IEEE Canada

KITCHENER-WATERLOO SECTION

March 2004

Masthead

The Kitchener-Waterloo Section of the Institute of Electrical and Electronics Engineers serves all members whose mailing address is in Bruce, Grey, and Perth, Waterloo or Wellington counties. It collects news relevant to local engineers and is published bi-monthly.
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Revamped website: http://www.ece.uwaterloo.ca/~ieee_kw
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Upcoming Events

Check http://ece.uwaterloo.ca/~ieee_kw/presentations.html for updated information.

CCECE 2004 - Technology Driving Innovation.

Tony Kormos
The next Canadian Conference of Electrical and Computer Engineering will be held in Niagara Falls in May 2004. This conference, organized by local IEEE sections, provides a forum for Canada's best emerging Engineering talent and industrial leaders to present, participate, sponsor and network between partners in Canada's high technology frontier. For more information, see: http://www.ieee.ca/ccece04

Young Professionals Network for Engineers

IEEE
The new chair of the Young Professionals Network (or GOLD), Kevin Ma, is initiating a number of events directed at new graduates and recent graduates. Keep an eye on the presentation link above for events as they are scheduled.

Perimeter Institute Lectures

This series has been moved to WCI, see the website for more information.
http://www.perimeterinstitute.ca
On April 7, the Kaplans will discuss “The Art of Mathematics”

UW Lunch Seminars

various
The Brown Bag (BRAG) Seminar Series is a monthly sequence of informal, lunchtime talks by faculty members of the Electrical and Computer Engineering Department of the University of Waterloo. Aimed at non-specialists, the seminars are intended as an introduction to the Department's wide range of research activities. They should be of interest to general technical audiences.
http://www.brag.uwaterloo.ca/index.html
April’s presentation will be done Professor Amir Khandani

Fast Simulation of RF/Microwave Circuits and Antennas

IEEE MTT chapter
April 1, 3:00 pm, UW EIT 3151
Raj Mittra of the Electromagnetic Communication Laboratory
Pennsylvania State University
Abstract:
Virtual prototyping of RF, wireless, and microwave circuits¾as well as integrated antennas for these systems¾plays an important role in the cost-effective and timely development of new products. However, this task may be very time-consuming because these circuits typically contain a large number of linear and non-linear components, and the procedures for the circuit simulation and optimization can be very computer-intensive.
The objective of this talk is to present an approach, called the Characteristic Basis Function Method (CBFM), which has been designed to alleviate the problem of large solution times alluded to above. The method, introduced relatively recently by the authors

and their colleagues, has evolved during the last two years and is currently in the process of being implemented in a CAD package. It attacks the problem of large simulation times in a 3-pronged manner: by reducing the time to generate the matrix elements; using special high-level basis functions; and, finally employing efficient techniques for spanning the frequency range.

RF MEMS

UW BRAG
March 12, 12-1 CEIT 3142, by Professor Raafat Mansour
The Micro-Electro-Mechanical System (MEMS) technology is the next logical step in the silicon revolution. It is destined to become the hallmark technology over the next two decades with numerous applications having a dramatic impact on everything from aerospace to biotechnology. Several market research studies have projected that the MEMS industry will grow to become a $100 billion industry by year 2020. In particular, the Radio Frequency (RF) MEMS technology has the potential of replacing many RF components used in today's mobile, communication and satellite systems. In many cases, such RF MEMS components would not only reduce substantially the size, weight, power consumption and component counts, but also promise superior performance. RF-MEMS also enables new functionality and system capability that are not possible with current technologies such as Nano-satellites and Intelligent RF Microsystems i.e. a system on a chip that is able to sense, to act and to communicate. The talk will address the following: An overview of the MEMS technology and its applications RF MEMS devices, a video tour of the new RF MEMS fabrication and characterization laboratory that has been recently established at the University of Waterloo.

Trends in Power Electronics in Japan

IEEE MTT-Chapter Presentation
Prof. Hirofumi Akagi
Tokyo Institute of Technology, Japan
DATE: Friday March 12, 2004, TIME: 3:00-4:00 pm, LOCATION: EIT 3142
Invited by Prof. Magdy Salama The emergence of power semiconductor devices such as insulated-gate bipolar transistors (IGBTs) or injection enhanced gate transistors 9IEGTs) and gate-commutated turn-off (GCT) thyristors enables power conversion systems to expand into utility and industry applications.
This talk focuses on the state-of –the- art power electronics and its applications to industry and utility in Japan, for example, trends in 600-V IGBT, a 1.4 GW HVDC transmission system using light-triggered thyristors, a 10-MW railway power conditioner using GCTs, a 200-MJ/20-MW flywheel energy storage system for line-frequency regulation, and so on. This talk also includes the personal views and expectations of the speaker.

New UW Student Program in Development

UW daily Bulletin
The University of Waterloo is creating a fundamentally new style of high school enrichment program. Waterloo Unlimited will be a trans-disciplinary, residential enrichment experience, bringing together students of exceptional promise from across the country. Unlimited students will live and study in a creative, articulate community of scholars where the students, staff and professors share a common vision: that a University

is a place where people of extraordinary ability and accomplishment come together in their pursuit of knowledge, experience, and excellence across the traditional boundaries of academic disciplines. The program is currently under development and they are looking for participants at all levels (mentors, students). See: http://www.unlimited.uwaterloo.ca/twiki/bin/view/About/WebHome

IEEE Members Benefit at Telus

The student chapter have arranged a special offering for the IEEE members from the new Telus store in the University Shops Plaza.

When you show your IEEE card…
$25 Mail In rebate!!! This is in addition to any other current Telus offerings. As well, 10% Discount off all accessories in the store and a free BACKPACK!

Recent Events

Annual General Meeting

IEEE, 14 January
The Kitchener-Waterloo Section held its AGM at 6.00 pm on Wednesday 14th January at the UW Davis Centre.

The treasurer reported a positve balance. A budget for the year is being prepared. Pens will be available to be presented as gifts to speakers.

A new website for the section has been developed and will be put in place soon.

Tom East has replaced Wai-Cheung Tang as Awards chair, and is stepping down as Life Members chair. Kevin Ma is the new GOLD chair (Graduates of the last decade).

The Information Theory/Computer Chapter has been split with Ladan Tahvildari becoming the Computer Chapter Chair. For more information see: http://swen.uwaterloo.ca/~ltahvild/

Professor Vlach On Communism

Tom East
After the AGM business meeting, Professor Jiri Vlach gave a fascinating account of life under communist rule, including in his native Czechoslovakia. Examples of the stupidity of the system were the footwear factory which continued to meet its quota of ladies' boots under the five year plan, even after all ladies in the region had a pair of boots and did not need any more; and a ruling that because new born calves in the Steppes of Russia needed kennels to protect them from the wind, those in southern climates had to be taken out of a warm barn and put outside in kennels. Vlach's career suffered because he was not a member of the party. He escaped the occupation of his country by Russian troops by a few hours, and went to Illinois in 1968, then the University of Waterloo.

After the talk, a student told Prof. Vlach that his grandfather who had grown up in China had told him tales of just the same bureaucratic bungling.

Senior Member Upgrades

The following local members have earned the professional recognition of their peers for technical and professional excellence.
Robert G. Ellis
Hamid Sheikhzadeh Nadjar
See http://www.ieee.org/ra/md/smprogram.html for more information on this program.

Engineer appointed to Order of Canada

KW Record
Local Electrical Engineer, George Holbrook, was recognized for his influence as a mentor, innovator and leader to students and colleagues.

E&CE Design Projects Symposium

U. of Waterloo – Jan 21
The E&CE Design Projects match teams of Waterloo Engineering students with design problems from industry and research. The teams work under the guidance of senior engineers to develop solutions to a wide range of engineering problems. For further information see http://eceprojects.uwaterloo.ca .

National Engineering Week Events

UW Daily Bulletin, others

UW Engineering student projects, including Formula SAE, Mini-Baja, WARG, and Midnight Sun, were on display at Conestoga part of Waterloo's contribution to National Engineering Week.

Students and engineers were at the Waterloo Regional Children's Museum helping to run K'nex construction workshops for local children.
http://www.knex.com/

Nine profs win research excellence awards

UW media relations office

Nine UW faculty members are recipients of the Premier's Research Excellence Awards, which aim to encourage innovation among Ontario's best and brightest young researchers within 10 years of receiving their PhDs. These included:

Mark Aagaard, electrical and computer engineering, "Verified Design Patterns for Pipelined Circuits." He explains: "In the design of digital hardware systems, such as microprocessors, design engineers usually choose evolutionary solutions over radical innovations. Even if the radical innovations would provide significant benefits in performance, area or power, engineers are hesitant to explore new regions of the design space for fear of introducing bugs into their hardware." The PREA funding will enable Aagaard to recruit a post-doctoral fellow to develop verified design patterns for pipe-lined circuits, used in digital-hardware systems ranging from simple signal-processing filters to high-performance microprocessors.

Otman Basir, systems design, "Biologically Inspired Sensory Modules for Intelligent Vehicles." The award will enable Basir to investigate and develop innovative biologically inspired sensors and sensing techniques with emphasis on intelligent transportation systems in the car industry. The research should result in significant publication activity in the field of intelligent transportation systems design technologies that can be commercialized.

Krzysztof Czarnecki, E&CE, "Generative Domain Modelling for Rapid Software Application Development." The award will help will help launch a research program aimed at improving productivity and quality in software development through generative technologies. The project will lead to tool prototypes and case studies.

Zoran Miskovic, applied math, "Interactions of Nano-Particles with Matter." Besides forming a research group in the area of interactions of nano-particles, the award will help Miskovic's group establish contacts and initiate collaborations with a broad range of nano-researchers through the relevant national and international networks. "Since nano-science is an extremely rapidly developing area, it is imperative to stay alert of the ongoing research activity," he says.

Mahesh Pandey, civil engineering, "Risk Assessment and Cost Effective Management of Energy Systems and Infrastructure." Improvement in power generation and transmission capacity is considered key to economic success and an enhanced quality of life in Ontario and Canada. The award will enable work to develop scientific protocols for inspection, assessment and refurbishment of power transmission systems. "The research results of the program are expected to reduce the operating costs, improve the efficiency and prolong the service life of critical engineering systems in power generation and transmission facilities," Pandey says.

Edlyn Teske, combinatorics and optimization, "Number-Theoretic Security of Public-Key Cryptosystems." "I anticipate exciting joint work on current and new public-key cryptographic schemes, both in terms of theoretical investigations and practical implementations," Teske says. "Disseminating our results in print and presentations will result in increased confidence in currently deployed cryptographic tools and will provide guidance for future applications in sectors such as electronic commerce or homeland security."

Entrepreneurship and the Engineer

IEEE MTT-Chapter Presentation, March 9

Have you ever considered starting a hi-tech startup company? There is a freedom and a potential for wealth that is associated with being a founder of a successful technology company but do you have what it takes? This well attended 2 hour presentation was by of some individuals who are very involved in the local technology sector; Andrew Abouchar from Tech Capital Partners, John Hutson from Deloitte & Touche and Tom Beynon from McCarter Grespan Robson Beynon Thompson LLP. They each gave a short talk from the viewpoints of the Venture Capitalist, the accountant and the lawyer respectively.

Dalsa Cameras on Mars

KW Record

The rovers Spirit and Opportunity use sensors built by local firm Dalsa, in their Quebec foundry. The sensors include two panoramic cameras mounted on the rover's mast.

RIM Reaches 1 Million Users

C.Hulls

Research In Motion today announced that its BlackBerry(R) wireless platform surpassed another major milestone with more than one million active subscribers. RIM continues to lead the market it pioneered with integrated wireless data solutions for mobile professionals; and this achievement tangibly illustrates the growing popularity and momentum of BlackBerry.

Sandvine Removes Worm Generated Traffic

KW Record

Sandvine's network solutions minimize the network capacity used by services such as file-sharing. Worms and other malicious programs generate network traffic, predicted to be up to 12% of the total Internet traffic. Recent changes allow Sandvine's solutions to remove 98% of traffic generated by worms.

Comtext Answers with AI

KW Record

Comtext Systems develops a natural-language interface to aid users of web sites to find the information they want. The company is continuing to grow and has a number of major customers including ScotiaBank.

UW Engineering students win top three prizes at provincial contest

UW Alumni

University of Waterloo engineering students collected half of the top prizes at the Ontario Engineering Competition held in February at Queen's University in Kingston, Ontario.

"Once again, our students performed admirably at the OEC," said Professor David Clausi of Systems Design Engineering, who acted as the UW coordinator at the contest. "Capturing three of the six top prizes is a terrific achievement and a reflection of the exceptional capabilities of the UW engineering students."

The undergraduate student competition consisted of six categories, emphasizing societal and technical engineering aspects.

A first-place prize went to UW's Elliot Smith (above) and Jay Detsky (Systems Design Engineering) for their Corporate Design entry, titled "Adaptive Delay System (ADS) for Sound Reinforcement." The category seeks a corporate design of a solution to a problem faced by a company. The ADS is a new method for synchronizing sound throughout an audience during a concert, in order to compensate for electrical impulses that travel faster to the speakers than the sound that travels from the stage.
For a complete list of prize winners see:
http://alumni.uwaterloo.ca/alumni/e-newsletter/2004/march/engineering_students.html

Robot cuts ribbon on CEIT

UW Daily Bulletin

Robot SCORBOT-ER III did the honours by cutting the ribbon officially opening the Centre for Environmental and Information Technology, UW's newest building.

The robot is normally used in an electrical and computer engineering class to provide an introduction to the basics of robot dynamics and control. SCORBOT is used to investigate how a typical "pick-and-place" task can be performed using a robot. Students first "teach" the robot positions in the workspace and then write a program to execute the desired task. Issues of path planning, collision avoidance and repeatability are involved.

After the ribbon cutting, chemistry staff poured liquid nitrogen into the "Great Lakes" exhibit at the Earth Sciences Museum, located in the centre's March Networks Exhibit Atrium.

Kitchener Engineers Develop Sidewalker

KW Record

City employees combined GPS, tablet computer and an adult tricycle to measure and record places that need repair on the sidewalks. Other municipalities are considering buying versions for themselves.

Microsoft links are going well

UW Daily Bulletin

A "partnership" with Microsoft Corp. is working well, says a memo from the electrical and computer engineering department, where the joint work on online learning is based.

E&CE has announced that a web site is now available with updates on what's being done. "Thanks to the UW Microsoft Online Learning Initiatives (MOLI) in Electrical and Computer Engineering," the memo says, "undergraduate students will continue to have access to world-class laboratory studies and courseware."

"The high-school outreach course, referred to as ECE 050, will be the first of its kind in Canada. The course has been designed to provide high-school students with an understanding of the fundamentals of computing and computer programming. Students will be taught a variety of computer languages including C#, C++, and Visual Basic using a combination of lecture notes, animations, and videos delivered electronically. http://www.moli.uwaterloo.ca/ for more information

Robotic Table Creator gives Talk at UW

Rob Gorbet

Max Dean, a renowned Canadian artist who employs technology in his practice, gave a visiting artist talk on March 3rd.

Dean recently collaborated with Raffaello D'Andrea, a Canadian engineer (BASc 1991, UT) now teaching at Cornell, on a neat piece entitled "The Table: Childhood". There is some web information on this piece, at
http://www.fundacion.telefonica.com/at/vida/paginas/v4/etable.html
<definitely follow this link, editor> and it is currently on exhibition at the National Gallery of Canada, returning from the prestigious Venice Biennale.
The National Gallery has this to say about the artist:

"Living and working in Toronto, Dean seeks to directly engage spectators by inviting them to participate into the workings of his pieces. In a number of his performances and artworks, Dean constructs situations in which the visitor is given the opportunity to make a choice to intervene, in some cases to stop an action from taking place and, in a more extreme example, to save him from being harmed."

Brandenberger Discussed the Big Bang

Tom East

On February 4th there was again a full house at the Waterloo Collegiate Institute for the Perimeter Institute Public Lecture. Robert Brandenberger questioned conventional thinking about the way the universe started with the Big Bang.

In the early days of radio telescopes, it was discovered that there is a very uniform microwave radiation background throughout the sky, which is claimed to be the remnants of radiation from the big bang. Very uniform, but not perfectly uniform: it's average value is 2.73 degrees kelvin, that is 2.73 degrees above absolute zero, but it has cooler and warmer areas which are up to 100 microkelvins (0.0001 degrees) above and below the average. (To someone who was used to noise figures expressed in decibels - that is hundreds of degrees - this is hard to swallow: how the heck are these minute variations measured? By long integration times as the telescope sweeps through the sky, apparently.)

In 1981, Alan Guth predicted the statistical properties of this variation, and measurements in 2003 have confirmed his prediction very closely. This result is inconsistent with the existing big bang theory, and Prof. Brandenberger's explanation is that there must have been a period of "inflation" at that time. Unfortunately, exactly what this means is unclear to this reporter.

Teaching techies to handle conflict

UW Gazette

When it comes to dealing with conflict, "we're all bad," laughs Keith Regehr, who's teaching a new course on the subject -- geared to techies -- at Conrad Grebel University College.

"While a number of professions include training around so-called soft skills," says Regehr, "there may be a stronger emphasis on technical skills in some of the programs of students I'm dealing with." He developed the course to help students move beyond what

he calls the basic fight-or-flight reaction to conflict, toward understanding the opposing interests that arise in interpersonal, work group and public relations -- and developing tools to "enable effective responses."
He plans to offer Conflict Management for Technical Professions every second year.
http://www.adm.uwaterloo.ca/interdis/pacs/

Exploring the use of Internet video

UW Daily Bulletin, selected by C.Hulls
"Internet based video-conferencing is really breaking down barriers right now," says Peter Goldsworthy of UW's Centre for Learning and Teaching Through Technology. It's featured on the LT3 web site this month.
"It seems as though there may be interest in two distinct groups related to using IPVC: technical (including different software, hardware and configuration parameters) and applications".
Meetings for the different groups are being organized at UW. More information is available from LT3's Liwana Bringelson at lbringel@engmail, phone ext. 5931.

Student space conference held at UW

UW Daily Bulletin
The third annual Canadian Student Summit on Aerospace (CSSA) was held at UW at the end of January, hosted by UW and the local branch of the Canadian Aeronautics and Space Institute, with involvement from the Waterloo Space Society. It's one of the largest student-run aerospace events across Canada.
The conference has grown to attract the interest of many large corporations including Research In Motion Ltd. and MD Robotics, which are helping to sponsor the summit.
"The conference will be of special significance to the aerospace community as it marks the tragic anniversary of the Columbia shuttle disaster," Carter said. This conference in Waterloo is one of the major highlights in a series of events that are being jointly organized by students across the country.

Graduate business students shine

UW Daily Bulletin

A team of students from the Master of Business, Entrepreneurship and Technology (MBET) program has been selected as one of three North American finalists in the Graduate Student Licensing Competition. The competition, sponsored by the Licensing Executives Society Foundation, is for graduate students interested in intellectual property and licensing issues.
The MBET team -- consisting of Prem Gururajan, Ethan Henry, Harish Patel and Joyce Kyeyune – also presented their plan at the society's winter meeting in San Francisco in mid-February. The MBET advisory council (a group of local entrepreneurs, venture capitalists and business professionals) has been active in coaching and mentoring the team.
"This is a prestigious accomplishment for our team, and the students will have a wonderful opportunity to receive additional guidance and mentorship by individuals with expertise in their area," says Howard Armitage, director of the Centre for Business, Entrepreneurship and Technology. MBET is a graduate program designed to provide

students with a technical background the business skills required to move ideas forward to commercial success.

Certicom offers $1million prize

Toronto Star

Want to win a million bucks and a high-paying job for life?
That's what Mississauga-based Certicom Corp. is offering anyone who can crack the code to its products and patents surrounding Elliptic Curve Cryptology (ECC) — a combination of algebra and algorithms that ensure everything from cellphone chatter to wireless e-mail sent and received on an Internet-enabled phone or a Blackberry PDA can't be hacked.

The math is complex, the technology used to apply it confounding. But its aim is simple. It is to give access only to those entitled to it — from mom using a cellphone to stay in touch with kids to military scientists using a computer network and determined to keep their secrets. "Our technology is based on a very difficult mathematical problem, so we're challenging people to solve the mathematical problem," said Scott Vanstone, a professor of math and computer science at the University of Waterloo and Certicom's founder, explaining the $1 million challenge.

Certicom was born in the mid-1980s in the labs of the University of Waterloo, where math majors were working on cracking different security codes.

Libraries improve access to map data

UW daily Bulletin
Library staff and geographers from UW, Wilfrid Laurier University and the University of Guelph have developed software that will give students and researchers "enhanced access to geospatial datasets", says the UW library's electronic newsletter. It's talking about access to electronic map data -- information, typically collected through remote sensing, about structures, population, watersheds, vegetation, temperature or shorelines, for example.
http://www.fesspatial.uwaterloo.ca/library/

Source-Channel Diversity Approaches for Multimedia Communication

IEEE sponsored, DSS, March 9
Joint work with John Apostolopoulos at Hewlett-Packard Labs and Emin Martinian and Gregory Wornell at MIT.
Diversity techniques are often employed to average over independent fluctuations in a communications medium, thereby reducing variations in performance and often dramatically improving average performance. For communication of multimedia signals, such as audio or video, there are two basic approaches to exploiting diversity in such scenarios: channel coding at the physical layer, or multiple description source coding at the application layer. We introduce a framework for analyzing and comparing these approaches, and develop a joint source-channel approach based upon multiple descriptions that leverages the benefits of both. The model and results apply to wireless channels with disjoint frequency bands and/or multiple antennas, and to wired networks such as the Internet with multiple paths between a source and destination.

Representing the Implementation of High-level Concerns in Software Systems

Dr. Robillard, University of British Columbia, Feb 2

Evolving a software system often requires discovering and understanding the implementation of different concerns, or high-level concepts that a developer must consider as a unit. Concerns may correspond to system features (e.g., the auto-save feature in a text editor), or to more technical issues such as enforcing a security policy in a distributed system. Correctly finding and understanding the implementation of a concern whose code is not well encapsulated in a module is a critical and difficult task which, if not done properly, can result in the introduction of costly regression faults in a system.

This talk presented a model, technique, and tool developed to help software engineers find, understand, and document how high-level concerns are implemented in a system. The model, called Concern Graphs, is an abstraction that captures the essence of the implementation of a concern in source code independently of the physical representation of the code (e.g., lines in files, indentation). The concern graph model also tolerates a certain degree of inconsistency between a description of a concern in source code and an actual code base, making it possible to reuse concern descriptions across different versions of a system.

These ideas have been implemented in a software tool called FEAT that allows developers to iteratively and semi-automatically build and use concern graphs during software evolution tasks. Empirical evaluation with FEAT has shown that concern graphs are inexpensive to create, are helpful during program evolution tasks, and can be reused in different versions of a system.

Higher Yet – 60GHz Being Opened Up for Wireless

Tom East: Microwave Journal Dec 2003 page 49

It so happens that oxygen absorbs EM waves in a broad band around 60 GHz to the extent of about 16 dB per kilometer, so this band is useless for long distance transmission, except in space (between satellites perhaps). However, if you want to keep your messages inside a room, (walls also absorb 60 GHz), and you want to set up a separate Wireless Personal Area Networks (WPANs) in each room in a building, this may be just the band you want to use.

FCC 47 CFR 15.255 defines a 7 GHz band around 60 GHz for this purpose. For more information on the IEEE 802.15 Working Group and the IEEE mmW Interest Group, visit http://ieee802.org/15/

Duality in Multi-user Uplink and Downlink Channels

IEEE sponsored, DSS, February 13

Wei Yu, Electrical and Computer Engineering Department, University of Toronto

There is an interesting duality between multi-user uplink and downlink channels. Under the same power constraint, the Gaussian broadcast channel and the multiple access channel have identical capacity regions. In the first part of the talk, we give a new interpretation of this duality by showing that uplink-downlink duality is equivalent to Lagrangian duality in convex optimization. This new interpretation not only gives an efficient numerical computation method for the sum capacity, it also provides new

insights into the structure of the broadcast channel. In particular, we show that the dual of a broadcast channel with per-antenna power constraints is a multiple-access channel with a diagonal uncertain noise. In the second part of the talk, we use duality to characterize the optimal spatial multiplex scheme in a multi-user wireless environment. It is shown that in a multi-user fading channel with N antennas at the base-station, the number of active users in the optimal transmission strategy is upper bounded by 1/2 N(N+1) at any given time. Thus, antennas are spatial resources. Multiple antennas at the base-station have the effect of creating extra spatial dimensions that allow multiple users to be accommodated at the same time.

Stabilization and control of a structural acoustic problem…

involving an intrinsic shell model
By Dr. Catherine Lebiedzik, Wayne State University, Feb 6

We presented a new model of a shell structure based upon the intrinsic differential geometric methods developed by Michel Delfour and Jean-Paul Zolesio. This new modeling scheme has the advantage of being more tractable for certain mathematical applications, such as the derivation of the energy estimates for proofs of system stability and optimal control. We then use this shell model in the context of structural acoustics -- the shell forms one wall of an acoustic chamber, thus giving a fully-coupled set of partial differential equations. We consider the question of stability of the coupled system and optimal control of the noise inside the chamber by means of piezoelectric actuators bonded to the shell walls.

Correlation Property of Polyphase Power Residue Sequence and Some Conjectures
Professor Hong-Yeop Song ,Invited by Prof. G. Gong, Feb 4

Let p be an odd prime and q be a divisor of p-1.In this talk, we review the definition and the autocorrelation property of q-ary power residue sequences (PRS, in short) of period p. They are very special example of poly-phase sequences in that their autocorrelation magnitude is upper-bounded by 3 regardless of the period and the number of phases.

And then, we will consider some sets of q-ary PRSs, and some other sets of q-ary sequences derived from one q-ary PRS, and then some interesting relations and cross correlation properties of the sets.

Alternative Energy

Car Comparison wins award

UW Imprint
Robin Sano, a third-year environmental engineering student at UW, recently received recognition for his year-long thesis by the Office of Energy Efficiency. Sano's report discusses the financial and environmental feasibility of replacing the two Volvos the university currently leases for UW's president and a vice president's with the gas-electric hybrid Toyota Prius. The report has earned him a nomination for the National Energy Efficiency Awards. The Energy Efficiency Awards are awarded annually by the Office of Energy Efficiency to commend people who contribute to the conservation of energy on a national scale.

Sano's report highlights the differences and similarities in features, performance and fuel efficiency of the president's 2003 Volvo XC70, and the vice president's 2003 Volvo S60. The result of Sano's extensive comparison is that the switch to a 2003 Toyota Prius would not result in a large amount of performance or feature reduction, and provide massive financial benefits.
http://alumni.uwaterloo.ca/alumni/e-newsletter/2004/march/robin_sano.html

Electric Cars – Alive While Dead

The Record 19 December 2003, collected by Tom East

A firefighter in Montgomery County, MD, noticed something strange recently when he approached a wrecked car. Although the engine was shut off, the injured driver kept her foot on the brake. It turned out the car was still running on silent electric power and could have surged forward, hitting rescuers or bystanders.

The car was a Toyota Prius, a gasoline electric hybrid vehicle that uses battery power at low speeds. In addition to running silently, the battery in a hybrid packs enough voltage to kill a person - more that 500 volts in the 2004 Prius, compared with 12 volts in the standard car battery. Both Toyota and Honda, the only companies currently selling hybrids, win high praise from rescue workers for marking high-voltage parts with attention-grabbing blaze orange and for engineering their cars with safety in mind. For instance, the powerful batteries aren't grounded to the frame, so there's little danger that simply touching a wrecked car could electrocute someone.

See-Through Solar Energy System Installed

Selected by M.Hulls
ARISE is also pleased to announce the completion of a project at the Waterloo City Hall building located in downtown Waterloo, ON. With custom design assistance from ATS Automation Tooling Systems (Photowatt), ARISE installed the attractive 1.1 kilowatt semi-transparent "see-through" solar energy system on city hall's skylight windows.

Solar Conference at UW in August

KW Record
The Solar Energy Society of Canada's 29th annual conference will be held at UW Aug 21 to 25th. Contact: mcollins@mecheng1.uwaterloo.ca

Engineers and the World

Engineers Without Borders

UW Daily Bulletin
Avi Caplan, a former volunteer with Engineers Without Borders, sends this message: "A few of us from EWB are trying to get a group of interested people together from across the university (not just engineers) to have regular informal discussions and perhaps to learn something from each other about _issues in development_, particularly as related to technology. We want this to be very participatory, so there are as of yet no 'topics'. No experience or background is required. Faculty and staff are very welcome." Anyone who's interested, can reach Caplan at aecaplan@artsmail .

Engineering Humor

Number Puzzle – The Answer

Tom East
You were asked to fill in the next number XX in:

71, 42, 12, 83, 54, XX

Did you find the answer? It is 24.
Hint: move the commas back one position.

Chess and Checkers

Tom East from David B. Fogel: Evolutionary Entertainment with Intelligent Agents: Computer June 2003 page 106-108
The IBM computer that defeated Kasparov used a program written by five chess experts. It had the advantage of experience learned by humans, and large memory and fast processing. However, if the tournament were repeated a few more times, Kasparov would learn from his experience playing the computer, but the computer would not learn anything new, and might lose.

The situation with checkers has gone one stage further. David Fogel and Kumar Chellapilla, using a Pentium II 400 MHz computer for 6 months, have developed an artificial intelligence (AI) program which, starting from scratch, learned to play checkers in 840 generations of its evolution, learning from each game that it played. The program was put on the internet with the name Blondie 24, complete with atavar, and playing 165 games was judged to be at the level of "expert" (below grand master and master). She also enjoys surfing and skiing, according to the article in IEEE Computer magazine.

A program that learns to play chess is the logical next step, but it would require much more memory and probably higher speed. Wait for a quantum computer?

Brain Teaser

Selected by C.Hulls
Three men entered a hotel and wanted a room for the night. They paid $30, each putting in $10. After they had gone to their room the receptionist realized he had made a mistake by overcharging them $5. He sent the bellboy with the $5 to give to the men. On the way to the room he couldn't figure out a way to split the money evenly between the 3 men, so he gave them $1 each keeping the remaining $2 for himself. This meant the 3 men paid $9 each for the room, which equals $27. Add the $2 that the bellboy kept-where is the remaining $1?

Answer next issue.