



**IEEE Canada**

# **KITCHENER-WATERLOO SECTION**

## **September 2007**

KW Section Executives .....	2
Section Officers.....	2
Committee Chairs .....	2
Society Chapter & Affinity Group Chairs .....	2
Student Activities Chairs and Programs .....	3
Upcoming Events.....	3
Canadian Conference on Electrical and Computer Engineering .....	3
Intelligent Communities and Broadband .....	3
Recent Events.....	4
Recent IEEE Fellows .....	4
Distributed Scheduling for Ad-Hoc Communications.....	4
Canadian Academy of Engineering Fellow .....	4
Manning Award of Distinction.....	5
Conestoga Students Develop Testing System for RIM .....	5
Robot is ready for underwater trial.....	6
WestJet Enables Email Boarding Pass.....	6
Flexible Printable Electronic Circuits Developing Locally .....	7
Engineers and the World.....	8
Local Presence Provided by Telecommuting Robot.....	9
Museum joins Com Dev for outer space exhibit .....	9
Semacode Corp. Helps Artist With Culture Statement.....	10

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 online bi-monthly. Contact the editor to have a printed copy mailed.

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## Upcoming Events

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

### Canadian Conference on Electrical and Computer Engineering

May 4-7 2008, Niagara Falls, Ontario, Canada

CCECE 2008 provides a forum for the presentation of electrical and computer engineering research and development from Canada and around the world. There will be eight mini symposia and papers are invited, in French or English, including but not limited to the following topics:

Biomedical Engineering, Communications and Networking, Circuits, Devices and Systems, Computer Systems and Appl's, Control and Robotics, Power Electronics and Systems, Emerging Areas, Signal and Multimedia Processing.

Papers can be submitted until December 7.

<http://www.ccece08.org>

### Intelligent Communities and Broadband

Waterloo Chronicle

October 25, Centre for International Governance Innovation

The Intelligent Waterloo Conference is a one-day conference exploring approaches to using broadband technologies more effectively to lessen dependence on energy, distribute energy and influence energy policy.

How can we save energy using broadband? What environments can we provide to simulate person-to-person contact at a distance? Can we outsource work to other places to reduce the need for office space and travel? What broadband technologies and pricing strategies can be used to encourage more energy conservation and what businesses might

be derived from broadband to support that? Hear broadband experts and visionaries share their thoughts on all these questions and more...

<http://www.intelligentwaterloo.com>

## **Recent Events**

### **Recent IEEE Fellows**

The IEEE Grade of Fellow is conferred by the Board of Directors upon a person with an extraordinary record of accomplishments in any of the IEEE fields of interest. The following local members earned this upgrade.

Murat Uysal

Andrei Sazonov

### **Distributed Scheduling for Ad-Hoc Communications**

IEEE seminar by Professor Junshan Zhang from Arizona State University

We consider distributed opportunistic scheduling (DOS) in wireless ad-hoc networks, where many links contend for the same channel using random access. In such networks, distributed opportunistic scheduling involves a process of joint channel probing and distributed scheduling. Due to channel fading, the link condition corresponding to a successful channel probing could be either good or poor. In the latter case, further channel probing, although at the cost of additional delay, may lead to better channel conditions and hence higher transmission rates. The desired tradeoff boils down to judiciously choosing the optimal stopping strategy for channel probing and the rate threshold. We first consider DOS from a network-centric point of view, where links cooperate to maximize the overall network throughput. Using optimal stopping theory, we show that the optimal strategy turns out to be a pure threshold policy, where the rate threshold can be obtained by solving a fixed point equation. We further devise an iterative algorithm for computing the threshold. Next, we explore DOS from a user-centric perspective, where each link seeks to maximize its own throughput. We treat the problem of rate threshold selections for different links as a non-cooperative game. We explore the existence and uniqueness of the Nash equilibrium, and show that the Nash equilibrium can be approached by the best response strategy. We then develop an online stochastic iterative algorithm using local observations only, and establish its convergence. Finally, we observe that there is an efficiency loss in terms of the throughput at the Nash equilibrium, and introduce a pricing-based mechanism to mitigate the efficiency loss.

### **Canadian Academy of Engineering Fellow**

UW Media

Mohamed Kamel, a professor of electrical and computer engineering, has been made a Fellow of the Canadian Academy of Engineering, the e-newsletter of the engineering faculty reports. He was honoured for his contributions to pattern recognition, image processing and intelligent systems. Kamel has studied co-operation in animals to assist in developing models of co-operation among intelligent machine systems and pioneered the

use of pattern recognition for treasury bills and cheques. He serves as director of Waterloo Engineering's Pattern Analysis and Machine Intelligence research group.

<http://ece.uwaterloo.ca/People/faculty/kamel.html>

## **Manning Award of Distinction**

UW Media

UW's En-hui Yang, of the electrical and computer engineering department, received the Manning Award of Distinction, sponsored by CanWest Global, for "his inventive solutions for data compression". More than 2,200 Internet Service Providers in 50 countries use his technologies to speed digital communications, says a news release announcing the award. Yang is co-founder of SlipStream Data Inc., now a subsidiary of Research In Motion. Many of SlipStream's products are the result of his theoretical work on data compression. He continues to add to his series of file-shrinking and network optimizing solutions, which speed tasks including Web browsing or checking e-mail with portable communications devices such as smart phones and laptops.

## **Conestoga Students Develop Testing System for RIM**

Conestoga/The Record

Third-year Conestoga Integrated Advanced Manufacturing Technology students (IAMT) were featured in the Record for their work designing and producing an advanced testing cell for Research in Motion (RIM). The system tests keys on their world-famous BlackBerry.

The students' system actually replaces work now done by hand -- or rather, by thumb -- at Research In Motion.

The BlackBerry Flexible Manufacturing Cell is a group of automated processes. It tests all keys on the wireless e-mail device, downloads software and applies labels. The automated process picks up any BlackBerry that doesn't pass the test and places it in a bin.

"What was exceptional is that at RIM, prior to the design of this project, the keys were tested manually with a guy's thumb," said Henry Reiser, chair of Conestoga College's engineering and information technology program.

"What we were able to do was actually measure what is a good force for the key release. . . . Therefore we could say either it was too soft or it's too hard and then we could recheck the key."

It's the first time the BlackBerry-maker has worked on a project with Conestoga College students.

[http://blogs1.conestogac.on.ca/news/2007/09/advanced\\_manufacturing\\_student.php](http://blogs1.conestogac.on.ca/news/2007/09/advanced_manufacturing_student.php)

## **Robot is ready for underwater trial**

UW Media

The University of Waterloo's Underwater Technology Team, known as (UW)2TT, is heading for its maiden competition, the International ROV (Remotely Operated Vehicle) Competition for Students, being held at Memorial University in Newfoundland from June 22 to 24. Fifty student teams from all over the world, including Canada, the United States, Iran and China, will compete in three challenges: they'll thread a cable through a buoy while fighting a current in the flume tank; perform simulated oil drilling equipment maintenance in the wave tank; and scoop up simulated marine life (actually ping pong balls) under the ice in the ice tank.

"We probably have the most technically advanced robot going in," says Jason Gillham, a mechanical engineering student who will graduate with his BAsC tomorrow. "Our goal isn't to win the competition but rather to develop neat technologies and educate the students involved. Still, I think we have a chance to do very well."

(UW)2TT is one of the newest Waterloo student teams. Founded in November 2005 by Gillham, the team has involved about 40 students and currently has 15 active members who have worked on the robot shown above in a schematic drawing.

Most of the team's work has gone into more intuitive controls. A typical underwater ROV is steered with two joy sticks, with a third controlling the camera. The camera for the Waterloo robot is hooked up to an EngSoc hard hat with added virtual reality goggles worn by the pilot. There's an inertial sensor hidden in the crown. "To turn the camera, you turn your head," Gillham explains.

Likewise the robot's motion is controlled by a single knob. "You push it forward to go forward, back to go back," says Gillham. "You can tell I've never played video games. I'm not very good at complicated controls." But he's not just thinking of himself. "I think if you make something easier to use, people will do a better job using it."

## **WestJet Enables Email Boarding Pass**

KW Record

Boarding WestJet flights from Waterloo Region's airport will no longer require any paper. When passengers book a flight with the airline, they have the option to have their boarding pass emailed to a wireless device such as a blackberry.

Passengers will be able to board a plane by showing the pass displayed on their wireless device's screen.

"Being located in the heart of Canada's Technology triangle, I am confident that BlackBerry check-in will be popular addition" Jeff Schelling, the airport's manger of development, said in a news release.

## **Flexible Printable Electronic Circuits Developing Locally**

KW Record

PackagingOne Corp, an early stage company that is working on flexible, printable electronic circuits, is entering the next stage of its product development.

The technology can be used to create flexible electronics of any kind, from smart labels with radio frequency identification device (RFID) tags to wearable medical patches with electronic monitoring capacity.

"What we are doing is taking ultra-thin, ultra-tiny, chips and putting them directly onto the label material," Asselstine says.

"We are literally talking about being able to print silicon chips directly onto the product of commerce and in theory we envision being able to print on paper, polyflexible materials, corrugate or box materials."

Making printable and flexile electronic circuits is one of the Holy Grails of technology. It could revolutionize the way business is carried on in a number of industries. For example, if the flexible circuits could be made cheaply enough, it could allow manufacturers to slap an inexpensive RFID tag on anything, so that all the information on that item could easily be scanned and tracked.

Asselstine says he expects his company's technology will be able to "migrate fairly easily" to the market for the more high-value products, such as the pharmaceutical industry.

Right now, it would not make economic sense to put a relatively expensive electronic bar code on a cheap can of pop, for example.

"Everything in the RFID space right now is about cost reduction," Asselstine says.

But if the cost can be reduced, "the demand is huge."

So, "as the process matures, we expect that we can deliver low-cost RFID."

The technology initially came out of Silicon Valley in California and was developed in partnership with a number of researchers in North America, Asselstine says.

He cautions that the company is still at an early stage -- working out the bugs and learning how to actually integrate its product with manufacturing processes.

"We would be surprised if there aren't some bugs. We understand the technology development path well enough to know that."

But the company has established its proof-of-principle in the laboratory and is speaking to investors about next-stage funding, Asselstine says.

"We have about 10 angel investors who have assisted us with the funding and also a number of research partners at different universities."

Excitement about the product is growing now that the technology is heading into the next stage of development, Asselstine says.

## **Engineers and the World**

### **Rolling across Canada 'like rock stars'**

UW Media

Next-Generation team members Eric Vieth and Benjamin Sanders now have an idea what it feels like to be rock stars. The pair, who graduated last month from electrical and computer engineering at Waterloo, say they received celebrity treatment while speaking at a Regina high school, one of 29 they visited on their bike trip across Canada to spread the word about creating a greener environment.

"More than 800 students packed the gym and there were TV cameras and newspaper reporters capturing the event. An eager pack of student volunteers were on hand to assist with the audio-visual setup," says Sanders. "We even had an escort motorcade -- my aunt who lives in Regina offered to drive ahead of us to show us the way to the school. There were some girls in the hallway giggling as we rolled into the school wearing bike tights. With all the fuss, it felt a bit like we were in a rock band."

In North Bay, Vieth and Sanders were greeted by throngs of students from Kindergarten to Grade 6 waving hand-drawn welcome signs. "We modified our presentation slightly, tailoring it to a younger audience and they turned out to be our most attentive and eager group on the tour."

Travelling 7,900 kilometres on bikes from Victoria, British Columbia, to St. John's, Newfoundland, Sanders and Vieth spoke to students about energy consumption and ways to help create a cleaner, more sustainable future. While Sanders and Vieth say it would have been possible to visit a greater number of schools travelling by car, they feel biking across the country with their message was more effective.

The pair equipped their bikes with the latest technologies: hydrogen fuel cells, solar panels, RIM BlackBerrys, a Global Positioning System transmitter (GPS) and an interactive, online mapping software interface.

After almost three months on the road the pair planned to take a break from biking. "However no more than two days after our return we had already unboxed the bikes, re-assembled them and gone for a spin," says Sanders. "Hard to break a habit, I guess."

<http://www.next-generation.ca/blog.aspx>

## **Local Presence Provided by Telecommuting Robot**

KW Record, Crave.cnet.com

Telecommuting is nothing new. Nor is Web conferencing. But building a robot to come into the office while you work at home? That's both new and awesome.

Ian McHardy created IvanAnywhere to cruise around the office and establish a physical presence for his co-worker, Ivan Bowman, as Bowman works remotely. For the past three months, the robot--which is a battery-powered aluminum rod on wheels equipped with a Web cam, speaker, infrared sensors, and a video screen--has been cruising around the office at iAnywhere Solutions in Waterloo, Canada.

Bowman, a programmer, operates the device from his home in Halifax, Canada, more than 800 miles away.

In addition to standing in on meetings, Bowman uses IvanAnywhere to visit his co-workers in their offices and sometimes just hang out.

<http://news.therecord.com/Business/article/236315>

## **Museum joins Com Dev for outer space exhibit**

KW Record

When Canadian astronaut Dave Williams is involved in a space walk or talks to a fellow astronaut aboard the Endeavour, visitors at the Waterloo Regional Children's Museum can watch it live.

A new exhibit titled, Mission: Outer Space . . . A COM DEV Adventure, opened in August to coincide with the launch of the Endeavour's STS-118. Com Dev sponsored the exhibit, and Williams is on board.

The live footage of the Endeavour is aired by NASA TV and not available on Canadian cable TV or satellite, said Brendan Lowther, manager of exhibits, facilities and events for the museum.

Com Dev is a Cambridge-based designer and manufacturer of space hardware, such as satellites.

"We wanted to be involved with kids and the education of kids in relation to space, which is the core of our business," said Greg Healy, project manager for this exhibit and a general manager at Com Dev.

At the exhibit kids can also see how they would appear on infrared camera, watch how gravity works in space and find their home on Google maps, using satellite technology.

"They're very good at what they do like science and we're very good at understanding what kids want, and you put those things together and come up with a cool exhibit," Lowther said.

The permanent exhibit will be a valuable tool for teachers in the region for field trips, and incorporates the Grade 4 to 7 curriculum.

"We try to showcase exhibits that are difficult to teach," Lowther said.

This can include space, optic, light and sound units.

Com Dev had already donated a "satellite" for the museum's opening. It can send messages to and from stations in the museum.

Admission for Waterloo Regional Children's Museum is \$7, \$6 for people 55 and older and free for children under the age of three.

### **Semacode Corp. Helps Artist With Culture Statement**

KW Record

Semacode Corporation chief executive Simon Woodside is proud of his Waterloo company's product but doesn't consider it a work of art.

A California artist disagrees; in fact, she thinks a Semacode bar code may fetch \$1,800 from someone looking to put a one-colour machine-readable square on his or her wall.

The artist, Michele Pred, spent two days embroidering a threaded version of a two-dimensional bar code on a canvas.

Pred sewed the 25-centimetre-by-25-centimetre piece so carefully, it can be read by a cellphone that has Semacode's bar code-reading software installed.

When the phone scans the artwork, it captures the name of the piece: You Are What You Buy.

It's supposed to make a statement about American consumer culture, she explained. "In our society, it's about what car we drive and what we wear that makes the person," she said. Pred said she first made a simple print but realized she could make a bigger statement by using thread. "We're part of the fabric of life, and technology is part of the fabric of life as well," she said.

Pred's piece went on display Thursday at an art gallery in Los Angeles. A Semacode-enabled cellphone is considered part of the piece and is included in the \$1,800 purchase price.

Woodside said he heard about Pred's project a couple of months ago, although his company was not involved in the creation of the embroidery.

As someone who deals with two-dimensional bar codes every day, he said he finds Pred's fascination with them "hilarious."

"To me, it's software, and here's someone that's taking days and days to embroider an image," Woodside said. "It's ones and zeroes to me, but to her it's something that obviously has deeper meaning."

Semacode's software allows mobile devices to read two-dimensional bar codes. For instance, in parts of the San Francisco area, commuters can scan bar codes at bus stops to find out when the next bus is to arrive.

The square bar codes, which can encode far more information than traditional one-dimensional bar codes, can also be used on advertisements.

In the pop-art spirit of Andy Warhol, Pred has long used everyday objects to raise provocative questions about modern life.

Pred has made sculptures out of discarded cellphone chargers, objects seized at airport security and marijuana plants she grew with a medical-marijuana licence from the State of California.

She said she hopes *You Are What You Buy* will be the first in a series of Semacode-themed art. The artist is thinking about using black-and-white tiles to make a bar code out of an entire wall.

Innovative as Pred may be, she is not the first person to turn Semacode bar codes into art. Last year, German artist Bernd Hopfengärtner embedded the phrase *Hello, World* in a bar code he mowed into a corn field.