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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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## Upcoming Events

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

### IEEE Seeks New Faces of Engineering Nominees

WASHINGTON (1 September 2004) - The IEEE is seeking nominees for the New Faces of Engineering to showcase during Engineers Week (EWeek) 2005. The New Faces program highlights the vitality, diversity and rich contributions of the world's young engineers.

Nominees must hold an engineering degree, be employed as an engineer from two to five years, and have worked with projects that significantly affect public welfare or further professional development and growth. The focus is on engineers 30 and under.

Nomination forms are available at

[http://www.eweek.org/site/News/Eweek/2005\\_Nominations.shtml](http://www.eweek.org/site/News/Eweek/2005_Nominations.shtml) .

Five IEEE members, including two from outside the United States, will be chosen by an ad hoc committee to represent the IEEE and will be featured on the EWeek Web site ([www.eweek.org](http://www.eweek.org)). The top nominee from each Eweek sponsoring society will appear in USA Today during EWeek 2005, 20-26 February. You can view last year's honorees at <http://www.eweek.org/site/Engineers/newfaces2004/index.shtml> .

IEEE nominees should be submitted to Helen Hall at [h.hall@ieee.org](mailto:h.hall@ieee.org) by Friday 1 October 2004.

### Electrical Power Symposium

The 4th Annual IEEE/IEE Electrical Power Symposium (EPS2004) Friday, Oct. 29th, 2004 Centrepointe Theatre, 101 Centrepointe Drive, Ottawa, Ontario, Canada Thursday, Oct. 28th, 2004 Tutorials and Field Visit to Chats Falls Hydro Plant, Fitzroy Harbour, Ontario, Canada For registration and more information please visit:

<http://www.ewh.ieee.org/soc/pes/ottawa/EPS2004/>

Contact person: Wahab Almuhtadi [almuhtadi@ieee.org](mailto:almuhtadi@ieee.org)

## **IEEE Toronto Seminar's**

October 1, 2004

Smart Antennas for Wireless Communication Systems and Networks  
an IEEE Antennas and Propagation Society distinguished lecture

October 8, 2004

Toward Maximum Achievable Diversity in Space, Time, and Frequency  
an IEEE Signal Processing Society Distinguished Lecture

see their website for more info:

<http://toronto.ieee.ca/events/upcoming.htm>

## **Perimeter Institute's Opening Gala**

October 2<sup>nd</sup> will be the open house for PI's new building. Lectures will be running throughout the day. Check their website for more details:

<http://www.perimeterinstitute.ca/>

## **Patient Information Delivered to Patients**

KW Record

Sept 22

UW's InfraNet project has a talk on creating a web portal to allow patients to review their care plans and results over the web. This system has been implemented at Grand River Hospital. See the link for more information:

<http://infranet.uwaterloo.ca/infranet/s200409.htm>

## **Entrepreneur Community Launched**

Gary Will

WatStart is a new community initiative aimed at helping prospective entrepreneurs and very-early-stage technology companies in the Waterloo area. If you've thought about starting a company, or already have one in a nascent form, please drop by the Web site at

<http://www.watstart.com/> .

WatStart will create opportunities for early-stage entrepreneurs to get together -- online and in person -- with each other and with local service providers to learn from each other and to receive ongoing guidance, support and encouragement. All at no cost to entrepreneurs.

## **Entrepreneur Week: Chapter 2 - Right on the Market**

Communitech

Tuesday, October 05, 2004

Bootstrapping. Protecting your invention. Landing a customer. Find out what keeps technology entrepreneurs -- and their companies -- alive at Chapter 2, a FREE event for aspiring and early-stage technology entrepreneurs in the Waterloo region. Last year, "Chapter 1: Inspiration" challenged entrepreneurs to start technology companies. This year, Right on the Market delivers the hard realities of going to market, from basement brainstorming to landing your first big customer. Learn what you need to know, and meet the people who can help you build your company.

<http://www.communitech.ca/events/NewEventsCustom.asp?itemid=708>

## Recent Events

### Senior Member Upgrades

The following local member has earned the professional recognition of peers for technical and professional excellence.

Anthony M. Ponsford

See <http://www.ieee.org/ra/md/smprogram.html> for more information on this program.

### Neuroprocessing: Image Compression and Audio Processing

Tom East

On August 4<sup>th</sup>, Professor Bob Dony of the University of Guelph reviewed the standard methods of compressing a video movie to reduce its bandwidth. Blocks of 16 x 16 pixels are subjected to Discrete Cosine Transform (DCT) and only the most significant coefficients are transmitted. This is the method used in the Joint Picture Experts Group (JPEG) and Motion Picture Experts Group (MPEG) standards. (You may have noticed an occasional fault condition in TV programs when the picture breaks up into tiny squares but quickly recovers). The next standard being developed is called JPEF 2000.

Dony's group has been looking beyond block coding to using wavelets, which avoids the hard boundaries. They also use neural networks in image compression, filter banks and noise reduction. Neural network prediction coding increases the quality of the result. He points out that signal to noise ratio is not always a useful measure of quality, which is unavoidably a subjective judgment.

Dony's development will help separate voice from noise in hearing aids. He speaks highly of Dspfactory of Waterloo, which has managed to cram an analog-to-digital converter, a filter, a signal processor and a digital-to-analog converter onto a tiny chip which fits into a hearing aid.

### UW Solar Car Tours for 40 Days

UW web site

The Midnight Sun VII solar car completed a 40-day tour of North America and surpassed the world record distance of 13,054 km set by an Australian vehicle in 2002.

<http://www.newsrelease.uwaterloo.ca/news.php?id=4144>

### UW WARG wins Aerial Robotics Competition

UW Daily Bulletin

UW's team, the Waterloo Aerial Robotics Group -- took first place in the 2004 International Aerial Robotics Competition, held at Fort Benning, Georgia. An essential part of the victory: successful completion of Level 1 (fully autonomous flight around a 3-kilometre course).

<http://www.ece.uwaterloo.ca/~warg/>

## **Same Great Company, Half the Keyboard**

Various

RIM's new product, the Charm (or more formally, the BlackBerry 7100t) reduces device size by having each key represent two letters. Software is used to figure out which letter the user intends. <http://www.rim.com>.

## **Solar energy conference held at UW**

UW Daily Bulletin

More than 100 solar energy researchers, practitioners, business people and enthusiasts from across Canada and around the world gathered at UW during August for the 29th annual conference of the Solar Energy Society of Canada. It featured numerous plenary sessions, technical presentations, workshops and tours, all under the title "Innovation and Application".

"The future of solar energy certainly is bright," says Alfred Brunger, technical chair of the conference and manager of energy systems at Bodycote Materials Testing Canada in Mississauga. "Demand for solar energy products has been growing at over 20 per cent annually. Even greater usage is expected in the future as prices continue to fall. This conference will highlight not only the latest in technological innovation, but also strategies for utilizing solar energy across a variety of applications," said Brunger, a former UW professor.

## **U of T student killed in solar car accident**

UW Daily Bulletin

Mechatronics engineering student Andrew Frow, 21, was killed in July while driving the University of Toronto's solar car "Blue Sky" along highway 7 and 8 from Stratford to Waterloo. He and his teammates were on their way to UW as part of the Canadian Solar Tour. According to a report this morning in The Record, Frow's car lost control suddenly and veered into oncoming traffic, colliding with a minivan.

## **Lossless Data Compression Patent**

Gary Will

SlipStream co-founder and EVP -- and UW professor -- En-hui Yang was listed as the inventor on a U.S. patent for lossless data compression issued in July to California-based DirecTV. It had been filed in November 2000.

## **UW Joins Supercomputer Network**

UW Daily Bulletin

The Shared Hierarchical Academic Research Computing Network (Sharcnet) consortium of 11 Ontario institutions, including UW, will become among the world's most powerful High Performance Computing centres, as the result of a \$50-million investment from the Canada Foundation for Innovation and the Ontario government.

HPC, sometimes called supercomputing, allows scientists to employ extremely powerful computers to accelerate the pace of their research in a cost-effective virtual environment and, in many cases, to tackle complex scientific problems that could not otherwise be studied. <http://www.sharcnet.ca/>

## **Cooperative Communication: Fundamental Limits and Enabling Technologies**

DSS, IEEE sponsored seminar

Behnaam Aazhang, Rice University, Houston, Texas

Within the last five years, there has been a cultural shift from wired landlocked connectivity to pervasive wireless information access. Most emerging mobile devices are now equipped with some form of embedded wireless radio. The expectations of high data rates and increased battery longevity have put tremendous pressure on all aspects of wireless system design. To meet the challenges of next generation wireless system design, we need fundamentally new methods to exploit all available dimensions of communication channels and network. This presentation talked about emerging systems and network level techniques to increase spectral and power efficiency of communication systems, and extends coverage of wireless networks. The cooperative communication paradigm pools distributed resources of different nodes, such that the nodes act like a collaborative system instead of greedy adversarial participants. Research and development plans in the context of a scalable experimental wireless system for mobile broadband Internet were presented.

## **Performance Wireless Network for Different Hop-Level ARQ Policies**

UW Seminar

Profesor Ekram Hossain, University of Manitoba

We model and analyze the performances of a class of ARQ (Automatic Repeat Request) protocols in a multi-hop wireless data network. The performance metric here is the number of transmissions required for successful delivery of a packet over a multi-hop link. By using a discrete time Markov model, the distribution for the required number of transmissions is modeled as a "phase type" distribution. The effects of different network parameters-such as packet error rate in each hop, maximum number of allowable retransmissions at each hop and retransmission probability at each hop-on the required total number of transmissions are investigated. The novelty of this model is that the probability density function (pdf) for the number of transmissions required for successful end-to-end delivery of a packet can be easily obtained from this model. Using the pdf, different quality of service (QoS) performance metrics such as end-to-end delay, transmission energy and percentage of data delivery can be calculated. The numerical results obtained from this model are observed to be very close to those obtained from simulation for end-to-end TCP (Transmission Control Protocol) and reliable UDP (User Datagram Protocol) flows, which demonstrates the usefulness of this model in analyzing end-to-end protocol performance across multi-hop wireless links.

## **From Microsystems to Biosystems**

IEEE Seminar

Prof. Henry Baltes, Physical Electronics Laboratory (PEL)

Highlights from chemical and biomedical microsensor research at the PEL based on CMOS IC technology are presented: chirality microsensors (distinguishing between a molecule and its mirror image), an integrated beam resonator with minimal power

consumption, a micro hotplate gas sensor operating at 500 deg C on a CMOS IC chip, a blood pressure sensor chip, and on-chip extraction of electrical signals from living cells. This is followed by an introduction to the emerging field of systems biology.

## **Message Traffic and Congestion Control Capabilities in Mobile Ad Hoc Networks**

IEEE seminar

Prof. A. Boukerche, University of Ottawa

The talk is an overview on major research projects related to wireless multimedia systems, wireless and mobile networking and a distributed management and security system for mobile phone operations which we are currently investigating at PARADISE Research Lab, U-Ottawa. Node congestion problem in mobile and wireless ad hoc networks is also tackled.

Frequent topology changes caused by node mobility in mobile and wireless ad hoc networks make routing in ad hoc wireless networks a challenging problem. Message routing requires mobile hosts to act as routers, by means of store and forward mechanisms. However, limitations on capabilities of mobiles require a control on node congestion due to message forwarding. We shall discuss the message traffic and congestion control mechanisms and show how they can improve and reduce the overhead of both proactive and reactive ad hoc routing protocols.

The talk also introduces SWiMNet, a high-performance simulation testbed for large-scale wireless and mobile networks we have developed. This testbed allows very detailed and realistic model specifications. It facilitates and enables the evaluation and design of new protocols and applications for future generations of mobile ad hoc network technologies.

## **Survey of Magnetoresistive Random-Access Memory**

UW Seminar

Dr. Bruce Cockburn University of Alberta

Magnetism has provided the basis for several generations of nonvolatile digital memory technology. Core memory was introduced in the 1950s and was widely used in large mainframe computers through the 1960s and early 1970s, when it was replaced by semiconductor-based dynamic random-access memory (DRAM). Magnetic bubble memory enjoyed a period of commercial production in the late 1970s and early 1980s, but this technology was superseded by advances in hard disk drives and battery backed up volatile memory.

Two decades after the commercial failure of bubble memory, a new generation of semiconductor-compatible magnetic memories is under accelerated development at several large companies, including Motorola, IBM, Infineon and Honeywell. These so-called MRAMs are based on magnetoresistive phenomena in nanoscale layered structures. MRAM technology appears to be a promising candidate for providing a universal memory type that offers storage densities near DRAM, access times as fast as SRAM, compatibility with standard CMOS, and the nonvolatility of flash memory (but with much greater endurance than flash memory).

This tutorial seminar will briefly review the new generation of MRAMs including anisotropic MRAM, spin valve and pseudo spin valve MRAM, magnetic tunnel junction (MTJ) MRAM, and toggle mode MTF MRAM. The state of MRAM development today, as well as other competing nonvolatile memory technologies, will be briefly surveyed.

## **Composite Electrodes for the anode of lithium secondary battery**

IEEE Seminar

Dr. Joong Kee Lee, Korea Institute of Science and Technology

Graphite has been commonly employed as an anode material for lithium ion batteries because of its low and flat working voltage and better cycle performance compared with the metal oxides. During charge process, a lithium ion reacts with the six atoms of carbon. Thus, theoretical maximum storage capacity of graphite can be calculated as 372 mAh/g.

Here, the purpose of this study is accomplishment of high capacity of anode material with good cycle performance through silicon coating on the graphite surface. In the present study, preparation of highly dispersed silicon on the graphite anode is tried. In the carbon-silicon composite system, we expect that silicon acts lithium alloying reactants during charge-discharge process and also carbon matrix play a role as the lithium intercalation sites and conducting medium between silicon particles as well.

## **Crosscorrelation of m-sequences: An overview and recent results**

UW Seminar

Tor Hellesest, University of Bergen, Norway

Binary m-sequences have many applications in coding theory, communication systems and in cryptography. This lecture studied the crosscorrelation between m-sequences of the same period.

## **IPv6 Intrusion Detection System**

UW Seminar

Zhiguang Qin University of Electronic Science and Technology of China

Detecting and decoding traffics are important components in an Intrusion Detection System (IDS). Currently, IDS has a superb decoder for the IPv4 traffics, and a lot of work on the IDS has been carried out for the IPv4 environment. However, for the upcoming Internet Protocol IPv6, the IDS is a new area. This talk, introduced some of the IPv6 IDS features, such as:

- 1) Capture packet with high speed (under full 100 Megabytes Fast Ethernet)
- 2) Support dual protocols and tunnel packets (IPv6 over IPv4 & IPv4 over IPv6 )
- 3) Abundant IPv4 & IPv6 intrusion rules
- 4) Active response, Implement IPS (Intrusion Prevention System) Functions
- 5) Flow features analyze (abnormal detection based on statistics)
- 6) The attack source locate and IPv6 Traceback
- 7) Graphic user interface for administration and configuration

# Engineers and the World

## Student's site cuts search clutter

UW Daily Bulletin

How about a single web page that will do a Google search, hunt for information in the Old Farmer's Almanac or a database of court rulings, take you to an online translator, or help you buy stuff?

Welcome to Fagan Finder (<http://www.faganfinder.com>), an easy-to-use quick reference site that's used by more than 100,000 people a day and created by a UW science-and-business student.

## IEEE Virtual Museum Program Continues to Thrive

The IEEE Virtual Museum, the History Center's informal education site, has added still another exhibit to its "halls": Let's Get Small: The Shrinking World of Microelectronics examines the continued process of miniaturization throughout the 20th century.

Visit the new museum exhibit at

<http://www.ieee-virtual-museum.org/exhibit/exhibit.php?id=159270&lid=1>

## Green Grid Solutions

Kw Record

This Waterloo company offers a variety of alternative power systems and components from it's store on Frobisher Dr in Waterloo.

Email: [freebreezeenergy@aol.com](mailto:freebreezeenergy@aol.com)

## Engineering Humour

### Some Things Just Don't Change

M.Hulls with thanks to J.A Fields for source material.

In computer years, 20 years seems like a really long time. Here are some opinions published in Sept 1983. If you replace UNIX with your current Operating System, how different is it really?

An Opinion: UNIX Reality by Henry Glover

1. UNIX is not a good base upon which to build an applications environment. UNIX is oriented towards text-processing. The file system has no record-access system, no keyed or indexed files. These are supplied only through add-on packages from second vendors. Layered products, such as forms management packages, or dbms must be acquired from outside vendors, forcing a problem in support.

2. With UNIX, you always get a UNIX person  
In every UNIX installation there seems to be a resident person who knows all about UNIX. The UNIXperson usually arrives at the employer's door bearing software, which has been acquired from other UNIXpersons, a favourite editor, shell, or backup utility. These then replace the system's own utilities. This leads to reality 3.

3. No two UNIX systems look alike.

UNIX is supposed to be the standard operating system for small computers. If no two systems look alike, what are we to use as the reference for standardization.

#### 4. UNIX Breaks

In order to optimize the performance of UNIX, it's developers decided to cache disk blocks in memory... When the system crashes, the file system gets corrupted. ...

#### 5. UNIX is user-unfriendly

<maybe this has changed, but the original text is too long to enter here ;-)>

#### 6. UNIX look-alikes usually don't

When we discuss UNIX look-alikes, we first have to decide what it is that they're trying to mimic. Is it the shell, the utilities, or commands? Is it the C language system calls? Or something more? Oh, by the way, which version of UNIX do they try to look like?

If an OS were truly UNIX compatible then utilities and second-sourced software should run on all such systems with translation. That is not the case.