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CONTACT

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS

Institute for Computing, Information & Cognitive Systems
Distinguished Lecture Series

Folklore of Network Protocol Design

Radia Perlman, Sun Microsystems

Thursday 26 February 330-450pm
Room 310 Hugh Dempster Pavilion, UBC

Network protocol design is not a nice, clean science, where what gets deployed is the best possible design. Instead, designs are influenced by issues such as politics, general confusion, and backward compatibility. Statements get made, and repeated, until it never occurs to anyone to question whether they're true. Mistakes get made, and rather than backing up and fixing them, kludges are introduced to make things sort of work. This talk discusses interesting bad protocol designs that have been standardized and/or deployed, and how some of the odder things we live with (e.g., bridges) came about.

Speaker: Radia Perlman is a Fellow at Sun Microsystems. She is known for inventing the spanning tree algorithm used by bridges/switches in today's networks, as well as the fundamental algorithms that make link state protocols robust and scalable. Her current research interests include assured delete, making large networks robust against Byzantine failures, and replacing bridges/switches with technology that is upwardly compatible, but more robust, flexible, and scalable. She is author of Interconnections: Bridges, Routers, Switches, and Internetworking Protocols, and coauthor of Network Security: Private Communication in a Public World, which are widely used both as textbooks in universities and by engineers learning the field. She holds over 90 patents, a PhD in computer science from MIT, and an honorary doctorate from KTH, the Royal Institute of Technology, Sweden. She was recently given a lifetime achievement award by Usenix, and named SVIPLA (Silicon Valley Intellectual Property Law Association) Inventor of the year.
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Managing Massive Interference

Helmut Bölcskei, ETH Zurich

Thursday 29 January 330-450pm
Room 310 Hugh Dempster Pavilion, UBC

The performance of many modern wireless communication systems is limited by interference. Managing this (often massive) interference is one of the major challenges in the evolution of wireless systems. This talk provides an overview of the associated information-theoretic performance limits and discusses several approaches to interference management on the system design level as well as on the signal processing and VLSI implementation levels.

Speaker: Helmut Bölcskei is a Professor of Electrical Engineering at ETH Zurich, Switzerland. He received his MS and PhD degrees at Vienna University of Technology, Austria, was a postdoctoral researcher at Stanford University and then joined the faculty of the University of Illinois at Urbana-Champaign. He received the 2001 IEEE Signal Processing Society Young Author Best Paper Award, the 2006 IEEE Communications Society Leonard G. Abraham Best Paper Award, the ETH "Golden Owl" Teaching Award, and was an Erwin Schrödinger Fellow of the Austrian National Science Foundation. He has been a plenary speaker at several IEEE conferences and serves as an associate editor of the IEEE Transactions on Information Theory. His current research interests are in communication and information theory, signal processing and quantum information processing.
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Control Systems

Force Balance Servo Accelerometers From Theory To Practice

Amirhossein Yousefi
Weir-Jones Group
Friday 30 January 1400 - 1500
Electrical & Computer Engineering
2332 Main Mall - Kaiser 2020, UBC

The principle of an accelerometer is a proof mass whose position is sensitive to external forces. The sensor responds to input acceleration by deflection of the proof mass through an angle proportional to the input acceleration. The pickoff and electronics module sense the deflection and convert it into a proportional electrical output signal. By use of negative feedback, the output signal forces a current to flow through torquer coil, causing a restoring torque to be applied to the proof mass. The amount of current that can generate the counterbalancing torque is proportional to the acceleration and therefore becomes the output of the accelerometer. The high-performance accelerometers are normally categorized by different performance specifications including sensor intrinsic noise, short and long term drift, thermal stability, bandwidth, and resolution. These types of accelerometers are generally used for seismic imaging, industrial and structural monitoring, and inertial navigation. From the specification mentioned above, noise and bandwidth are the most challenging. The former is very dependent on the closed loop design of the sensor and overall electronic design including its readout electronics. The latter, depends heavily on the mechanical design and specific features of the sensing element.
The purpose of this talk is to provide an overall understanding of the theory, operation and characteristics of high-performance force balance accelerometers and corresponding practical limitations.

Speaker: Amirhossein Yousefi received his Ph.D. in Mechatronics from Technical University of Munich. He works now as control systems designer at Weir-Jones Group in Vancouver. His research fields have been primarily related to model and controller reduction techniques. Most recently, he has been working in the area of designing extreme sensitive force balance accelerometers for use in the environmental, geotechnical and structural industries.
Info: Control Systems Chair: Ryozo Nagamune, nagamune@mech.ubc.ca

Control Systems

How sophisticated control techniques help make possible high-speed atomic-force microscopy

Professor John Bechhoefer
Simon Fraser University
Monday 23 February 14:00-15:00
Electrical & Computer Engineering
2332 Main Mall - Kaiser 2020, UBC

Scanning probe microscopy, awarded the Nobel Prize soon after its invention, has been an experimental technique that has seen increasingly wide use in many fields of science. Starting from the initial scanning tunneling microscopy, a number of variants have been developed. The most important of these, atomic force microscopy (AFM), allows high-resolution imaging and local extraction of materials parameters from both conducting and non-conducting surfaces. Despite this success, most commercial AFMs are very slow. They build an image by a raster scan, done usually at 1-10 Hz. Although there has been some development of high-speed instrumentation, such instruments are either custom made or specialized to certain kinds of applications. In this talk, I will review AFM instrumentation, the various aspects that make high-speed operation challenging, and discuss our own work on the use of control techniques to increase scan speeds. In particular, I will focus on an approach inspired by repetitive-control techniques, where one takes advantage of the fact that an essentially identical input is repeatedly sent to a system. We have devised Fourier-space algorithms to iteratively compute the input that leads to a desired output. These techniques allow scan rates 10-100 times faster than usual.

Speaker: John Bechhoefer received his Ph. D. in Physics from the University of Chicago in 1988. After a postdoctoral fellowship in France at the Univ. de Paris and Ecole Normale Supérieure (Lyon), he joined the Physics Dept. at Simon Fraser University in 1991. His first interests were in nonlinear phenomena and focussed on experimental studies of phase changes in liquid crystals, which showed the instabilities that lead to snow flakes when ordinary liquids freeze. After further studies of liquid crystals, phase changes, and instabilities, his interests shifted towards nanotechnology and biophysics. The former work has focussed on developing instrumentation and applications of atomic force microscopy (AFM), including the development of a widely used method of calibrating the force constants of AFM cantilevers. More recently, he has been applying modern control theory techniques to improve the performance of AFM instrumentation.
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Joint Communications

Amateur Radio – from Boat-Anchors to DSP

Adam Farson
VA7OJ/AB4OJ
Monday 09 February 700 - 900pm
BCIT SW3-1750

The evolution of amateur radio from 1945 to the present is covered, with particular emphasis on techniques (technologies) & equipment employed by amateur radio operators.

The time-line is divided into successive decades. Radio communications techniques ranging from basic modulation schemes through radio networks to modern, sophisticated digital transmission methods are discussed, together with the deployment of technologies starting with classical vacuum-tube circuits, and ranging through transistor and IC designs to the most modern DSP and SDR implementations.
At each stage of the timeline, examples of contemporary equipment are described briefly and illustrated.

A short equipment demonstration is planned to follow the presentation.
Speaker: Adam was born in the UK, and raised and educated in South Africa. After earning a BSEE at the University of Cape Town, he worked for Racal in South Africa from 1964 to 1967 as an RF design engineer. He was involved in some interesting, advanced projects - a VHF FM/SSB tactical ground radio system for the Ministry of Defence, and solid-state HF transceivers for PMR ("bush radio") applications. They had a 25W manpack and a 100W mobile, both of which used TV line-output transistors with Ft > 100 MHz in the transmitter PA and driver.
Adam emigrated from South Africa in 1967, then spent 3 years at CERN as an RF design engineer, working on a modulation system for a 10kW 9.5 MHz "transmitter" feeding RF power to a proton accelerator. That served as the thesis for his MSEE (University of Cape Town, 1971). After that, Adam joined GTE International Systems, and was with them (and a subcontractor of theirs) for 4 years, in the commercial satcom field. This involved assignments in Venezuela and Israel. After that came 5 years at Nortel in Toronto, then 2 years at GTE-AE Labs near Chicago, as a switching systems engineer, working on public telephone exchanges. (The collapse of that venerable firm caused him to move to Siemens in Florida). He spent 20 years at Siemens, also as a systems engineer, but on private and corporate networks. His main tasks were systems verification and compliance engineering, mainly in the areas of trunking, signalling and transmission. Adam retired at the end of 1999, and moved to BC for family reasons. He is also a licensed radio amateur with the Advanced Certificate (VA7OJ) and the US Extra Class Licence (AB4OJ).
Info: Joint Communications Chair
Alon Newton, anewton.ieee@gmail.com

Dave Michelson Wins E.F. Glass Western Canada Merit Award

Dave Michelson, a Senior Member of IEEE in the Vancouver Section, is an Assistant Professor at the University of British Columbia. He is receiving the E.F. Glass Western Canada Merit Award for outstanding contributions to the IEEE Vancouver Section and the IEEE Communications Society.

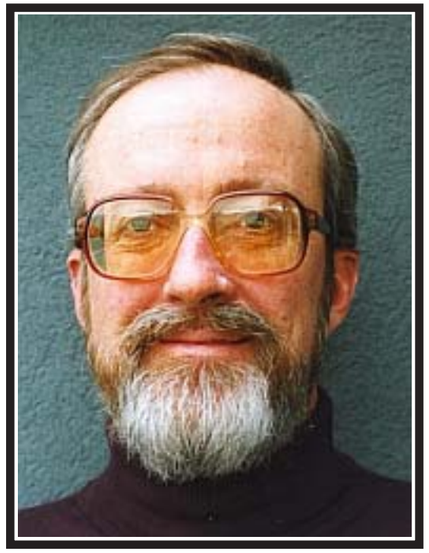
David G. Michelson (SM, IEEE) received the BASc, MASc and PhD, all in Electrical Engineering, from UBC. From 1996-2001, he was a member of a joint AT&T Wireless Services (Redmond, WA) – AT&T Labs–Research (Red Bank, NJ) team that developed advanced channel models applicable to broadband fixed wireless systems. From 2001-2002, he was an adjunct professor at UBC while serving as a consultant to UBC IT Services as they deployed one of Canada's largest campus wireless LANs. Since 2003, he has led the UBC Radio Science Lab where his research interests focus on radiowave propagation and channel modeling in macrocell, industrial, biomedical and space environments.

During his eight-year term as chair of Vancouver Section's Joint Communications Chapter, Professor Michelson greatly expanded the chapter's role in British Columbia's wireless community. He hosted well over one hundred monthly meetings, mini-symposia and other technical events that helped wireless engineers stay current in their field, helped promising startup companies recruit talent and helped engineering students begin productive careers. He also supported WINBC, BC's wireless industry association, as they set up and established their own programs. He also established the IEEE Communications Society student chapter at UBC, which he continues to serve as faculty advisor.

Professor Michelson is a past Associate Editor of IEEE Transactions on Vehicular Technology and served as a guest editor of a pair of special issues of the IEEE Journal on Selected Area in Communications that dealt with propagation and channel modeling. In Summer 2005, he was a visiting faculty member in the Space Physics department at the International Space University. He currently serves as an appointed member of the Board of Governors of the IEEE Vehicular Technology Society, as Chair of the IEEE VT-S Technical Committee on Propagation and Channel Modeling, and as an Associate Editor for Mobile Channels for IEEE Vehicular Technology Magazine. He has received numerous awards for his service to British Columbia's wireless community through his leadership roles in IEEE Vancouver Section and the IEEE Joint Communications Chapter.

Dave Michelson: dmichelson@ieee.org

IEEE CANADA Service Awards will be presented at IEEE Canada CCECE Conference, May 2009,St. John's, Newfoundland



Ian Cumming, IEEE-F Vancouver, British Columbia "for achievements in synthetic aperture radar signal processing"

Ian Cumming

New Vancouver Section IEEE Fellow

Ian is a retired Professor of Electrical and Computer Engineering at UBC and former holder of the MacDonald Dettwiler/NSERC Industrial Research Chair in Radar Remote Sensing. His research interests include synthetic aperture radar (SAR) processing algorithm development, SAR interferometry, SAR data encoding, and SAR polarimetry.

Ian maintained close connections with MacDonald Dettwiler, and collaborated with the Canada Centre for Remote Sensing, the Defence Research Establishment Ottawa and the European Space Agency. Many of his students worked on research problems in collaboration with MacDonald Dettwiler, and with the other institutions listed above.

He also taught a graduate course in Applied Digital Signal Processing, ELEC 591, in which the processing of SAR data is used as an example. The course also included other examples from fields such as sonar, speech, communications and navigation, so that students got practical training for applying DSP in industry.

Ian enjoys travel and outdoors activities such as skiing, hiking, trekking, biking and windsurfing.

UBC/IEEE Mini-Symposium on Wide Area Wireless Systems

Friday 03 April 2009
100 - 430 pm
BC Hydro - Edmonds, Burnaby, BC

During this afternoon event, university and industry presenters will review recent progress in wide area wireless systems with particular focus on fixed wireless propagation studies, systems engineering, and product development.
There is no charge for admission but pre-registration is required.
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Wireless Innovation Network
of British Columbia, WINBC
http://www.comsoc.org/vancouver/wireless2009.html
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