KITCHENER-WATERLOO SECTION

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The Kitchener-Waterloo Section of the Institute of Electrical and Electronics Engineers serves members whose mailing address is in Bruce, Grey, Perth, Waterloo or Wellington counties. It collects news relevant to local engineers and is published bi-monthly.

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Upcoming Events

Check http://kw.ieee.ca/activities.html for updated information.

Linear Precoding in MIMO Systems

IEEE Co-sponsored, January 21, DC 1302, 2:30-3:30, by Ravi Adve from U of T
Recently, precoding has emerged as an effective approach to maximize data throughput in MIMO networks in both single- and multi-user scenarios. However, in a large part, the analyses undertaken have been information theoretic with limited attention paid to schemes to implement precoding. This talk with focus on recent results in single-user precoding with covariance feedback and multi-user linear precoding with channel feedback. The talk will conclude with preliminary results on precoding with limited rate feedback.
http://www.cst.uwaterloo.ca/DSS/talks_2005.html

Space Robotics in the 21st Century

IEEE Toronto
Feb 10, 2005 Toronto's Computer Chapter is cosponsoring a meeting with the Toronto Dufferin and Kingsway PEO Chapters. Paul Cooper, VP of Business Development and R&D at MD Robotics, will speak on the topic "Space Robotics in the 21st Century: Canada's Expanding Role". Remaining details to be announced shortly, check website for more.
http://toronto.ieee.ca/

The Black Hole Wars

Perimeter Institute, Wednesday, February 2nd, 2005 7 pm
The strange paradoxes and puzzles of the quantum behavior of black holes and the things that fall into them led to a spirited battle of ideas between Stephen Hawking, Leonard Susskind and other scientists. Resolving the debate may change our entire understanding of space, time, matter and information - is the entire world, for example, a quantum hologram?
http://www.perimeterinstitute.ca/activities/community/generalpublic/publiclectures.php

From Web Services to The Semantic Web: Global Data Reuse

David Booth W3C Fellow and Senior Research Architect Hewlett-Packard
This seminar was to be Jan 10 and will be rescheduled to a later date.

In this presentation, David Booth will begin with a brief look at Web services and the roles of W3C standards such as SOAP, WSDL and Choreography. He will then address the implications of the proliferation of Web services, the need for machine-processable semantics and the problem of "babelization." This growth in the Web leads to the fundamental question of how data can be integrated or re-used on a global scale. Finally, he will explain how Semantic Web technologies such as RDF, ontologies and OWL address this problem.
http://hi.uwaterloo.ca/hi/WIHIR_Research_Seminar_David_Booth.htm

Community Events

Also see David Suzuki to Kick Off One-Tonne Challenge and Engineers Without Borders in the Engineers and the World section below

Recent Events

Senior Member Upgrades

The following local member has earned the professional recognition of peers for technical and professional excellence.
Prof. Mohamed Kamel recognized as IEEE Fellow for contributions to pattern recognition and intelligent systems.
Ravi Mazumdar (new to UW this fall after a career at Purdue University).
See http://www.ieee.org/ra/md/smprogram.html for more information on this program.

Galileo and the Church as told by Prof. Lindberg

Tom East

The Perimeter Institute public lecture on January 5th was sold out: the 600 or so seats were filled and people were turned away. Professor Lindberg of the University of Wisconsin-Madison gave an entertaining account of the life of Galileo of Florence, and the events that led to his falling out with the Catholic Church. New light was shed and old myths exposed.

Prior to 1543, it was generally assumed that the earth stood still and the sun, moon and stars moved round it: **the geocentric theory**. It made common sense, and also several passages in the Bible reinforced that idea. If the earth were moving round the sun, one should see parallax in the positions of some stars, but none was observed [the actual reason for this, that the stars are many times further away than the sun, seemed preposterous]. In 1543, Copernicus proposed **the heliocentric theory,** that the earth and planets moved in orbit round the sun. He published this in a book: in spite of censorship in Rome, his book was approved, and was even dedicated to the current Pope. Galileo favoured this idea: for example, it explained why the planets sometimes appear to move backwards.

There were good observations of the motions of the planets, and calculations could be made to predict future positions using either the geocentric or the heliocentric theory. The telescope had been invented, and Galileo used it to observe mountains on the moon, spots on the sun and moons orbiting Jupiter: he made many telescopes that were in

demand by churchmen and others. However, the overwhelming scientific opinion among astronomers was geocentric.

The cardinal who later became Pope Urban 8 was a friend of Galileo and encouraged his work, without taking sides in the controversy. Galileo was a bit of a curmudgeon: clever, argumentative and politically naïve: he thought arguments would win the day. He liked to win public opinion, and, of course patronage, but also liked to embarrass important people.

When Urban 8 became Pope, he still did not take sides, declaring that humans are incapable of knowing the divine plan. He was under great pressure from Martin Luther's protestant movement in Northern Europe, and the Catholic Church turned more conservative.

Galileo's big mistake was to write a dialog in which his ideas were presented, and the contrary arguments, which had been put forward by Urban 8, were in the mouth of a buffoon. The Roman Inquisition (less brutal than the Spanish one), tried him, forced him to sign a recantation and sentenced him to house arrest for the rest of his life (eleven years): the house itself was very comfortable, but his travel and visitors were severely restricted, and publication banned.

Professor Lindberg summarized the situation by saying that it was not a case of Science right, Church wrong, but there were geocentric and heliocentric supporters among both the astronomers and the church.

Legacy Product Strategy: Software Product Maintenance
IEEE Seminar, Dr. Burton Leathers, Cognos, Incorporated
Every product has a life cycle. Some products have such value and durability that they live a long life. It includes an extended period of "maturity" in which they are essentially feature complete but are still very good at what they do. Such mature products are often termed cash cows because, if well managed, they generate revenue far in excess of the maintenance costs they incur. Although some cash cows happen by accident, the best are spotted early and are managed through a coherent sequence of maturation, exploitation and termination. This paper examines the mature product life phases as they apply to software products. It shows the interaction between business and technology which drive the phases. It considers the distinctive challenges of mature product maintenance, real software maintenance -- in contrast to normal software creation and enhancement. Throughout, it shows that work on mature products offers challenges and rewards comparable to those to be gained from work on new and current products.

ATS Supports Robotics Competition
UW Bulletin
ATS Automation Tooling Systems Inc. has donated $50,000 in support of the FIRST Waterloo Regional student robotics competition which will be held on the UW campus March 24-26.

The FIRST (For Inspiration and Recognition of Science and Technology) Robotics Competition challenges teams of students and their mentors to solve a common problem in a six-week time frame using a standard kit of parts and a common set of rules. Teams build robots from the parts and enter them in a series of competitions designed by FIRST founders Dean Kamen and Woodie Flowers.

"Canada needs to position itself as a technology leader. In order to meet this goal we must generate excitement in the minds of our young people about careers in science and technology," said Mike Cybulski, a vice-president of ATS. "FIRST Robotics provides a unique opportunity for young people to gain exposure to a career in engineering. Also, in order to be successful each team must collaborate at a very high level, this aspect of the competition is as important as the technical side."

"FIRST redefines winning as scoring the most points is a secondary goal," said electrical and computer engineering professor Rob Gorbet, who chairs the FIRST Waterloo Regional Planning Committee. "Winning means building partnerships that last." Gorbet explained that teams are rewarded for excellence in design, demonstrated team spirit and gracious professionalism and maturity, along with the ability to overcome obstacles.

http://www.firstrobotics.uwaterloo.ca/ , http://www.atsautomation.com/

Christie Digital Systems Supports Renison

UW Bulletin

Christie Digital Systems Inc. contributed digital projection units to Renison College. Christie, with expertise in film projection since 1929 and professional projection systems since 1979, arranged a donation of digital projection units to be installed immediately in classrooms and seminar rooms at the College, providing advanced teaching technology for faculty and students."

CEO Gerry Remers said: "Giving support to the local community where Christie makes its home is important to us. Renison College offers unique programs within the University of Waterloo and being able to make a difference to students enrolled in their programs by enhancing the educational experience is very rewarding."
http://www.christiedigital.com/

Woodhead webGATE offers web based monitoring & control

Waterloo based SST now incorporated into Woodhead Industries, announces the release of applicom webGATE, a customizable web-enabled gateway providing both local and remote monitoring services for Serial connected devices. Woodhead now offers a complete industrial network solution. The applicom software running on a webGATE server allows a client terminal to be located anywhere as long as it supports a standard web browser. WebGATE also manages alarms and status information to remote service centers. It includes a unique feature called IP callback, providing the security required to allow maintenance personnel to service the Serial devices through the webGATE. Other solutions available from Woodhead include PC/PLC network interfaces, gateways, I/O

simulation software, diagnostic tools, I/O modules, connectors, cable assemblies, and connector blocks. To find out more, visit http://www.woodhead.com

Students begin first PDEng course

UW Bulletin

The first students have taken the first modules in the new Professional Development for Engineering Students program of non-credit, online training.

"Students have completed two of the eight modules of PDEng 15 this term," writes the assistant director of the program, Jeremy Steffler. "The remaining six modules will be completed next term," when many of the first-year students will be out on work term jobs.

PDEng is being introduced gradually, with the class of 2009, who started at UW this fall, being the first students to participate. They're starting with PDEng 15, "Professional Engineering and You -- Being an Effective Employee". Later courses, for subsequent work terms, are titled "Critical Analysis in the Workplace"; "Professionalism and Ethical Decision-Making"; "Becoming a Leader and Project Manager"; and "Integrating Professional Skills for a Global Workplace".
http://www.pdeng.uwaterloo.ca/

Proof By Diagram and a Puzzle

Tom East © 2004

In the November 3rd Perimeter Institute public lecture, James Robert Brown claimed that many mathematical theorems could be proved by two methods: by mathematical induction (logic) and by geometrical diagrams.

As an example, take S1/(4^n), that is, ¼ + 1/16 + 1/64 + … The value of this infinite series is 1/3. Here is a proof using a diagram. Inside a unit square, draw squares for each of the terms along a diagonal, thus:
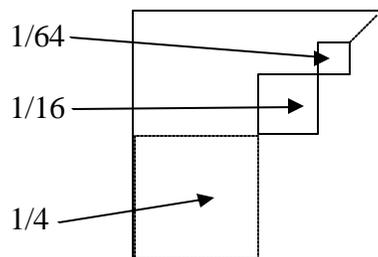
You will find that you can do this again, filling the space to the right of the original squares, and again, filling the space above the original squares:
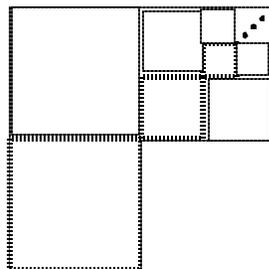
Since there are three equal sets of squares filling the unit square, one set of squares must have an area of one third. Quod Erat Demonstrandum.

Here is a somewhat more complicated problem:
The cumulative sum of the cubes of integers, starting from 1, is always a perfect square:

$1 = 1$
$1 + 8 = 9$
$1 + 8 + 27 = 36$
$1 + 8 + 27 + 64 = 100$ and so on.

This can be proved using mathematical induction.
Can you prove it by using diagrams? *Answer in the next issue.*

One curious feature is that the square roots of the results (1, 3, 6, 10) are the cumulative sums of integers starting from 1.

UW Course Ends in MiniSumo Tournament
UW Bulletin
The Mechanical Engineering students of ME597 build robots over the term. During the last class, they will have a tournament to decide a winner. The rules and notes from last term are linked below:
http://www.me.uwaterloo.ca/~me597/miniSumo.html

Universities join for technology transfer
UW Daily Bulletin

Four southwestern Ontario universities have created one of the nation's largest consortia for technology transfer. UW, the University of Western Ontario, the University of Guelph and McMaster University   have signed a memorandum of understanding to collaboratively protect and commercialize technologies deriving from research at each institution.
This memorandum is the first of its kind in Canada and puts the consortium on a par with the largest technology transfer institutions in the United States. This initiative is based on a joint vision for coordination, cooperation, collaboration and commercialization. By sharing resources and expertise, the universities hope to establish broader partnerships, apply jointly for funding opportunities and more effectively market and commercialize technologies.

Brock Solutions "Best-Managed"
KW Record
Brock Solutions, an engineering services company based in Kitchener, has stayed in Canada's list of 50 Best-Managed Companies for 8 years.
http://www.brocksolutions.com/index.html

Efficient Variable-Length Channel Coding …
Dec 10, Dr. Frank R. Kschischang

Abstract:
Is it possible to communicate reliably and efficiently over an unknown channel without first measuring it at the receiver and feeding back the measurements to the transmitter? In this talk we present a coding strategy that shows how this may in principle be accomplished, using only a very limited feedback: the transmission of a single acknowledgment message by the receiver. In particular, we present a strategy for the reliable communication of a message selected from a codebook of fixed size, in a variable number of channel uses, over an unknown discrete memoryless channel. At certain selected times, the receiver tests the received sequence and decides if it can decode. If so, the receiver sends an acknowledgment to the transmitter, which then stops transmitting. By choosing the size of the codebook large enough, the transmission rate realized by this strategy can be made to approach arbitrarily closely the mutual information between the user-chosen input distribution and the induced channel output distribution. This is the maximum rate that can be hoped for, since, without additional knowledge, the input distribution cannot always be set equal to the capacity-achieving input distribution. The strategy presented can be considered as a generalization to arbitrary discrete memoryless channels of earlier variable-length coding schemes, such as digital fountain codes for erasure channels, and a coding strategy for binary symmetric channels presented by Tchamkerten and Telatar.

Engineers and the World

Conquering Change: Cross-Discipline Experiences
At various stages of your career, you will almost certainly find yourself on the bottom of one learning curve or another, challenged to climb it quickly. The good news is that as problem solvers, such as engineers probably more than any other professionals are well equipped to deal with change.
http://www.todaysengineer.org/2005/Jan/change.asp

An Engineering Way to Assist in Tsunami Relief
RedR Canada is the Canadian Branch of RedR (Registered Engineers for Disaster Relief), a worldwide organization that provides engineering expertise to support disaster relief by working with NGOs. RedR Canada, together with RedR colleagues around the world, is doing it's very best to help the coastal nations of South Asia struck by the tsunami on December 26. It is helping in two ways: 1. Providing engineers and other skilled relief workers to the agencies operating on the front lines in the affected countries, and 2. Providing funds where most needed. Please consider donating your time or your money via the RedR Canada web site.
http://www.redr.ca/

Engineers Without Borders
Jan 26, 5:30 UW DC1302
The Scala Program improves the employment opportunities for underprivileged Filipino youth by establishing Computer Livelihood Training Centres. Engineers Without Borders (EWB) Waterloo is putting on a 3-part Workshop series Entitled "Introduction to

Information Communication Technologies (ICT) for Development".   These workshops are open to anyone interested in learning about ICTs for Development and the role that EWB is playing in this area with the Scala program.

As part of this program, it is up to the Waterloo chapter to collect the required 65 computers to send to the Philippines. So if you have old computers to donate or know of anyone or any company that may be willing to help out, please email m2kamgar@engmail.uwaterloo.ca or gotcomputers@gmail.com, http://scala.ewb.ca/

David Suzuki to Kick Off One-Tonne Challenge

Jan 26, 8pm UW HUM

The One-Tonne Challenge, an initiative of Environment Canada, calls on each Canadian to reduce their greenhouse gas emissions by one-tonne or 20% of the five-tonne average for an individual annually. The national website allows you to calculate your emissions and offers recommendations on how they can be reduced. [30]A local web site will highlight local programs for citizens.

David Suzuki's lecture will not only help motivate citizens to reduce their personal greenhouse gas emissions, but also champion the cause to others in the community.

David Suzuki is an ideal speaker on the importance of taking concrete steps to reducing greenhouse gas emissions, whether that be driving less or making one's home more energy efficient. "This event will be the initial spark to get our project out into the community," says Jessica Kwik, coordinator of the One-Tonne Challenge for Waterloo Region.

Tickets for Suzuki's 8 p.m. talk are on sale at $11 for community members through the Humanities Theatre box office from noon to 5 p.m., or by calling 888-4908. Various titles written by Suzuki will be available for sale with a book signing by Suzuki following the event.

http://www.davidsuzuki.org/ , http://www.climatechange.gc.ca/ , http://www.ireduce.ca/

Biodiesel Gains Star Front Man

Various

Willie Nelson, a country music star, has joined with business partners to increase the visibility of biodiesel. This alternative to petroleum-based fuels is being marketed to truck drivers, a market that that can be hard to reach through normal media channels.

Canadian SCISAT Brings Home the Spectrum

Toronto Star

A Canadian satellite, SCISAT, and researchers from UW are making spectrum analysis of the atmosphere available internationally. The scans provide information about contents of the atmosphere including pollutants.

Engineering Humour

They'll Get It If They Want It

Tom East, KW Record 26 November 2004 page E8

A wealthy Florida man had a classic car, and a salesman offered him a GPS-based recovery system to guard against theft. He refused, instead relying on his own system of chaining the car to two palm trees, one to the front, one to the back.

A few weeks later, he phoned the salesman to have the GPS system installed. Why did he change his mind? He looked out of his window one morning and saw that the car was stilled chained to the two trees, but facing the opposite direction. On the windshie ld was a note that said "When we want it, we will come and get it."