



KITCHENER – WATERLOO SECTION July 2004

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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.

Editor: Mike Hulls

Contributors: Tom East, Carol Hulls and others

Address: http://kw.ieee.ca

IEEE K-W Section, c/o Elect.& Comp.Eng.(EIT 3028), University of Waterloo Waterloo. Ont. N2L 3G1

## Section Officers

Position	Name	Phone	Email
Chair	Mauro Rossi	747-3969 x110	<a href="mailto:mrossi@handshakeinteractive.com">mrossi@handshakeinteractive.com</a>
Vice Chair	Tony Kormos	725 4706 x226	<a href="mailto:a.kormos@ieee.org">a.kormos@ieee.org</a>
Secretary	Shahab Ardalan	888-4567 x2033	<a href="mailto:ardalan@ieee.org">ardalan@ieee.org</a>
Treasurer	Joseph Shu	747-3969 x103	<a href="mailto:jshu@handshakeinteractive.com">jshu@handshakeinteractive.com</a>
<b>Committee Chairs</b>			
Awards	Tom East		<a href="mailto:teast@sympatico.ca">teast@sympatico.ca</a>
Educational Activities	Magdy Salama	888 4567 x3757	<a href="mailto:msalama@hivolt1.uwaterloo.ca">msalama@hivolt1.uwaterloo.ca</a>
Membership Development	Tony Kormos	725 4706 x226	<a href="mailto:a.kormos@ieee.org">a.kormos@ieee.org</a>
Nominations	John Mowbray	884 1710	<a href="mailto:john.mowbray@ieee.org">john.mowbray@ieee.org</a>
Newsletter Editor Newsletter Content	Mike Hulls	747-5222 x208	<a href="mailto:mike.hulls@ieee.org">mike.hulls@ieee.org</a> <a href="mailto:Kw.newsletter@ieee.org">Kw.newsletter@ieee.org</a>
Professional Activities	Gilbert Lai	581-8332	<a href="mailto:gmylai@Kingcong.uwaterloo.ca">gmylai@Kingcong.uwaterloo.ca</a>
<b>Society Chapter &amp; Affinity Group Chairs</b>			
Antennas & Microwave Theory	Raafat Mansour	888 4567 x5780	<a href="mailto:Raafat.mansour@ece.uwaterloo.ca">Raafat.mansour@ece.uwaterloo.ca</a>
Circuits & Systems	Faycal Saffih	888 4567 x5167	<a href="mailto:fsaffih@vlsi.uwaterloo.ca">fsaffih@vlsi.uwaterloo.ca</a>
Communications / Vehicular Technology	Raouf Boutaba	888 4820	<a href="mailto:rboutaba@bbcr.uwaterloo.ca">rboutaba@bbcr.uwaterloo.ca</a>
	Youssef Iraqi	888 4567 x4716	<a href="mailto:iraqi@bbcr.uwaterloo.ca">iraqi@bbcr.uwaterloo.ca</a>
Computer	Ladan Tahvildari	888-4567 x6093	<a href="mailto:ltahvild@swen.uwaterloo.ca">ltahvild@swen.uwaterloo.ca</a>
Control Systems	Faycal Saffih	888 4567 x5167	<a href="mailto:fsaffih@venus.uwaterloo.ca">fsaffih@venus.uwaterloo.ca</a>
Electron Devices	Arokia Nathan	888 4803	<a href="mailto:anathan@venus.uwaterloo.ca">anathan@venus.uwaterloo.ca</a>
Information Theory	Amir K. Khandani	888-4567 x 5324	<a href="mailto:a.khandani@ece.uwaterloo.ca">a.khandani@ece.uwaterloo.ca</a>
Signal Processing (SP) Neural Networks	Mohamed Kamel	888 4567 x5761	<a href="mailto:mkamel@pami.uwaterloo.ca">mkamel@pami.uwaterloo.ca</a>
GOLD (Young Professionals Network)	Kevin Yang Ma	(519) 241-8652	<a href="mailto:Kevin.ma@ieee.org">Kevin.ma@ieee.org</a>
Life Members	open		
<b>Student Activities Chairs and Programs</b>			
Conestoga College	Valdis Cers	748 5220 x3857	<a href="mailto:cersval@mcmaster.ca">cersval@mcmaster.ca</a>
University of Guelph	Shawki Areibi	824 4120 x3819	<a href="mailto:sareiba@uoguelph.ca">sareiba@uoguelph.ca</a>
University of Waterloo	Siva Sivoththaman	888 4567 x5319	<a href="mailto:sivoth@ece.uwaterloo.ca">sivoth@ece.uwaterloo.ca</a>
UW Branch A	Robert Woolley	(416) 516-0044	<a href="mailto:rcwoolle@engmail.uwaterloo.ca">rcwoolle@engmail.uwaterloo.ca</a>
UW Branch B	Boyang Qin		<a href="mailto:bqin@engmail.uwaterloo.ca">bqin@engmail.uwaterloo.ca</a>
Computer Society Tutorial Program	Zohreh Azimifar	(519) 747-4214	<a href="mailto:azimifar@rousseau.uwaterloo.ca">azimifar@rousseau.uwaterloo.ca</a>
Computer Society Distinguished Visitors Program	Ladan Tahvildari	(519) 888-4567 x6093	<a href="mailto:ltahvild@swen.uwaterloo.ca">ltahvild@swen.uwaterloo.ca</a>
Information Theory Distinguished Visitors Program	Ali Abedi	(519) 888-4567 x5007	<a href="mailto:abedi@ieee.org">abedi@ieee.org</a>

## Upcoming Events

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

### Calling All Life Members

Tom East

We are working on setting up an "Affinity Group" for life members. An affinity group is similar to a chapter, but the rules are a bit different. All Life Members in the Kitchener-Waterloo section would be part of the group: we are considering forming a joint group with the Hamilton section. Life Senior members and Life Fellows would be included, of course.

Goals of the Group could include:  
a campaign to promote members to senior members,  
critiquing the IEEE Virtual Museum  
identifying IEEE milestones.

If you are interested in becoming active in such a group, (the position of chair is vacant) please contact me at [teast@ieee.org](mailto:teast@ieee.org) or phone me at 519-746-7809.

## Recent Events

### Scott Tremaine Asked "Is the Solar System Stable?"

Perimeter Institute

Tom East

On June 2nd, in a fascinating Perimeter Institute lecture before a full house at the Waterloo Collegiate Institute, Scott Tremaine, an astrophysicist at Princeton University, discussed the mechanics of our solar system and other planetary systems. Copernicus proposed that Earth and other planets orbited around the sun, Kepler summarized observations in three laws, and Newton tied these laws together by his law of gravitation: even Einstein has made extremely little difference to the situation.

When the planets were first generated, there was a lot of stray matter in the area between them, but by gravitational attraction, the planets swept it up, settling into their present orbits.

All the planets except Pluto move in nearly circular orbits, not far from a single plane. Pluto has a highly elliptical orbit, tilted 17 degrees from the average of the others. Since its closest distance from the sun is 29.6 AU and the average distance of Jupiter is 30.6 AU (1AU is the average radius of the earth's orbit), surely they must collide some time? It turns out that the period of rotation of Pluto is exactly 1.5000 times that of Jupiter, so they are synchronized, in a way. Pluto dips into the orbit of Jupiter when they are 90 degrees apart in their positions, and when they are aligned, Pluto is at its furthest from the sun. [It sounds like doing the Jive, where the dancers move into each others' space, but do not collide].

Calculations of an N-body problem, such as the solar system, if extended over billions of years, are difficult to run in parallel on many computers. Better results are obtained with a single very fast computer running for months, but then rounding-off errors accumulate: this was believed to be the cause of the Patriot defence radar failing to intercept a SCUD missile by 0.3 seconds after 100 hours of operation.

The question being asked nowadays is: are there other planets of other stars which could support life? Any attempt to observe a planet with a telescope is doomed because the host star blinds you. However, there are four ways to detect whether a star has planets: the star and its planets orbit around their combined centre of gravity, and the slight motion of the star can be detected by the Doppler effect on its radiation, or even by its very slight sideways motion. Transit of the planet in front of the star produces a dip in the apparent brightness (Venus did this June 8th.). A fourth effect is a gravitational lens effect of the planet on the star's light, which increases the brightness. All these methods only work for relatively large planets, which are unlikely to support life.

Will our solar system remain stable for the next 10 billion years, until the sun becomes a red dwarf and swallows us all up? I didn't hear a definite "yes".

The Perimeter Institute public lectures have ended for the summer, but will resume in September. The new building on Father David Bauer Drive in Waterloo is predicted to open October 2nd 2004.

## **Real-Time Digital X-Ray Imaging**

UW Bulletin

Karim S. Karim, a UW PhD recipient and winner of the recently announced 2004 NSERC Doctoral Prize has been researching fluoroscopy. Fluoroscopy is moving real-time X-ray imaging. With existing fluoroscopy technology, the X-ray image is projected onto a fluorescent plate coupled to the equivalent of a television camera. A radiologist watches the images on a TV screen.

Compared with traditional film radiographs, digital X-rays are immediate and can be easily stored and shared, reducing the need for large X-ray film archives. Digital X-rays also open the door for real-time tele-radiology. Detecting the low-power X-rays requires sensors built like LCD displays but larger. Karim and colleagues added a signal amplifier directly into the pixel readout circuit, creating the first "active" pixel -- able to sense and amplify -- in amorphous silicon.

## **Local Hardware reaches Saturn**

KW Record

A radio diplexer produced by Com Dev International is onboard the Cassini spacecraft now in orbit around Saturn. Com Dev delivered the hardware to JPL in 1995.

## **Local Ice Aids Spacecraft Testing**

KW Record

Hensell company, Iceculture was contracted by NASA to create precision ice shapes. The company specializes in creating ice sculptures such as used for centerpieces. Their techniques for making pure ice create a very dense ice. NASA uses the ice as a worse case scenario in bombardment tests of the space shuttle components.

## **RIM VP Reviews Computer Efficiency**

UW Bulletin

Waterloo graduate David Yach, a vice-president of Research In Motion (RIM), received the 2004 J.W. Graham Medal in Computing and Innovation during spring convocation for mathematics.

In his talk, Yach discussed how the types of efficiencies sought from computers 20 years ago have changed, and how and when the skills of software developers of earlier years can still be applied today.

Today's emphasis on making people effective often leads to a completely different way of looking at the type of software developed and the tools and techniques used to create it. Although these two types of efficiencies appear to be completely opposing, they are often complementary, and in fact are just two different viewpoints on the same problem -- optimizing overall system efficiency given a set of constraints.

## **Computer Vision and AI Help Security Surveillance**

KW Record

Aimetis is receiving recognition for its software product that monitors surveillance cameras, detects exceptions and triggers escalation procedures. The AI software identifies objects and properties such as direction of travel.

## **Handshake Debuts VR Toolset**

Tech Capital

HANDSHAKE has developed a suite of patented technologies that allow users to manipulate and touch virtual objects over broadband network connections. The company's proprietary time delay compensation technology has been recognized by industry as the only commercially available technology that allows haptic devices to function effectively over a network since it overcomes otherwise fatal network latency. Potential target industries for telehaptics include military, medical, industrial, and consumer markets.

## **Woodhead Releases Next Generation of Communication Solutions**

T. Kormos

Woodhead has released its new high performance SST™ DeviceNet and Profibus Generation III interface cards. These interface cards allow connectivity between various bus formats of computers and either a DeviceNet or Profibus network. Applications include PC Control and device development as well as simply connecting your operator interface or HMI software to DeviceNet or Profibus.

Woodhead Industries, Inc. develops, manufactures and markets Network and Electrical Infrastructure products engineered for performance in demanding, harsh, or hazardous environments. <http://www.WoodheadConnectivity.com>.

## **Solar Shingles roll out of new plant**

KW Record

Spherical Solar Power officially opened its state of the art factory to produce solar cells in larger configurations than available with traditional technology. The cells are believed flexible and robust enough to use as a power-producing roofing material. A Region of Waterloo building will be one of the first to implement the product.

### **Hardware's last day becomes more eco-friendly**

KW Record

Cambridge firm Shred-Tech specializes in equipment to reduce the volume and recovery of waste products such as old computers or chemical warheads. The "reduction engineering" involves a lot of science but also involves giant machines that use brute force and big knives to mulch whatever gets fed into them. Waste plants in Brampton and Barrie use the products to keep local waste out of the landfill and recycle it back into new products.

### **Hosted Services Available in Waterloo**

KW Record

Waterloo Networking Company can provide a broad range of services geared towards smaller and medium-sized groups. The services include "enterprise-class" email, specific applications, virus and spam protection.

### **UW Power group sparks Online Education**

UW Bulletin

Professors in the power and energy systems group in electrical and computer engineering are introducing a new online professional development program for engineers in the electrical power industry. The training program will address a shortage in qualified engineers at Hydro One and other organizations worldwide. Various courses are developed and presented online using technology developed for UW's Master of Technology distance program.

### **Clearer and Faster Pictures Now Travel Farther**

KW Record

Dalsa's high-end cameras require extensive bandwidth often limiting the distance from camera to processing. The recent addition of Pleora Technologies giga-bit Ethernet technology has produced Dalsa-NetLink. This product will allow images to be transferred up to 100 meters from the camera and will not require a image capture board on the processing platform.

### **Sensors – From Automation on Earth to Exploration on Mars**

IEEE Seminar

Mo Jamshidi

The role of sensors for automation of life on earth with emphasis on robots was first given. Some movie clips on snake robots and wall-climbing robots were presented. Then there were discussions on space applications and the role of sensors. The audience was then taken on a journey to Mars with some animated movies.

### **10Gbps Backplane Demonstrated**

Waterloo Tech Digest

Kaparel was part of a tradeshow demonstration by San Jose's Xilinx which it said "shatters [the] 2.4 terabit PICMG 3.0 bandwidth barrier by demonstrating 10Gbps serial

signaling over ATCA backplane." The system used local company Kaparel's ATCA backplane.

## **UW Convocation Degrees**

UW Newsletter

Mo Jamshidi received a Doctor of Engineering at the recent UW convocation. A pioneer in the fields of robotics, automation, intelligent manufacturing and autonomous control, Jamshidi's work has given him international recognition and fellowship in prestigious professional societies. He is the author or co-author of 49 books and edited volumes, some of which are used by students all over the world. He established and heads the Autonomous Control Engineering Centre and the Computer Aided Design Laboratory at the University of New Mexico.

Also, Prabha Kundur received a Doctor of Engineering. An internationally recognized leader in the area of power system stability, Kundur is President and CEO of Powertech Labs Inc., a research and technology subsidiary of B.C. Hydro. His many research contributions have led to significant improvements in power system control and operation. His book, Power System Stability & Control, has received worldwide recognition as an authoritative book on the subject.

## **An Optimum Linear Space-Time Code for MIMO Communications**

DSS, IEEE joint funding

Max Wong

Signal processing designs have benefited much from the theory of convex optimization recently. There are various types of optimum design problems to which convex optimization can be applied. This talk focused on the use of Jensen's Inequality to obtain an optimum class of linear space-time block code for a multi-input multi-output (MIMO) communication system.

## **Engineers and the World**

### **Solar Car to Travel Continent**

UW Bulletin

The Midnight Sun team will be driving the newest generation solar car -- Midnight Sun VII -- across Canada and the United States to try to capture the world distance record in a single journey by a solar-powered car. The journey will cover approximately 19,000 km over 40 days of driving and take the team through all 10 provinces and 25 states.

Throughout the tour, the solar car will serve as an example of alternative energy application and energy conservation.

### **Vegetable Oil used to power Diesel cars**

KW Record

Vehicles that run on free fuel and are more environmentally friendly. Not a dream with a conversion kit from <http://www.greasecar.com>

## **Engineering Humour**

T. East

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