the higher co-channel interference.

Throughout this study, we used street maps for portions of Boston and New York City (Manhattan) along with a ray-tracing tool (WiSE) developed at Bell Labs. The results were obtained using standard equations for achievable rate for different MIMO modes.

**Speaker:** Larry J. Greenstein received the B.S., M.S., and PhD degrees in electrical engineering from Illinois Institute of Technology, Chicago, IL, in 1958, 1961, and 1967, respectively. From 1958 to 1970, he was with IIT Research Institute, Chicago, IL, working on radio frequency interference and anti-clutter airborne radar. He joined Bell Laboratories, in Holmdel, NJ, in 1970. Over a 32-year AT&T career, he conducted research in digital satellites, point-to-point digital radio, optical transmission techniques, and wireless communications. For 21 years during that period (1979-2000), he led a research department renowned for its contributions in these fields. He is now a Research Professor at Rutgers University's WINLAB where he works on PHY-based security techniques, MIMO-based systems, broadband power line systems, cognitive radio, and channel modeling.

Dr. Greenstein is an IEEE Life Fellow, an AT&T Fellow, a recipient of the IEEE Communications Society's Edwin Howard Armstrong Award, and co-recipient of several best paper awards. He was recently Director of Journals for the Communications Society

Tuesday 10 August  
3:00 - 4:00pm

Room 2020/2030  
Fred Kaiser Building  
2332 Main Mall, UBC  
[www.maps.ubc.ca/?313](http://www.maps.ubc.ca/?313)

**Information**  
Joint Communications  
Chair Alon Newton  
[alon.newton@gmail.com](mailto:alon.newton@gmail.com)



## New frontiers in revitalizing the power grid



Dr. Damir Novosel  
Quanta Technology LLC

### Distinguished Lecturer

Monday 09 August  
Noon - 1:30 pm

BC Hydro  
Dunsmuir Auditorium  
2nd Floor, 333 Dunsmuir  
Vancouver

**Information**  
PES Chair  
Glen Tang

[glen.tang@powerex.com](mailto:glen.tang@powerex.com)

Society mindset has changed and new sense of urgency has been brought to all energy issues, including the power grid. Reliable grid operation is critical to society and oil dependency and environmental concerns drive the power industry. Power companies are in the position to benefit by making the transition from existing to new infrastructures to improve the performance of electric utility systems and address the energy needs of society, such as improved efficiency and utilization, renewable energy integration, demand response, power quality and reduced maintenance cost.

This approach requires system infrastructure reinforcement, integrated system planning and automation. This complex infrastructure requires using the cutting edge technology or “Smart Grid”. The global topic of development and deployment of a “smarter” electricity grid has been at the forefront of industry initiatives and investments around the world. Advanced monitoring, protection, and control technologies enable implementation of “smarter” electrical grids to realize the needs of the electricity users for sustainable energy delivery and enhanced power system performance.

This lecture addresses following topics:

- Emerging Trends in Energy Investments
- Holistic Smart Grid Approach
- Challenges Requiring Transmission Smart Grid
- Transmission Smart Grid: Wide Area Monitoring, Protection and Control (WAMPAC)

The focus will be on WAMPAC technology enablers such as system integrity protection systems (SIPS),

integrated system-wide communication infrastructure allowing flexible and secure data collection, and synchronized measurements.

**Speaker:** Dr. Damir Novosel is President of Quanta Technology and Energized Services. Damir has over 29 years of experience working with electric utilities and vendors. Damir holds MSc and PhD degrees in electrical engineering from University of Zagreb, Croatia, and Mississippi State University, respectively. He has developed and consulted on a number of products and methods to improve power system performance.

Prior to joining Quanta Technology, he was President of T&D Consulting at KEMA in the US. He has also



held various positions in ABB including Vice President of global development and product management for automation products. His work in electrical power system monitoring, protection, control, and

automation earned him international recognition and was elected IEEE Fellow. He presently holds 16 US and international patents. Damir published over 100 articles in Refereed Journals and Conference Proceedings in various areas of power systems.

Damir is presently Vice President of the IEEE PES Technical Council and member of the IEEE PES Governing Board. He is co-chairing Performance Requirement Task Team for the North American Synchro Phasor Initiative (NASPI), large-scale activity of the North American utilities on implementation of Synchronized Phasor Measurements.

## Development of an ice-penetrating radar: a system integration approach



Laurent Mingo  
Blue System Integration

Blue System Integration ([www.bluesystem.ca](http://www.bluesystem.ca); [www.radar.bluesystem.ca](http://www.radar.bluesystem.ca)) specializes on remote monitoring and control within diverse areas of applications, including fuel cells, manufacturing processes and transportation sectors. Environmental monitoring and alternative energy technologies are also within BSI's realm of expertise.

Understanding the response of glaciers to climate is an essential step in evaluating climate change impacts on the glacierized regions of the world. Developing accurate 3D models of glacier geometry is a pre-requisite to many of these studies. In this context, Blue System Integration has developed an ultra-portable ice-penetrating radar system to assist glaciologists in performing surveys on icefields and glaciers. The system was developed to allow for foot and ski surveys in a difficult mountain environment. Ultra-light hardware components are used and a software application was specifically developed to perform acquisition, analysis, and data management tasks. This presentation will focus on the system integration approach taken, and expands on the applicability of the design and implementation methods to other types of data acquisition platforms with a perspective on the monitoring of renewable energy systems.

**Speaker:** Laurent is a broadly experienced systems engineer who has been active in the field of tests and measurements for more than 15 years. His background in engineering physics led to developing expertise with data acquisition systems, controls, and also data management. Laurent has developed application and systems that are used in a wide range of sectors, from products automated testing in the manufacturing industry to R&D applications in a research environment.

Laurent's company, Blue System Integration Ltd., has qualified as a National Instruments Alliance member since 2004, and is now a recognized systems integration service provider in the Vancouver area. "To provide customized, state-of-the-art information sys-



tems for scientific, research & development, and industrial applications. To foster the development of clean technologies, and develop solutions that lead to GHG emissions reduction." is BSI's mission statement.

Friday 06 August 06  
12 noon - 1:00pm

BC Hydro  
Edmonds Auditorium  
Center Room  
(near Edmonds  
Skytrain Station)  
6911 Southpoint Drive  
Burnaby

**Information**  
Industry Applications  
Chair  
Jahangir Khan  
[mjakhan@ieee.org](mailto:mjakhan@ieee.org)

IEEE Industry Applications Society



# WE WIN WORLD

## IEEE Vancouver named Outstanding Large Section for 2009!

The results are in: IEEE Canada has named Vancouver as Canada's Outstanding Large Section based upon our operational record during 2009. During the past year, we:

- ▲ **recorded a 12% increase in our active higher grade and student membership**
  - our Power and Energy Society Chapter won the PES Membership Contest
  - our BCIT Student Branch Chapter Chair was recognized as Canada's top Member-Get-a-Member recruiter
- ▲ **hosted 12 Distinguished Lecturers and Visitors**
- ▲ **established a Section History Committee established an Industry Advisory Council**
- ▲ **received approval from the IEEE Global History Network to nominate three sites as IEEE Historical Milestones**
  - (1) CBUT Broadcast Transmitter Site (North Vancouver),
  - (2) the TRIUMF 520 MeV cyclotron (Vancouver) (3) the DRAO Radio Astronomy Observatory (Penticton)
- ▲ **saw our Power and Energy Society Chapter recognized as the PES High Performance Chapter**
- ▲ **saw our Section Chair receive the IEEE Canada E.F. Glass Western Canada Merit Award for his service to IEEE**
- ▲ **strengthened our industry connections by**
  - establishing a Section Industry Advisory Council
  - establishing a LinkedIn group
  - hosting three mini-symposia either on company premises or with local conferences
- ▲ **facilitated a Memorandum of Understanding between Japan's MCPC and IEEE ComSoc**
- ▲ **introduced a new Section website based upon Drupal web technology**
- ▲ **formed five new units**
  - a Women-in-Engineering Affinity Group;
  - IEEE Northern British Columbia Subsection;
  - IEEE Okanagan Subsection;
  - University of British Columbia - Okanagan IEEE Student Branch;
  - a Joint Aerospace and Electromagnetics Chapter incorporating the Aerospace and Electronic Systems Society, Electromagnetic Compatibility Society, Geoscience and Remote Sensing Society, Microwave Theory and Techniques Society, Product Safety Engineering Society and Reliability Society
- ▲ **joined the IEEE Concentration Banking system**
- ▲ **delivered 29000 issues of Contact**
- ▲ **added the IEEE Photonics Society to our Joint Communications Chapter increasing the society representation to AP03, VT06, COM19, PHO36.**
- ▲ **sponsored IEEE ICUWB 2009 and hosted a joint Conference/Section event**
- ▲ **reactivated**
  - our Conferences Committee
  - our Continuing Education Committee
- ▲ **saw our Joint Communications Chapter hold a record number of technical meetings: 22!**
- ▲ **held our first Section Cultural Event**
  - a theatrical event at the Playhouse Theatre

### ***Congratulations to Vancouver Section!***

Om P. Malik, FCAE, LFIEEE, FIET, FEIC, FAPEGGA, FWIF President, IEEE Canada, Professor Emeritus, University of Calgary

### ***Congratulations for a job well done!***

#### ***This is a well deserved recognition for Vancouver Section.***

Hussein Mouftah, FRSC, FCAE, FIEEE, FEIC Chair, IEEE Canada Awards and Recognition Committee Canada Research Chair and Distinguished University Professor School of Information Technology and Engineering University of Ottawa

# IEEE Vancouver Section Special Annual General Meeting and Dinner 2010 – a memorable event!

The 2010 Vancouver Section AGM was held on June 24, 2010, at the Vancouver Convention Centre. The event was a great success with 130 people in attendance, including IEEE Canada president, Prof. Om Malik.

On this special evening we were recognized for our successes over the past year including being recognized as the IEEE Canada Exemplary Section.

It was a memorable evening, thank you all for attending and see you at the next Vancouver Section event!



Dave Michelson, Section Chair and Om Malik, IEEE Canada President announcing the winning of the Exemplary Large Section Award



IEEE Canada 2010 Exemplary Large Section Award Plaque for Vancouver Section



Mazana Armstrong, Section Vice-Chair, gave the opening remarks at the Vancouver Convention Centre.



Attendees enjoying the AGM and dinner. The event was attended by 66 IEEE Members, 29 student members, 6 life members and 29 non-members.



Frank Plumptre's entertaining feature presentation on the history of electrical engineering



Plus many recognitions:

Volunteer recognition awards:

- Ljiljana Trajkovic - Outstanding Service Award
- Ezra Kwok - Outstanding Achievement Award
- Glen Tang - Outstanding Chapter Chair Award
- Zahra Ahmadian - Outstanding Women In Engineering Award

Industry recognition awards:

- BC Hydro Power Smart
- Telus

Government agency recognition award:  
Western Economic Diversification Canada

Student scholarships:

- Adam Noel (UBC) - the Hector J. McLeod Scholarship Award
- Duncan Chan (SFU) - the Thurb Cushing Scholarship Award
- William Tigor (BCIT) - The John Deane Scholarship Award

Lex Engineering, Powertech Labs and BC Hydro Transmission Engineering were recognized for their support to the IEEE Vancouver Section events.

Special thanks to AGM volunteers: Joshua Smith (BCIT), William Tigor (BCIT), Patrick Sandi (BCIT), Shahrzad Rostamirad (UBC), Shahin Rostamirad (UBC)





30 June 2010

Prof. David G. Michelson  
IEEE Vancouver Section  
Vancouver, BC  
Canada

Dear David:

On behalf of the IEEE Member and Geographic Activities Board (MGA), I am pleased to formally advise you that the **IEEE Vancouver Section** has been selected as the recipient of the 2009 Member and Geographic Activities Board Outstanding Large Section Award. The Section was selected for this award on behalf of your activities for the 2009 calendar year. The selection was approved by the Member and Geographic Activities Board during its 26 June 2010 meeting.

The Member and Geographic Activities Board is pleased to honor the IEEE Vancouver Section for their outstanding support to IEEE and Region 7. This award consists of a plaque, which carries the following citation:

*“For successful efforts in fulfilling the educational and scientific goals of IEEE for the benefit of the public by maintaining, enhancing, and supporting the Student Branches, Technical Chapters, and Affinity Groups of the IEEE Vancouver Section in Region 7.”*

The Member and Geographic Activities staff will work with the Region 7 Director to have the plaque presented at an appropriate Regional Event.

On behalf of the entire IEEE Member and Geographic Activities Board, please convey our congratulations to the IEEE Vancouver Section for having achieved this honor.

Sincerely,

A handwritten signature in black ink that reads 'Barry L. Shoop'. The signature is written in a cursive style with a large, sweeping underline.

Barry L. Shoop  
2010 Vice President, IEEE Member and Geographic Activities  
Chair, IEEE Member and Geographic Activities Board

cc: Om Malik, Region 7 Director  
Hussein Mouftah, Region 7 Awards Chair  
Eugen Trandafir, Past Section Chair  
Jeremy Gates, Nominator  
Ralph Ford, Chair, MGA Awards and Recognition Committee  
Cecelia Jankowski, Managing Director, Member and Geographic Activities

# Are You A Professional in the Power Industry Who Would Like to Learn More About the Electric Power System?



- **Do You** work in the power industry but not as an engineer?
- **Would You** like to understand more about the technical aspects of the industry in a format that is geared to non-technical professionals?
- **Are You** an engineer new to the industry, or working in another industry who would like to transition to the power industry?

If you answered YES to the questions above...  
Register for our upcoming courses:

## Plain Talk About the Electric Power Industry

September 15-17, 2010 in Vancouver, BC Canada

BC Hydro Edmonds Auditorium

- **Power System Basics**-Understanding the Electric Utility Operation Inside and Out
- **Distribution System**-Delivering Power to the Customer
- **The Grid**-The Interconnected Electric Bulk Power System

*These courses will provide you with the practical knowledge you need to help you understand the electric power system and how you can apply that knowledge to work better and smarter!*



PES Plain Talk courses for the **Non-Engineering** Power Professional will help you to understand technical aspects of the Electric Power System, even if you do not have an engineering background. You will gain insights into the concerns of engineers, the demands of regulators and consumer groups, and the factors and trends that impact the operation of today's electric power systems. These courses are also appropriate for non-power engineers who are transitioning to the electric power industry.

**For Detailed Course Brochure and To Register:**

Visit <http://www.ieee-pes.org/education/programs/plain-talk-courses>

**Contact** Susan Koval, Sr. Administrator Education Services  
IEEE Power & Energy Society  
at (732) 562-6897 or via email [s.koval@ieee.org](mailto:s.koval@ieee.org)

