KITCHENER-WATERLOO SECTION

July 2005

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.

Raytheon's RADAR: Looking to the Future
GOLD Chapter Company Tour, September 15, 2005, 5:00pm - 6:00pm
LOCATION: Raytheon Canada Limited, 400 Phillip Street, Waterloo, ON
Attendance is limited - RSVP to dizaji@ieee.org by Sept 9th.

Raytheon's Waterloo facility is a world leader and a registered center of excellence in the fields of solid-state primary surveillance radar (PSR) and high frequency surface wave radar (HFSWR) technology. This facility has been a major supplier of air traffic control equipment for over 40 years, and has produced an extensive range of radars, signal processing, and data management systems for land and sea civil and military land and maritime applications.

The tour begins with a brief presentation: First an overview of Raytheon's latest Digital Airport Surveillance Radar (DASR) system is presented. This solid-state, air cooled radar system has superior tracking capability and costs less than analog system with longer durability and easier maintenance. In the second part of the presentation, Raytheon's Integrated Maritime Surveillance (IMS) system is introduced. This system uses land-based long-range high frequency surface wave radar (HFSWR) system. The HFSWR system has revolutionized the maritime surveillance technology by offering a cost effective 24 hours/7 days over the horizon coverage with the capability of tracking air and surface targets up to 200nm. Finally, a High Clutter Tracking (HCT) system developed in Raytheon for homeland security and search and rescue purposes is introduced.
Following the presentation, attendees are given a tour of Raytheon's Waterloo facility.

International Engineering Management Conference
September 2005
You are invited to St. John's, Newfoundland, Canada, for the 2005 International Engineering Management Conference (IEMC 2005). IEMC brings together engineering and management professionals, and academics from around the world. We encourage

attendance from engineers, managers, business and management consultants, academics and researchers. IEMC is a forum for the exchange of ideas, experience, theories, and knowledge between all persons involved in engineering management. For more information on the conference, please visit the website: http://www.iemc2005.org .

The Man | The Science | The Times | The Legacy
September 30 to October 23 | 2005

Join the Perimeter Institute for a spectacular celebration of the 100th anniversary of Albert Einstein's annus mirabilis – "miracle year" – of 1905 when, at the age of twenty-six, he published several groundbreaking ideas that led physics—and thereby, the world—into the modern era.

EinsteinFest explores our rapidly changing civilization at the turn of the century and sets Einstein's prolific contributions in context with the science, philosophy, politics, art and music of the day. A full spectrum of hands-on exhibits, educational activities, compelling lectures and inspiring performances examines the discoveries, brilliant minds and rich culture of this transformative period in history.
Sign up for updated information or to volunteer.
http://www.perimeterinstitute.ca/activities/community/einsteinfest/

Recent Events

Senior Member Upgrades
The following local member has earned the professional recognition of peers for technical and professional excellence.
Ehab F. El-Saadany
See http://www.ieee.org/ra/md/smprogram.html for more information on this program.

Aerospace and Electronic Systems Society Chapter
New IEEE Chapter
Members of the Aerospace & Electronic Systems Society (AESS) of the IEEE are interested in the design, integration, test, and analysis of large, complex systems consisting of major subsystems that contain dissimilar electronic devices. Most of our members work on sensor systems (radar. sonar, optics, and navigation), communications systems, command and control centers, avionics, space systems, military systems, digital signal processing simulators, and software development. Some members work on robotics, energy, and transportation systems.
http://ewh.ieee.org/soc/aes/

Communications/Vehicular Technology now Separate Chapters
IEEE Kitchener Waterloo Section - Communication Society Chapter Chaired by Dr. Raouf Boutaba (rboutaba@bbcr.uwaterloo.ca)

IEEE Kitchener Waterloo Section - Vehicular Technology Society Chapter Chaired by Dr. Weihua Zhuang (wzhuang@bbcr.uwaterloo.ca)

UW Midnight Sun Results

Daily Bulletin

Midnight Sun VIII, the student-built solar car that has traveled from Texas to Alberta representing UW, crossed the finish line of the North American Solar Challenge July 27 at the Olympic Oval on the University of Calgary campus. UW's entry finished fifth in the NASC, which was won by the University of Michigan.
http://nasc2005.americansolarchallenge.org/ , http://www.midsun.uwaterloo.ca/

Student Starts Business, Earns Co-op Credit

U of Guelph website

With funding and support from the Canadian Youth Business Foundation (CYBF), a University of Guelph student entrepreneur started his own business by pursuing a non-traditional co-op placement through the Business Venture Program option offered by U of G's Co-operative Education and Career Services Department.

Justin St-Maurice, a fourth-year engineering systems and computing student, is one of the city of Guelph's first recipients of CYBF start-up funding.

In May, he opened The Guelph Computer Shop on the upper level of downtown's Old Quebec Street mall and to date has completed five months of his eight-month co-op term. In the fall, he'll return to his studies part time and continue to build his business.

Prof's Sculpture Selected for Installation

Daily Bulletin

Solar Collector, is an interactive sculpture that gives form to the graceful angles of the sun and responds to the community and the seasons, coming to life at dusk with flowing waves of light. Designed by Gorbet Design Inc, which includes UW ECE Professor Rob Gorbet, the sculpture will be installed at the Regional Operations Centre in Cambridge.

Hot Fusion a Step Closer?

From The Record 29 June 2005 page A6:

France beat out Japan for the site of the International Thermonuclear Experimental Reactor, which will be in Cadarache in the south of France. The current list of players in the consortium is USA, Russia, China, Japan, South Korea and the European Union. Participating countries have to sign a final agreement. The project will cost 13 billion US dollars, and is scheduled for completion in about 2014.

Tom East notes:

In an article I wrote for this newsletter in February 1992, I described the proposed ITER.

An alternative to current nuclear stations, which use fission of uranium, ITER would use a fusion reactor in which hydrogen atoms collide at extremely high temperatures and fuse together, releasing large amounts of heat. The advantage of fusion over fission is that it does not generate large amounts of radioactive byproducts, and is much less hazardous if

it malfunctions. The favoured type of reactor is the Tokamak, a toroidal chamber containing a plasma: a large magnet keeps the plasma away from the walls of the toroid. Hydro Quebec had a small Tokamak at Varennes, and Britain had a much larger one, but still not able to run continuously and generate useful amounts of power. At that time, (1992), it was agreed to pool the resources of several big players to build an "International Thermonuclear Experimental Reactor" large enough to prove the practicality of such a power station.

WARG Maintains 2nd Place

Press Release August 4
The UW Waterloo Aerial Robotics Group (WARG) maintained second place overall in the 2005 International Aerial Robotics Competition last week.
This large group of students is working toward a, as yet unachieved, goal of autonomous flight, imaging and motion.
http://www.ece.uwaterloo.ca/~warg

Grad Student Heading to NASA

U of Guelph website
A University of Guelph graduate student will be spending his "summer vacation" at a place many others only dream about: the National Aeronautics and Space Administration's Goddard Space Flight Center.

John Carter, a master's student in the Department of Computing and Information Science (CIS), will head to Maryland in July to work with officials from NASA's Software Engineering Laboratory. "I'm definitely excited to be going," said Carter, who is part of the CIS Modeling and Design Automation research group with his supervisor, professor William Gardner.

Gardner added that the focus of the U of G group's research — a particular approach to developing computer software — strongly resonates with work under way at the space agency. He said that typically, the process of constructing software follows a well-worn path: specifying what it's supposed to do, designing its structure to make it fulfill the requirements, writing the software using some programming language (such as C++), then testing it.

But when high stakes are involved — such as in space missions — special techniques known as "formal methods" may be used to ensure that the software can be proven to meet the requirements. "The objective is to reduce the likelihood of bugs, which can be catastrophic in systems that cannot afford to be rebooted like your home computer when it crashes," he said.

Gardner and his students are trying to make it easier to use a particular formal method called Communicating Sequential Processes (CSP). For example, their tools allow specifications written in CSP's algebraic notation to be automatically translated to C++, saving a time-consuming and error-prone step of hand translation.

Fuel cell team takes top honours
UW Daily Bulletin

A Canadian vision of the vehicle of the future has taken top honours at a North American competition in Detroit. A team of Waterloo engineering students -- the only Canadian team in the competition -- beat out 16 top U.S. universities to win first place overall at Challenge X for their fuel-cell-powered vehicle design.

The team, sponsored by Natural Resources Canada and Hydrogenics Corporation, was the only one to use fuel cells for vehicle propulsion in their design to improve fuel economy and reduce greenhouse gas emissions.

Challenge X is a three-year competition sponsored by GM and the United States department of energy. It focuses on the re-engineering of a General Motors crossover sport utility vehicle. Last week's four-day event at GM University marked the end of the first year of the competition.
http://www.challengex.org/

Waterloo tech firm provides challenge for integrated case exercise
WLU website
An emerging Waterloo technology company that simulates the sense of touch in human-computer interactions is asking 297 business students at Wilfrid Laurier University for recommendations on which market segments to target.

Handshake VR Inc., which develops software for haptic-enabled (sense-of-touch) tele-operation applications, is the subject of the Laurier school of business and economics' (SBE) latest integrated case exercise (ICE). All third-year core courses in the bachelor of business administration (BBA) program are cancelled for a week and a half as 60 teams of four or five students focus all they have learned on analyzing Handshake.

Handshake, named a "Top 25 Up & Comer Technology Company" by the Branham Group, introduced its first product, the Handshake proSENSE™ Virtual Touch Toolbox, in March 2005. The proSENSE Toolbox offers both expert and novice users a wide range of tools to develop sense-of-touch applications, including the proprietary time delay compensation technology (TiDeC™), recognized by industry as the only commercially available technology that addresses fatal network latency. To learn more about Handshake VR Inc. and the proSENSE Toolbox, please visit
http://www.handshakevr.com .

Accelerator Centre launches program
UW Daily Bulletin

The launch of a mentorship network called the "Entrepreneurs' Council" took place at the first annual general meeting of the Waterloo Research and Technology Park Accelerator.

The Accelerator Centre is a key feature of the research park under development on the UW north campus. The centre will encourage the growth of high-tech firms and act as a

catalyst for the creation of new products and services. The centre will provide a broad range of services: IP management, business practice, mentoring, access to professional service providers, community networking events and investor matchmaking with innovators. Common services including office and meeting space and administrative services will be available to clients who will move through a proactive process to commercialize their ideas and ultimately move to profitability.
http://www.uwrtpark.uwaterloo.ca/

Faster Searches of Large Strings?

UW Alumni

University of Waterloo Professor Ian Munro of the School of Computer Science and holder of the Canada Research Chair in Algorithm Design is developing data structures to hold words from large amounts of data (such as the internet) so they are compact and easily searched.

The tree-based solution will provide an alternative to systems used by search engines such as Google that can be inaccurate and slow.
http://db.uwaterloo.ca/~imunro/

Low-Power Circuit Techniques for Wireless Communications

IEEE Seminar by Dr Balteanu, Skyworks Solutions

Cellular Technology is a market of 600 millions headsets a year. Due to high volume, low cost and low power consumption the ICs design is facing many challenging issues. This talk will address the special design considerations for low power RF/analog circuits used in mobile headsets. There will be presented circuit techniques and the trade-offs with system specifications for RF/analog ICs used in Bluetooth, GSM/EDGE/CDMA and WEDGE-3G systems.

Array Synthesis Using Reflectors and Lenses

IEEE Seminar by Prof L. Shafai, U of Manitoba

Reflectors and lenses are commonly used in high gain antenna applications, where signal intensity is the main concern. The phase properties are often neglected. These phase properties were discussed and a possible application for small array syntheses was presented.

Double Sense Multiple Access for Wireless Ad Hoc Networks

IEEE Seminar Dr. Yang Yang, University College London

In wireless ad hoc networks, it is a challenging problem to design an efficient random access protocol that can completely avoid the interference from the hidden terminals, which are defined as the terminals out of the radio coverage area of the transmitter but within that of the receiver. The dual busy tone multiple access (DBTMA) protocol, proposed by Haas and Deng, uses two out-of-band busy tone (BT) signals to clear other packet transmissions within the radio coverage area of the intended transmitter-receiver pair. As an extension of DBTMA, we present a double sense multiple access (DSMA) protocol for solving the hidden-terminal problem in wireless ad hoc networks. DSMA uses the "double sense" mechanism and two time-slotted channels, i.e. control and data, to completely avoid the data packet collisions. Compared with DBTMA, our DSMA protocol reduces the transmission delay and is more efficient in channel utilization and power consumption. For a realistic non-fully-connected network scenario, the throughput

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performance of DSMA is derived mathematically and verified by computer simulation. The tradeoff relationship between throughput and other parameters is also discussed.

Engineers and the World

The Crackberry Backlash
Tom East, From the Economist 25 June 2005

You can have too much Blackberry

The Blackberry, an iconic pocket-sized e-mail device, has millions of devoted fans – but increasingly has its critics, too. "My wife has banned me from using it at weekends," moans one technology industry executive. At a recent technology conference organized by *The Economist,* the question of "Crackberry" dependency, rather than grid computing or web services, was one of the hottest topics. The winner of the British version of "The Apprentice", a reality TV show, has admitted that his wife has threatened to flush his blackberry down the toilet. Meanwhile bosses grumble that nobody pays attention in meetings any more, because they are so busy doing e-mail under the table. It takes over your life! It distracts you at work! The Blackberry backlash, it seems, has begun.

The rise of the Blackberry is part of a wider trend, as wireless and broadband technologies make it possible to work any time, anywhere. But blaming communications technologies for their social consequences is shooting the messenger. This has been going on since the mid 19th century, when telegrams were introduced. "The businessman of the present day must be continually on the jump – he *must* use the telegraph", grumbled one New York merchant in 1868. With each new gizmo, most people eventually discover a sensible work/life balance. It just takes time to adjust.

True, wireless services pose a particular challenge, because they work anywhere. As a result, users themselves must decide when to use them for work and when not to – and many people, it seems, are so far unable to decide where to draw the line. "It's wonderful that we can work anywhere now, but at the same time we need rules for ourselves," says Brown, a mobile computing specialist at IDC, a consultancy. In some cases, he says, workers have refused to use mobile e-mail devices, or have given them back. Less drastically, P. Diddy, a rap star, is reported to have switched off his Blackberry for a few weeks while he appears in a Broadway play. Is he the first celebrity member of a growing, happy band of recovering Blackberry addicts?

Note from Tom: My father refused to have the telephone installed in our home until 1944, because he did not want people phoning him from the office. TE.

Helping people with disabilities

UW Daily Bulletin

An exhibit was part of a third-year engineering design course in the Systems Design Engineering department in UW's Faculty of Engineering.

Twelve groups exhibited innovative proof of concept designs demonstrating functioning prototypes as well as the envisioned final form of a device or system that solves a particular need associated with a disability or disabling condition or chronic illness.

The problems faced by people trying to cope with disabling conditions are real, difficult to solve with affordable solutions and need to be addressed by our future engineers.

Personal Displays

KW Record

Motion Research will soon sell helmet-based displays for motorcycle and bicycle usage. These devices, priced in to $200-$300 USD range, will provide text information (speed, revs, distance) without looking down.

http://www.motionresearch.com/