

IEEE NEWSLETTER KITCHENER-WATERLOO SECTION

September 2000

Meetings

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EDITORIAL

Under the IEEE alias system, you send the IEEE your real e-mail address, but give out your alias:

(*yourname*)@ieee.org

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Contact www.ieee.org/web/accounts.

If you do go this route, don't forget to send us your e-mail address, and let us know if you would rather receive this newsletter by e-mail instead of hard copy. (Mouse mail, instead of snail mail).

The Kitchener-Waterloo Section of the Institute of Electrical and Electronics

Engineers serves all members whose mailing address is in Bruce, Grey,

Perth, Waterloo or Wellington counties.

**MTT CHAPTER MEETING 11 SEPTEMBER
RAJ MITTRA ON EXTRACTION OF S-PARAMETERS OF DISCONTINUITIES**

Date: Monday September 11, 2000 **Time:** 5.30 pm
Place: University of Waterloo Davis Centre, room DC1304
Subject: Efficient Extraction of S-parameters of Transmission Line Discontinuities for RF and Wireless Circuit Designs

Speaker: Prof. Raj Mittra, Fellow, IEEE; Distinguished Lecturer

Subject: Virtual prototyping of RF and wireless circuits plays 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 circuit simulation and optimization can be very computer-intensive. Typically, one resorts to EM field solvers for extracting the S-parameters or Spice-equivalent circuits for discontinuities in transmission lines such as microstrip lines, striplines and coplanar waveguides. However, if one runs a frequency sweep for each choice of parameter sets, e.g. the width and height of etch and dielectric constant of substrate, and uses full wave solvers, the time required to develop the design may be prohibitively large to achieve the required frequency response and impedance match. To circumvent this difficulty, one frequency resorts to using closed-form expressions that are readily available and extremely fast to compute. However, these expressions for lumped-circuit parameters representing discontinuities are based on quasi-static analyses and are, therefore, often quite limited in their range of application. To date, no simple alternatives seem to be available for bridging the gap between quasi-static and full wave models.

What is needed is an approach which can be used to derive S-parameters almost as numerically efficiently as those based on closed-form expressions, but which does not compromise the accuracy of the models of the discontinuities. The objective of this talk is to propose one such approach that uses neural networks in combination with quasi-electrostatic and -magnetostatic analyses to create models for microstrip discontinuities such as bends, gaps, stubs and so on.

Examples will be provided to demonstrate the usefulness of the approach by comparing accuracy and computation times with full-wave solvers.

Speaker: Raj Mittra received a BS from Agra College, an MS from the University of Calcutta, and a PhD from the University of Toronto. He joined the University of Illinois in 1957 and became Full Professor and Director of the Electromagnetics Laboratory in 1966. He was appointed to Director of the Electromagnetic Communication Laboratory in 1984. He is an authority on Electromagnetic Communications and has addressed professional groups around the world. He has authored three books - Analytic methods in the theory of guided waves in 1971, Numerical and asymptotic techniques for electromagnetics in 1975, and Computer techniques for electromagnetics 2nd edition in 1987.

Dr. Mittra received the Guggenheim Fellowship in 1965, and was elected Fellow of the IEEE and Distinguished Lecturer for Europe in 1971. He received the IEEE Centennial Medal in 1984. He retired from the University of Illinois in 1996 and is currently at Penn State University.

DIABETIC INTERNET APPLIANCE FROM UW COMES FIFTH IN COMPUTER SOCIETY CONTEST

The Diabetic Internet Appliance which we described in our June issue was entered in the IEEE Computer Society International Design Competition (CSIDC 2000). There were 150 entries altogether from all over the world, and the University of Waterloo entry came fifth. The team members are Bamdad Afra, Faisal Karmali, Gordon Li and Wallace Leung. Congratulations! An entry from McMaster University (Hamilton, Ontario) came first.

MTT CHAPTER MEETING 11 OCTOBER JOHN HAMEL ON SILICON-BASED MONOLITHIC INTEGRATED CIRCUITS

Date: Wednesday 11th October 2000 **Time:** 5.30 pm
Place: University of Waterloo Davis Centre room DC2577
Subject: Present and Future Technologies for Silicon-Based RF, Microwave,
and Millimeter-Wave Monolithic Integrated Circuits.
Speaker: Dr. John Hamel, Dept of Electrical and Computer Engineering,
University of Waterloo.

Subject: The current explosive proliferation of sophisticated consumer wireless communication devices owes much of its success to the ever increasing technological capability of Silicon-based monolithic rf, microwave, and millimeter-wave components and circuits. Although the high frequency properties of Silicon are measurably inferior compared to those of more exotic III-V and II-VI semiconductor materials, the significantly greater levels of integration which can be achieved in Silicon combined with higher yields and lower manufacturing costs, will continue to place emphasis on Silicon as the material of choice for future generations of rf, microwave, and millimeter-wave monolithic IC's.

Future penetration of rf, microwave, and millimeter-wave IC's into new commercial and consumer applications, as well as continued improvement in existing portable communication products, will require higher levels of integration, lower operating power, and higher frequencies of operation. Several challenges lie ahead, however, if these goals are to be achieved.

In this talk the current status and future trends of Silicon-based technology for rf, microwave, and millimeter-wave monolithic integrated circuits will be presented. Two broad areas of application will be addressed, namely, ultra-low power high frequency rf/microwave devices and circuits for narrow band mobile communication applications, and millimeter-wave technologies for broad band communication and sensoric applications.

Speaker: Dr. Hamel received his Phd in Electrical Engineering from the Department of Electrical & Computer Engineering at the University of Waterloo in 1992. This began his second career, his first career being an officer and a pilot in the Canadian Armed Forces from 1982 to 1987. Dr. Hamel held Postdoctoral Fellowships at the University of Waterloo and at the University of Southampton, UK from 1992 to 1994, including an NSERC Postdoctoral Scholarship. From 1994 to 2000 Dr. Hamel has held permanent academic positions as a Lecturer in the Department of Electrical & Electronic Engineering at the University of

Canterbury, Christchurch, New Zealand, and in the Department of Electronics & Computer Science at the University of Southampton, UK. At Southampton, from 1996 to 2000, Dr. Hamel was a member of the Microelectronics Group that houses the central University-based silicon fabrication research facility for the UK. Dr. Hamel is currently an Associate Professor in the Department of Electrical & Computer Engineering at the University of Waterloo.

Dr. Hamel's research activities have focused on a wide range of topics pertaining to the design, fabrication, modeling, and characterization of devices for use in high frequency integrated circuits, including polysilicon emitter bipolar transistors, SiGe heterojunction bipolar transistors, and rf/microwave passive

RAYTHEON CANADA TOPS IN AIR TRAFFIC CONTROL RADAR

According to Frost and Sullivan, the well known market analysis company, in 1999, Raytheon Systems Canada Limited held the number one share of the world market for Air Traffic Control Primary Radar. The company sold radars to countries world wide, including over 200 to the USA.

ANNUAL GENERAL MEETING 15 NOVEMBER - ADVANCED NOTICE

The Kitchener-Waterloo Section of the IEEE will hold its AGM on 15th November. Although there will be no elections (officers and executive hold office for two years) there will be reports of the section activities. These will be followed by a presentation by Martyn Exon of Raytheon Systems Canada on Primary Radar: it will be suitable for a non technical audience and **spouses and friends will be invited.**

NEWS FROM ACADEMIA

At the **University of Waterloo**, Professor Jon Mark has received the Canadian Award in Telecommunications Research for his research, scholarship, and leadership in wireless communications and computer networks. He directs the Centre for Wireless Communications in the Electrical and Computer Engineering Department.

Also at the **University of Waterloo**, a project led by Professor Brendan Frey on Computing Infrastructure is to receive \$750K from the Canada Foundation, the Ontario Innovation Trust and private funding. Its goal is an environment for algorithm development, simulation, and data warehousing.

NEWS FROM INDUSTRY

The 2001 edition of ACanada's Top 100 Employers: The Guide to Canada's Best Place to Work@ by Richard Yerema includes these five companies: **Mitra Imaging, Mortice Kern Systems, NCR Canada, PixStream, and Research In Motion.**

AdExact Corp. of Kitchener has developed a system by which the TV commercials in a program are tailored to the viewer. For instance, a diaper ad goes to families with small children, even while the next door neighbor, watching the same program, see a different ad, more relevant to their interests. The selection process depends on the e-commerce used by viewers.

Fakespace of Kitchener has sold a RAVE display to NASA, who will use it for simulating structural analysis and fluid dynamics problems. RAVE stands for Reconfigurable Advanced Visualization Environment.

PixStream Corp. of Waterloo has been named one of Canada=s Shooting Stars by Deloitte and Touche. A company must have been in business for three years, have reached operating revenues of \$1M, and develop and manufacture technology which contributes to its operating revenues, to qualify for this award. The company is planning an Initial Public Offering of shares, and wants to allow the public, as well as financial institutions, to buy them.

Research In Motion (RIM) of Waterloo is to supply its Blackberry wireless e-mail pager to Cellnet in the UK for trials. RIM now owns six buildings along Columbia Street, west of Phillip Street, and a factory in Kitchener. It plans to expand its production rapidly. At its AGM recently, a shareholder who had difficulty reaching a microphone, sent in a question to the CEO using a Blackberry pager: the question was read out and answered from the platform.

Virtek Vision of Waterloo has acquired the portion of Engineering Services Inc. of Toronto which makes DNA microarrays: these are biological specimens which can be read by Virtek=s laser scanners.

CONFERENCES IN CANADA

2000

Sep 10-13 ICIP 2000 7th International Conference on Image Processing. Vancouver. R.K. Ward 604 822 6894
e-mail: rababw@cicsr.ubc.ca
<http://icip2000.ece.ubc.ca>

Oct 1-4 Adaptive Systems for Signal Processing Communications and Control. Lake Louise, Alberta. L. Brooks 905 525 9140 x 24291 e-mail: brooks@mcmaster.ca

Oct 15-18 CEIDP 2000 IEEE conference on Electrical Insulation and Dielectric Phenomena. Victoria.
V.K.Lakdawala. 757 683 4665 e-mail : lakdawala@ece.odu.edu <http://www.eeel.nist.gov/ceidp/>

Oct 23-25 2000 IEEE International Carnahan Conference on Security Technology. Ottawa. L.D. Sanson
606 223 9840 e-mail: lsanson@lex.infi.net

Nov 12-15 2000 IEEE Conference on Tools with AI (TAI 2000). Vancouver. C Koutsougeras 504 862 3369
e-mail: ck@eecs.tulane.edu

2001

Jan 24-26 2001 IEEE/IAS PCIC Electrical Safety Workshop. Toronto. K Eastwood.
512 396 5801
e-mail: kimeastwood@ieee.org
<http://www.ieee-pcic.org/safety/esw.htm>

Apr 28-May 2 IEEE 43rd Cement Industry Technical Conference. Vancouver. A. Moore 604 946 0411
e-mail: amoore@tilbury.lehighcement.com

May 12-19 IEEE 23rd International Conference on Software Engineering. Toronto.
H.A. Muller 250 721 7630
e-mail: hausi@csr.uvic.ca <http://www.csr.uvic.ca/icse2001/>

May 13-16 CCECE 2001 Toronto **Deadline for Abstracts 1 Dec 2000**. See notice on last page.

May 13-17 2001 URSI International Symposium on Electromagnetic Theory. Victoria.
Deadline for summaries 23 Sep 2000 URSI-B2001@nrc.ca
+46 8 790 8195 e-mail: staffan@tet.kth.se
<http://www.nrc.ca/confserv/URSI-B2001>

Jul 7-13 ICCV: IEEE 8th International Conference on
Computer Vision. Vancouver.
IEEE Computer Society. 202 371 1013

Jul 15-19 2001 IEEE Power Engineering Society Summer Meeting. Vancouver. Y. Mansour 604 473 2730
e-mail: yakout.mansour@bchydro.bc.ca
<http://www.ieee-spm2001.org>

Jul 16-20 NSREC 2001: IEEE Nuclear and Space Radiation Effects Conference. Vancouver. M.Shaneyfelt
505 844 6137 e-mail: shaneymr@sandia.gov <http://www.nsrec.com/npsnews.htm>

Jul 25-28 IFSA/NAFIPS 2001: Joint 9th IFSA World Conference & 20th NAFIPS International Conference.
Vancouver. M.H.Smith 403 225 1024 e-mail: mhs@mining.ubc.ca
<http://morden.csee.usf.edu/ifsanafips2001.html>

Aug 13-17 EMC 2001: IEEE International Symposium on Electromagnetic Compatibility. Montreal.
IEEE EMC 2001 Secretariat 514 287 1070 e-mail: emc2001@jpd.com

Sep 24-26 PCIC 2001 IEEE Petroleum and Chemical Industry Technical Conference. Toronto. F.A.DeWinter
519 740 4736 e-mail: Fadewinter@ra.rockwell.com

Oct 14-17 2001 Conference on Electric Insulation and Dielectric Phenomena. Kitchener. Ontario.
SH Jayaram 519 888 4567 x533 e-mail: jayaram@sunee.uwaterloo.ca

2002

Jun 24-28 IGARSS 2002: IEEE International Geoscience and Remote Sensing Symposium. Toronto.
IGARSS Business Office 281 251 6067
e-mail: grss@clearsail.net <http://www.igarss.org>

Sep 28-Oct 3 INTELEC 2002 IEEE International Telecommunications Energy Conference. Montreal.
MS Davis 450 458 5353 e-mail: mdavis@odyssee.net
<http://www.intelec.org/>

2004

May 1 ICASSP 2004 International Conference on Acoustics, Speech and Signal Processing D
O=Shaughnessy 514 875 1266x2012

ELECTRIC CARS ON THE MOVE

In the month of July, a solar car made the 7,000 km journey across Canada, powered only by sunlight falling on its solar cells and generating 1 KW. It was built by students at Queen=s University in Kingston, Ontario.

Meanwhile, all-electric cars for consumers seem to be some way off. They would require Agas@ stations to have charging facilities.

General Motors predicts that by 2010 fuel-cell trucks and cars may be on the market. GM and ExxonMobile have developed a way to convert gasoline to hydrogen for use in a fuel cell with much less pollution than conventional engines. Ballard of Vancouver has already supplied fuel-cell powered buses, but has a way to go before its fuel cells are competitive for cars.

The first hybrid electric car sold in Canada went to David Suzuki, the famous environmentalist: it was a Honda Insight, a two passenger model. Honda plans to make 6,500 Insights this year: they are rated at 70 mpg (4 litres/100 km). The Toyota Prius is a five passenger model. DaimlerChrysler has developed an SUV (Sports Utility Vehicle), the Durango, which uses a gasoline motor to drive the back wheels and an electric motor for the front wheels, which also acts as a generator to charge the battery: the only connection between the two motors is Athrough the pavement@.

Meanwhile, new models of the regular gas guzzlers that most of us drive will soon be using 42 volt batteries instead of the present 14 volt (12 volt nominal) ones. Fuel savings of 10% are predicted. Renault may be first in 2004. See the article in IEEE Spectrum of May 2000, pages 34-39. [Some of us remember when the standard was 6 volts in North America - Ed]

THE INTERNET IN WATERLOO REGION

Canada=s Technology Triangle has shrunk somewhat with the withdrawal of Guelph as a member. The corners of the triangle are now Cambridge, Kitchener and Waterloo.

Meanwhile, local school boards and municipalities are setting up the Waterloo Region Education and Public Network (WREPNET). It consists of 550 km of fibre optic cable, which will connect Regional and Municipal offices, public libraries, school boards, fire stations and Conestoga College. The cable has already been laid to the Waterloo Recreation Complex. WREPNET received a \$10M grant from the Ontario Ministry of Education. Members of the public will be able to do business with city hall through it.

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