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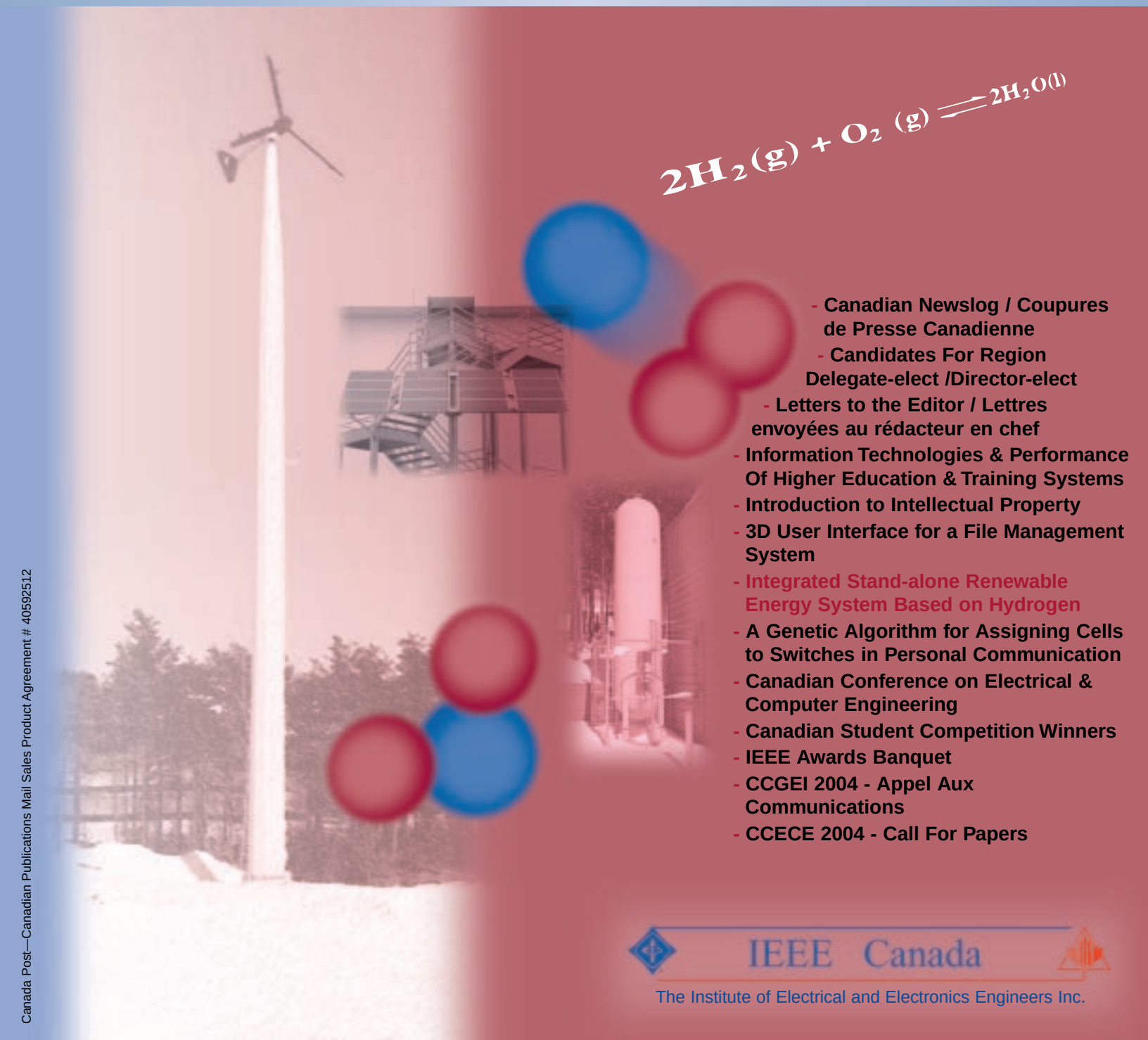

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The Institute of Electrical and Electronics Engineers Inc.

IEEE Canada

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IEEE Canadian Review General Information

The ***IEEE Canadian Review*** is published 3 times/year as follows: Winter (to appear in April); Spring/Summer (to appear in August); Fall (to appear in December). Its principal objective is to project an image of the Canadian electrical, electronics, communications and computer engineering professions and their associated academic and business communities to:

(i) Canadian members of IEEE;
(ii) Canadian members of the profession and community who are non-members of IEEE;
(iii) The associated Canadian academic (i.e. universities, colleges, secondary schools), government and business communities.

To ensure that the ***IEEE Canadian Review*** has the desired breadth and depth, editors are responsible for screening articles submitted according to the following general themes:

1- National Affairs	4- Education	7- Computers
2- International Affairs	5- Power	8 - Electronics
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Information for Authors

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Managing Editor
Rédacteur en chef

Vijay K. Sood
Hydro-Québec (IREQ)
1800 boulevard Lionel-Boulet
Varennes, Québec. J3X 1S1
tel: (450) 652-8089
fax: (450) 652-8051
email: v.sood@ieee.org

Associate Editors
Adjoints à la rédaction

Terrance J. Malkinson
Engagement Services Organization
GE Capital Information Technology Solutions Inc.
Calgary, AB T2P 3P2
tel: 403-282-1065
email: t.malkinson@ieee.org

Shaowen Song
Dept. of Physics & Computing
Wilfrid Laurier University
Waterloo, ON N2L 3C5
tel: (519) 884-0710 Ext. 2195
email: ssong@wlu.ca

Samuel Pierre
Dept. of Computer Engineering
Ecole Polytechnique of Montreal
P.O. Box 6079
Station Centre-Ville
Montreal, QC H3C 3A7
tel: (514) 340-4711 Ext. 4685
email: samuel.pierre@polymtl.ca

Slawo Wesolkowski
Systems Design Engineering
University of Waterloo
Waterloo, Ontario N2L 3G1
email: s.wesolkowski@ieee.org

Camille-Alain Rabbath
Defence Research & Dev. Canada
2459 Pie-XI Blvd. North
Val-Belair, QC G3J 1X5
tel: 418-844-4000 x4756
email: camr@ieee.org

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Quelques mots du rédacteur en chef — A few words from the Managing Editor

Vijay K. Sood, Hydro-Québec

Encore une fois c'est un été chaud, et nous avons un autre numéro tout aussi chaud de la revue canadienne de l'IEEE. Il y a plusieurs sujets d'intérêt dans ce numéro.

Premièrement, il y a une section spéciale dédiée aux célébrations du centième anniversaire de la section de Toronto de l'IEEE Canada. Deuxièmement, nous avons un changement au sein de l'équipe de rédaction. Samuel Pierre, PhD, va remplacer Chela Vaidyanathan, PhD, qui nous quitte après plusieurs années de loyaux services à la revue canadienne de l'IEEE. Je souhaite à Vaidy de connaître beaucoup de succès dans sa carrière. De plus, Camille Alain Rabbath a été promu au rang d'adjoint à la redaction. Il était auparavant rédacteur auxiliaire. Un court CV de Samuel Pierre est présenté à la page 24 de ce numéro de la revue canadienne. Veuillez prendre note que nous sommes toujours à la recherche de collaborateurs pour se joindre à l'équipe de rédaction, spécialement des membres de l'Ouest canadien. Si vous êtes intéressés, n'hésitez pas à me contacter.

Ce numéro présente un reportage sur la conférence CCGEI2003 qui s'est tenu à Montréal en mai dernier sous la direction de Guy Olivier. Les fait saillants de la conférence sont décrits dans ce numéro. L'an prochain, la conférence aura lieu à Niagara Falls, Ontario. J'espère vous y voir en grand nombre.

Vous avez sûrement remarqué les deux candidats de haut calibre qui sont en lice pour le poste de président-élu de l'IEEE Canada. L'élection aura lieu cet automne (voir page 5). Prenez le temps de voter.

Finalement, nous apprécions toujours recevoir vos commentaires, suggestions et contributions. Si vous désirez partager avec les membres de la communauté canadienne de l'IEEE des nouvelles ou des articles d'intérêt, vous n'avez qu'à contacter un des adjoints à la rédaction (page 2). Sinon, bonne lecture.

Another hot summer and another hot issue of the Canadian Review. There is much to inform you about in this issue.

First, there is a special pullout section on Toronto's Centenniel celebrations. Second, we have a replacement to the editorial board: Dr. Samuel Pierre will take over from Dr. Chela Vaidyanathan who is leaving after many years of dedicated service to the Canadian Review. I wish Vaidy success in his future career. Also Camille-Alain Rabbath is being promoted to associate editor from assistant editor. A short CV and information about Samuel Pierre is available on page 24 of this edition of the CR. We are always seeking new recruits for the editorial board, especially from IEEE members in western Canada. If you are interested, do get in touch with me.

This issue also provides a closing look at the very successful CCECE'2003 conference held in Montreal during May under the able leadership of Guy Olivier. Some pages of this issue depict the events of this conference. Next year the conference will be in Niagara Falls, Onatario. I hope to see many of you over there.

You will note that we have two strong candidates for election as President-elect of IEEE Canada; elections will be taking place this Fall (see page 5); please vote.

Finally, we always like to hear from you. If you have news items or articles of interest to our members, do contact one of the associate editors (page 2). Otherwise, happy reading.

Opinion

Spam - What to do about it?

I have finally reached my limit with Spam. Have you? The internet is a wonderful and economical way to communicate, but when enterprising individuals and corporations abuse it, then we all end up paying a price for it. Time and memory resources cost.

Right now I am out-viagraed, my jockey shorts have been replenished to capacity as never before and my bank manager actually offered me "free" airline tickets to visit a third world country to collect on my "investments" over there. What is one to do? At my age, it is difficult enough trying to decide on which side of the bed to get up on in the morning, let alone decide on matters of such high importance.

We, as electrical, computer and telecommunications engineers, have a duty to be vigilant to remove this poison spreading on our laptops/desktops. Control it, or it will end up controlling you. And the authorities and ISP providers have an obligation to do so. Remember, it is not the messenger that you have to go after, it is the corporation behind. Using filters, just like anti-virus programs, is one option. But I like the option of sending all those messages back to the spam sender even better. Remember, the post office always had the option of "Return to Sender". We should use that.

Vijay Sood

Cover picture / *Photo de couverture*

A few of the elements of an electrolytic hydrogen renewable energy demonstration project at the Hydrogen Research Institute, part of the Université du Québec à Trois-Rivières.

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Canadian Newslog / Coupures de presse Canadienne

Newslog Editor

Rédactrice des Coupures de presse

Alexandre Abecassis is a patent agent trainee in Montreal at Ogilvy Renault, Lawyers and Patent and Trade-mark Agents.

Alexandre Abecassis travaille à Montréal chez Ogilvy Renault, Avocats et agents de brevets et de marques de commerce, comme agent de brevets en formation.

Send any news clippings you would like to contribute via e-mail to alexandre.abecassis@ieee.org

Veuillez faire parvenir les coupures de presse proposées par e-mail à alexandre.abecassis@ieee.org

OTTAWA, ON, 16 juin, 2003. Sega.com a annoncé le lancement officiel d'un jeu collectif de stratégie en ligne intitulé "Legacy Online". Ce jeu a été développé par Oceanus Communications, fabriquant de logiciels basé à Ottawa. Des tournois en ligne, basés sur ce jeu, sont prévus prochainement.

TORONTO, ON, le 16 juin, 2003. La conclusion d'une alliance stratégique permettant d'offrir aux usagers des services Internet plus conviviaux dans le futur a été annoncée par Bell Canada et Microsoft Corporation. Cette alliance permettra aux usagers d'obtenir une combinaison unique de services pour l'accès à Internet.

RICHMOND, BC, June 3, 2003. MacDonald, Dettwiler and Associates Ltd. announced that the Canadian Space Agency (CSA) has awarded a 4-year contract, worth $116 Millions, to the company's MD robotics subsidiary. Under the contract, MD robotics will provide ongoing engineering services for the Canada-made Mobile Servicing System on the International Space Station.

MONTREAL, QC, May 13, 2003. An innovative imaging platform is being currently developed in collaboration with searchers from LCTI Central Image Processing Laboratory of University of Montreal Hospital Research Center (CHUM) and Dynapix Intelligence Imaging. The innovative imaging platform will provide CHUM radiologists, inter alia, with new methods for diagnosing peripheral vascular diseases (PVD) such as aneurysms and vascular obstruction.

RICHMOND, ON, April 17, 2003. CanDo Networks Corporation has launched a new service which removes email attachment size limits. Using such service, it becomes possible to send large attachment files despite attachment size limitations.

MONTREAL, QC, July 10, 2003. Nstein Technologies Inc has announced the integration of one of its software with a software of Context Media Inc to provide an "easier way for organizations to manage, distribute and access digital content stored in disparate content management, document management, and digital asset management system across an enterprise".

TORONTO, ON, 7 juil., 2003. CAE va réaliser le premier simulateur pour Airbus A380. L'accord au montant d'approximativement 55 millions de dollars canadiens entre les deux parties comprendra la livraison de solutions intégrées de formation pour l'avion.

TORONTO, ON, Jun. 26, 2003. Tri-Vision International Ltd has announced it has signed a non-exclusive license for its Canadian Patent 2,179,474 with Samsung Electronics Inc. The license covers all television sets manufactured for sale in Canada by Samsung Electronics Inc.

TORONTO, ON, May 14, 2003. IBM Toronto Lab creates 100 jobs. The new team will focus on development of IBM' provisioning software under Tivoli brand. A provisioning software enables a business to pool its IT infrastructure resources and to automatically deploy the resources in response to business needs.

MONTREAL, QC, 9 mai 2003. Technologies D-Box Inc et Activision présentent au salon E3 le premier système interactif de simulation de mouvements pour jeux sur ordinateur. Un prototype du jeu "Call of Duty" sera présenté avec le simulateur de mouvements développé par Technologies D-Box Inc.

OTTAWA, ON, May 7 2003. Jacent Technologies has chosen voice cards from PIKA Technologies to complete their first product based on this platform. The product is a stand-alone telephone system which enables voice ordering as well as routing and managing calls. The product will be used by Domino's pizza.

BURLINGTON, ON, April 28, 2003. Acsys Biometrics Corp and Purdue University create Advanced Biometrics Laboratory. The technology provided by Acsys comprises advanced neural net applications for use in biometric applications such as face recognition.

TORONTO, ON, Apr. 22, 2003. Charitable organizations will benefit from softwares donated to reBOOT Canada through Microsoft Canada. Co's I Can Software Donation program. The donation comprises software for approximately $3.5 million.

MONTREAL, QC, Apr. 1, 2003. CMC Electronics has received an order from Swiss international Airlines to provide its high gain Satellite Communications antenna system for its fleet of 12 Airbus A340 aircrafts. The antenna system virtually eliminate multi-path interferences and enables simplified installation.

OTTAWA, ON, Apr. 9, 2003. Telesat Canada and Storm Internet Services have signed a joint agreement for delivering high-speed Internet access to the townships of North Stormont.

TORONTO, ON, Jul. 9, 2003. Bell Canada extends Wi-Fi pilot to VIA Rail Canada trains. A free WLAN Internet access will be provided, for a limited time, to VIA 1 passengers traveling between Montreal and Toronto.

TORONTO, ON, May. 8, 2003. An agreement has been signed between Rogers Cable and MGM Home entertainment to add MGM movies to Rogers Cable Video on Demand (VOD) apparatus. Rogers Cable is the first Canadian Cable company to sign a VOD content agreement with a major Hollywood studio.

PARIS, France, Apr. 9, 2003. Research In Motion (RIM) and SFR announced the launch of a new wireless handled and enhanced features for enterprise customers.

Candidates For Region Delegate-elect/Director-elect, 2004-2005, Region Delegate/director, 2006-2007 - Region 7 (Canada)

B. John Plant, P.E. (Nominated by Region 7)
Executive Director
Engineering Institute of Canada
1295 Hwy 2 E, Kingston, ON K7L 4V1
Email: jplant1@cogeco.ca
Phone: (613) 547 5989

I am pleased to be a candidate for Region 7 Delegate-Elect/Director-Elect, 2004-2005. It is an honor, but more than that, an opportunity to promote professional development in the IEEE community. I have been so in the Canadian engineering community for more than a decade.

Il me fait plaisir d'être un candidat pour la position de Délégat-élu - Directeur-élu, 2004-2005 de la région sept de l'IEEE. C'est un honneur, mais aussi une opportunité de promouvoir le maintien et l'amélioration des compétences professionnelles des ingénieurs canadiens.

I offer years of experience in leadership, and administration in military, government, academic and societal/association contexts. This includes addressing organizational, personnel, ethical, conflict of interest, equity, liability and accountability issues.

J'offre des années d'expérience en leadership et administration dans les domaines de la fonction publique, l'académie et les associations professionnels et de technique.

The IEEE sets the world standard for technical societies. I believe it is in every engineer's interest to be involved in and to support the technical societies. I have the time, interest, experience and energy to approach the duties of Delegate/Director with enthusiasm.

IEEE Activities -- (S'63-M'65-SM'73-F'93-LF'99) REGIONS: Region 7: Awards Committee, 1999-03. SECTIONS/COUNCILS: Kingston: Chair, 1967-68; Bay of Quinte: Chair, 1972-73; Central Canada Council, Vice Chair, 1972-73; Chair, 1974-76. AWARDS: McNaughton Medal, 1996; Centennial Medal, 1984.

BIO -- My engineering career began with 17 years in the Navy and my military career continued (9 yrs.) in an extracurricular manner as a Commanding Officer in the Naval Reserve. My academic career at the Royal Military College began in 1965. I was Head EE, Dean of Graduate Studies and Research, and Principal (three five-year terms) in succession there. Semi-retirement began as the part-time Executive Director of the Engineering Institute of Canada and President of the Advanced Technology Educational Consortium in Kingston (a trainer of chip designers). The former continues but the latter ended with the collapse of the microelectronics industry. I was President of the Canadian Society for Electrical and Computer Engineering (CSECE) and later of the EIC, and am proud to have been one of the key players in the merger of Region 7 IEEE with the CSECE. In addition to IEEE activities I am an Engineering Institute of Canada (EIC) Fellow, a winner of the EIC Stirling Medal, the Order of Military Merit (a military part of the Order of Canada) and the PEO Citizenship Award. I have published one book, chapters in two books, and 23 refereed journal papers. I spent a year in industry in France where I developed my fluency in French and was a visiting scholar to the Virginia Military Institute in Lexington Virginia. I am a founding board member of "Registered Engineers for Disaster Relief Canada" and a member of the Board of Governors for St Lawrence College. I received my Ph.D., EE from MIT, 1965.

Robert A. Hanna, P.E. (Nominated by Region 7)
President
RPM Engineering, Ltd.
Mississauga, ON L5K-2R1
Email: r.hanna@ieee.org
Phone: (905) 823-3363

Dr. Hanna received the B.Sc. Degree (Honour) from University of Basra, Iraq in 1971, the M.Sc. (Distinction) from Queen Mary College, University of London, England in 1973, and the Ph.D. from Imperial College of Science and Technology, University of London, England in 1977, all in electrical engineering. Following a short teaching career, in 1981 he joined Gulf Canada, now Petro Canada, as Central Engineering Specialist providing technical expertise to the refineries in implementing capital projects and equipment selection. In 1995, he founded RPM Engineering, Ltd., a certified consulting company specializing in Adjustable Speed Drive applications, power quality studies and power system analysis. He has authored 35 technical papers, including 16 IEEE Transactions/Conference papers and has been an invited speaker to several utilities. He is a registered professional engineer in the provinces of Ontario, Alberta, British Columbia and, in 1993, became a Fellow member of IEE, UK.

IEEE Activities - (S'75-M'76-SM'88) SECTIONS/COUNCILS: Central Canada Council, Vice Chair, 2001-03. Toronto: Chair, 2002-03; Centennial Committee, Chair, 2003; TECHNICAL COMMITTEES: Standard 1566, Vice Chair, 2001-03. SOCIETIES: Industry Applications: 1983-03; Paper Review and Evaluation Subcommittee, 1992-03; Power Engineering, 1996-03; Industrial Electronics, 1999-03; CONFERENCES: 2004 Canadian Conference on Electrical and Computer Engineering, Chair, 2003; Local Arrangements, Chair, 2001; PES General Meeting, Section Liaison, 2003; IAS Annual Petroleum & Chemical Industry Conference, Vice Chair, 2001; Vice Chair, 1991.

Statement - I am honoured to be nominated to serve as Region 7 Delegate-Elect/Director-Elect, 2004-2005. I am committed to serve and enhance the interests of the Region, sections, chapters, and particularly of all IEEE members. Having been an IEEE volunteer for over 25 years, I am now privileged to be the Chair of the Toronto Section, the largest in Canada, which celebrates its centennial in October, 2003.

Déclaration - Il me fait honneur d'être mis en candidature afin de servir comme Délégué Désigné / Directeur Désigné de la Région 7 pour la période 2004-2005. Je m'engage à servir et rehausser les intérêts de la Région, ses sections, ses chapitres, et particulièrement de tous les membres de l'IEEE. Ayant été bénévole auprès de l'IEEE pour plus de 25 ans, j'ai présentement le privilège de servir en tant que président de la Section de Toronto, la plus grande section au Canada, qui célébre son centenaire en octobre 2003.

Due to my work experience and my academic credentials, I've had the opportunity to successfully conduct business in seven Canadian provinces. I will use my broad experience, communication and leadership skills to advance the strategic goals of IEEE Canada.

Building on the accomplishments of all past Canadian Directors, my goals for Region 7 advancement include improving:

- Relationships with industry and universities
- Benefits and services for IEEE members and to our students
- Relationships between various sections throughout Canada
- Electronic media to deliver products & services in a timely manner

I will ensure that IEEE will serve you better. Thank you for your consideration.

Candidates statements and CVs are also available at: http://ieee.ca/candidates

Letters to the Managing Editor / *Lettres envoyées au rédacteur en chef*

11 July, 2003

Dr. Sood,

I was interested in having some reprints done of an article that was in your publication in Spring of 2002. LSI Logic acquired VideoLocus a few months ago and I believe they received approval from you to post the article on their Web site. We would like to not only post it to our Web site, but also print the article for distribution at trade shows. Please let me know what the policy is on this?

Thank you, in advance, for your help.

Jacqueline Gladden
Marketing Communications
LSI Logic
California, USA

Editor's Response:

Dear Ms. Gladden,

We are pleased to note that you will be using this article.

Our policy on reprints and web hosting of articles is as follows:

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3. That the article be reprinted with the **IEEE Canadian Review** identification at the bottom of the page intact.

Vijay Sood
Managing Editor

16 May 2003

Dear Sir,

I would like to get the contact of the University of Calgary about the **Light Up the World** program.

Thank you for your time and attention.

Dr. E. Azombo
France

Editor's Note:

The Canadian Review carried this story in Issue no. 36 in the Autumn issue of 2000.

Obituary

ALDEN, Dorothy (nee Ingram)

June 11, 1906-June 7, 2003

Passed away on Saturday, June 7, 2003 just before her 97th birthday. Predeceased by her husband Thomas. Loving mother of Robert and his late wife Judy, and Margaret and her husband Andrew Findlay. Adored Gran to Christine, Amanda, Elizabeth and Suzanne, also fondly remembered by Lydia and Zoe. Dear sister of Gerry and his wife Pat, and Fred. Dear friend of Linda Oliver and Pat McEwan. Dorothy was a longtime member of St. John's Church where she taught two generations of Sunday School. A Memorial Service was held at St. John's York Mills Anglican Church on Thursday, June 12, 2003 at 2:30 p.m. If desired, donations may be made to the church:

19 Don Ridge Drive, Toronto, Ontario M2P 1H3.

Awards Received by IEEE Members

Two distinguished Canadian power engineers received major awards at the IEEE Power Engineering Society meeting on June 15, 2003 at the Sheraton Centre Hotel in Toronto.

Dr. Sarma P. Maruvada received the Herman Halperin Electric Transmission and Distribution Award "for contributions to the understanding and characterization of electromagnetic fields and corona phenomena associated with high voltage AC/DC overhead transmission lines". Dr. Maruvada obtained his doctorate at the University of Toronto in 1968 and worked for most of his professional life at the Hydro Quebec Institute of Research. He is currently a consultant.

Herman Halperin Electric Transmission and Distribution Award was presented by IEEE Past President Ray Findlay (right) to Sarma Maruvada.

Dr. M. Azizur Rahman received the Cyril Veinott Electromechanical Energy Conversion Award "for contributions to the design and analys of hysterisis and permanent magnet motors". Dr. Rahman obtained his doctorate from Carleton University and has worked in a variety of industrial and academic environments. He is currently University Research Professor at Memorial University of Newfoundland.

Cyril Veinott Electromechanical Energy Conversion Award was presented by IEEE PES President John Estey (right) to Aziz Rahman (centre). Ray Findlay, past IEEE President is on the left.

Order of Manitoba for IEEE Member

On Wednesday, July 16th, 2003 eleven Manitobans were invested into the Order of Manitoba by Lt.-Gov. Peter Liba. Among them was Leonard Bateman -- a former CEO of Manitoba Hydro in the 1970s. Bateman oversaw the development of the Nelson River hydro project. He provided the engineering leadership to avert pressure to install coal-burning generating plants rather than hydro capacity.

New Senior Members

Gabriel Benmouyal, Member of IEEE Power Engineering Society, and

Jean-Pierre Martin, Member of IEEE Nuclear & Plasma Science Society.

Information Technologies and Performance Of Higher Education and Training Systems: A Comparison Between Canada and OECD Countries

by *Hadj Benyahia*
University of Quebec at Montreal, Montréal, QC

Abstract

This study shows that the access rate of the Canadian university system (56%) is one of the highest in the OECD countries. This good quantitative performance however is not accompanied by a similar qualitative performance in science graduation if we consider that the relative share of science graduates (25%) in total university graduates is below those observed in traditional areas (humanities and social sciences). For computer sciences graduates, the relative share still remains low (4%) in all the OECD countries. For these computerized countries, this paradox is then explained. For the Canadian continuing training system, the weakness observable in the quantitative performance (participation rate) is accompanied by a qualitative weakness considering that annual duration of training is two times inferior to the OECD average (31hours versus 64). To reduce the performance gaps between the higher education system and the training system, a couple of measures are presented to improve the integration between these two systems. These interventions are considered for universities, for companies and at the government level.

Sommaire

Cette étude montre que le taux d'accés au système universitaire canadien (56%) est un des plus élevés dans les pays de l'OCDE. Cette bonne performance quantitative n'est cependant pas accompagnée par une performance qualitative similaire pour les diplômes délivrés en science si l'on considère que la part relative de ces diplômes (25%) dans le total des diplômes universitaires est inferieure à celles observées dans les disciplines traditionnelles (humanités et sciences sociales). Pour les diplômés en informatique, la part relative reste faible (4%) dans tous les pays de l'OCDE. Pour ces pays informatisés, ce paradoxe est alors expliqué. Pour le système canadien de formation, la faiblesse observable dans la performance quantitative (taux de participation) est accompagnée par une faiblesse qualitative étant donné que la durée annuelle de formation est deux fois inférieure à celle de l'OCDE (31heures versus 64). Pour réduire les écarts de performance entre le système d'enseignement supérieur et le système de formation, un ensemble d'actions sont proposées pour améliorer l'intégration entre ces deux systèmes. Ces interventions concernent les universités, les compagnies et le gouvernement.

1.0 Introduction

According to the Organization for Economic Co-operation and Development [1], Canada ranks among the first ten countries in the world having invested the most in information and communication technologies. The purpose of this study is to analyse the impact of this massive investment on the access rate and the graduation rate of higher education, particularly in science, as well as to analyse the effects of these technologies on the participation rate to continuous training activities and the quality of these. In conclusion, we will present some elements of an integration strategy between higher education system and training system in order to reduce the performance gaps between these two systems.

2.0 Quantitative Performance Of Both Systems In 1999

The following observations can be drawn from Table 1:

- Canada allocates a considerable financial effort to the development of its university system. This expense equates to more than half (58%) of the Gross Domestic Product (GDP) per capita. This important investment places Canada 4th among the 30 OECD countries for financing of higher education.
- The university enrolment rate is an indicator of accessibility at this strategic education level because, according to a canadian government study [3], 70% of all new jobs in 2004 will require a post-secondary diploma of which 25% will require a university degree. An important result of the enrolment rate is that in all OECD countries, higher education is no longer an elitist education for a minority but a mass education which reaches nearly half (45%) of the population of age to enter university. In Canada, it is more than half of this population (56%) that has access to higher education. This result confirms the forecasts of many specialists [4].
- The indicator that represents the human capital growth gives the pace of progression to the accessibility to higher education. This indicator will also serve as the potential for the future highly qualified labour force. There again, Canada has a high progression rate of 6.9%, which places it 4th in the OECD.
- However, these good performances of the higher education system have not been gained due to its training system that ranked 15th and 16th, below the average of OECD countries. The gap between a very accessible higher education system and a more restrained training system shows an integration problem between these two systems and leads to an inefficient use of human capital. Moreover, this gap presents a paradox if we consider that Canada ranked 5th in importance of hardware/software investment in information technology whereas the training activities only represent 1-2% of Canadian companies sales figures according to Statistics Canada [5].

3.0 Qualitative Performance Of Both Systems In 1999

In Table 2, the resources indicators (expenses and enrolments) previously examined are now accompanied with the result indicators (graduates and duration of training) in order to evaluate the quality of the production of knowledge, particularly scientific and technological knowledge.

The following observations can be drawn from the qualitative performance table:

- The indicators of the graduation rate at the three levels of higher education represent the production rate of the highest levels of knowledge. Canada's position is above the OECD average for the first university level (Bachelor) but falls below the average for the Master's and Ph.D. levels. Consequently, a high entry ratio (quantity indicator) does not go hand in hand with a high rate of graduation (quality indicator).
- The indicators of graduation rate in science are productivity indicators because the scientific and technical areas constitute the modern economy's locomotive. Pertaining to this point, we observe a paradox in all OECD countries if we consider that for these computerized countries only one out of four graduates (23% to 26%) has a scientific background whereas the majority of graduates (two out of three) have traditional backgrounds (33% in humanities, arts and education; 34% in social sciences, commerce and law). In Canada, the relative share of these science graduates is inferior to the OECD average for university programs of three or more years duration (21.5% versus 26.3%). However, it is superior to this average for short university programs (two years) giving direct access to the labour market (26% versus 23%). For computer science graduates, the relative share of graduates still remains low (3% to 4%).
- There are three factors that could be considered to explain this paradox: first, the high level of dropouts and failures in university studies in science. Second, the required skills in information technology are no longer simply technical but also include management skills, oral and written communication skills and the ability to solve complex problems and work in heterogeneous teams. Thirdly, there

Table 1: Quantitative Performance Of Both Systems In 1999

Quantitative performance indicators	Value of the indicator for Canada	Average value of the indicator for OECD	Canada's rank among 30 OECD countries	Top ranked country in OECD
Expenditure per university student	$14 579	$9 063	3	USA ($19 802)
Expenditure per university student in relation to GDP per capita	58 %	44 %	4	USA, Sweden and Switzerland (61 %)
Enrolment rate in higher education (*)	56 %	45 %	6	New-Zealand (71 %)
Growth of working age (25-64) population with an university attainment (1989-1996)	6.9 %	4.2	4	Ireland (7.8 %)
Participation rate of working age population with university attainment in job related training	33 %	46 %	15	United Kingdom and Denmark (70 %)
Participation rate of working age population with university attainment in all continuous training activities (**)	43 %	58 %	18	United Kingdom and Denmark (75 %)

Notes:

(*)Enrolment rate = number of enrolments for an age group divided by the population in that age group.

(**) These activities include on-job-training, certification given by a company or an organisation, training courses and workshops.

Sources: Table established from OECD [1] and OECD [2] data.

seems to be no systematic link between information technology training and the available positions in this field. For example, in the United-Kingdom [4], nearly half of the people occupying positions in information technology do not hold a degree in this field. On that same note, more than half of those who have received education and training in information technology occupy positions that are not linked to these technologies. The most typical case is that of a computer engineer occupying the position of administrative manager. The electronic commerce field is also a good example of the association of technical and commercial skills.

Finally, in terms of the effectiveness of the continuing training system, the indicators tables show that the weakness observable in the quantitative performance (participation rate) is accompanied by a qualitative weakness considering that the annual duration of training is clearly inferior to the OECD average, in particular for the salaried graduates for whom the hours received in training for each year are two times inferior to the OECD average (31 hours versus 64 hours).Therefore, The problem of quantitative integration also involves a qualitative integration problem between the higher education and training systems. These gaps often cause labour shortages. According to the Information Technology Canadian Association, Canada had produced about 8000 graduates in computer science and engineering in 2001 whereas the demand was twice as high in these fields. To reduce the performance gaps between these two systems, we will present in our conclusion a couple of elements of an integration strategy for these systems.

4.0 Conclusion: Integration Strategy Elements Between A Higher Education System And A Training System.

a) The following measures could be considered for universities:

- Using the potential of high-speed networks (ex. Internet 2) for long distance education of information technologies for basic courses in all education programs and not only in computer science, for all students and teachers.
- Strengthening of the partnership between universities and the industry to better sensitize students, during their on-job-training, to methods of working used within companies.
- Increase the participation rate of women in university computer science programs.

b) The following measures could improve the training system effectiveness for companies:

- Increase access to computers and to the Internet in all work locations and for all employees (ex. GM, Ford, Intel, American Airlines programmes and the likes).
- Favour qualified staff retention measures by offering salary based and non-salary based incentives (training programs, career profiles, flexible schedules, benefits sharing, etc.).
- Solve short-term labour shortages by making a more frequent use of certification offered by companies such as Microsoft, Cisco, Novell, Oracle, etc.
- In the long term, favour software outsourcing for small and medium highly specialized companies.

c) The following interventions could be considered at government level:

- Create more organisms working in concert with the industry (ex. Office of partnerships for advanced skills) that could respond to the needs of industry in terms of qualified personnel and sensitize universities to IT training.
- Offer fiscal incentives to companies for their training programs.
- Contribute to short-term problems of labour shortages by facilitating granting of visas and work permits in immigration policies.
- Participate in the establishment of international norms on information technology skills.

Table 2: Qualitative Performance Of Both Systems In 1999

Qualitative performance indicators	Value of the indicator for Canada	Average value of the indicator for OECD	Canada's rank among 30 OECD countries	Top ranked country in OECD
Graduation rate in first degree university programmes (*)	42 %	36 %	8	Japan (59 %)
Graduation rate in second degree university programmes (Master)	4.7 %	5.4 %	12	Poland (18.2 %)
Graduation rate for Ph.D.	0.8 %	1.0 %	12	Switzerland (2.6 %)
Science graduates as a % of total graduates (3 years and more university programmes)	21.5 %	26.3 %	20	Korea (42 %)
Science graduates as a % of total graduates (2 years university programmes)	26 %	23 %	10	Korea (45 %)
Computer science graduates as a % of total university graduates.	3.5 %	3.2 %	11	Ireland (9.5 %)
Number of years spent at university level	2.8	2.5	7	Finland (3.9 %)
Annual training hours per participant with a university degree	94 hours	129 hours	14	New-Zealand (258 h)
Annual training hours per employee with a university degree	31 hours	64 hours	15	New-Zealand (161 h)

Notes:

(*) Graduation rate = number of graduation for a given age group divided by the population in that age group.

Sources: Table established from OECD [1] and OECD [2] data.

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About the author

Hadj Benyahia is a Professor in the Computer Science Department of the University of Quebec at Montreal since 1983. He has a "Doctorat d'Etat" from the University of Paris.

He was formerly a project manager and consultant at Gamma Institute specializing in evaluation of new information technologies.

His present research fields are economics of computers, software engineering economics and office automation. He has published many books, reports and articles in these research areas.

Life Members Activities

In May of this year the Hamilton Section formed a Life Member Chapter, with Bert de Kat acting as Chair. The next meeting of this Chapter will be a luncheon on October15th, at the Plainsman Restaurant with a discussion of the Decew Falls Milestone Project.

The Montreal Section Life Member Chapter plan to hold their first meeting on Thursday October 9th., at12:30 in Room A 480, at École Polytechnique. Art Yelon is organizing this inaugural meeting. To get the Chapter Life Members actively involved, discussions are planned on a possible milestone project. Lunch will be available for those who reserve in advance. To reserve, please contact Ron Potts, LM Chapter Co-ordinator R7, at r.potts@ieee.org. If you don't have e-mail, call (514) 340-4711 x 4751.

Activités Des Membres À Vie

En mai dernier, la Section de Hamilton a formé une chapitre; Bert de Kat est Président intérimaire. La prochaine réunion du chapitre sera un lunch, le 15 octobre au Plainsman Restaurant avec une discussion du Projet Decew Falls Milestone.

La première réinion du chapitre des membres à vie de la Section de Montréal est prévu pour le jeudi, 9 octobre à 12h 30, dans la salle A 480 de l'Ecole Polytechnique. Cette réunion inaugurale est organisé par Art Yelon. Pour inciter les membres à vie du chapitre de s'impliquer, on envisage des discussion sur un projet 'Milestone'. Un lunch sera disponible pour ceux qui réservent à l'avance. Pour votre réservation veuillez contacter Ron Potts, r.potts@ieee.org. Ceux qui ne disposent pas de courriel peuvent télephoner à (514) 340-4711 poste 4751.

An Introduction to Intellectual Property

1.0 The Need to Protect Technology

Engineers understand the challenges of developing cost-effective, commercially viable solutions to complex problems. Among these challenges is the time (in person-years) it takes to understand and analyze a problem, to develop, prototype and test multiple solutions and then to engineer the solution into a commercial form. A second primary challenge is the cost of innovation - even relatively simple concepts can require hundreds of thousands, or even a few million, dollars to develop in a commercially acceptable form.

For many companies, this engineering challenge is the easy part. The challenge of actually commercializing the technology is often greater.

As soon as a product is successful, and often even earlier, competitors pop up out of nowhere, ready to make similar or even identical products. These competitors don't incur the costs and delays of innovating the product. Even worse, competitors may be better positioned to actually manufacture the product more cheaply than the inventor (or to have it manufactured overseas), and may be able to offer it to the market at a lower price than the true innovators. In some cases, the competitor may be able to appropriate the entire financial benefit from the innovation, after having borne none of the risks and expenses of making it. It may come as a surprise that this sort of conduct is generally legal in almost all countries, including Canada and the United States.

2.0 Mechanisms for Protecting Technology

Fortunately, there are several ways to control a third party's use of your technology.

First, the technology can be keep secret. In some cases, it is possible to keep an invention entirely secret and still make commercial use of it. While this can be extremely effective, there is a risk that a third party will independently develop the same technology, possibly by looking at what you are doing, and then compete with you. Worse still, the third party might be able to get a patent and actually force you to stop using the invention.

Another mechanism is to enter into a contract with the third party - typically a confidential disclosure agreement that limits how the third party uses technology you have given to it. Contracts are enforceable only against parties that actually agree to them. Other parties can continue to appropriate your technology. Also, if your technology isn't actually confidential (i.e. it has been publicly disclosed through academic or industry papers or could be discovered by reverse engineering a product), then contract based protection may be impossible or difficult to enforce (and may actually be illegal in the U.S.). These first two mechanisms rely on the law of trade secrets or confidential information.

Typically, the most powerful mechanism for controlling a third party's use of your technology is to patent it. A patent gives its owner the right to stop others from making, using or selling articles that include the invention. The protection lasts for 20 years, and when set up properly, it can give the patentee exclusive control to commercialize or otherwise benefit from the invention. A patent is effective against third parties who develop the same technology, even if they do so independently.

3.0 Types of IP Rights

Trade secrets and patents are two IP rights used to protect technological innovations. Innovations may also be "protected" by publishing them for the world to see. Such a "defensive publication" prevents third parties from getting a patent for the innovation, even if they develop it independently (unless they filed for the patent before the publication).

Other IP rights include industrial designs, copyrights, trade marks, integrated circuit topography registrations and plant breeders rights. Table 1 summarizes various aspects of these rights. In future articles, we will review each type of IP right in greater detail.

4.0 Managing Intellectual Assets

The IP rights described may be seen as intellectual assets. They do not exist in a physical form, but they embody and protect the creative and innovative concepts that their owner may use with some degree of exclusivity. A company's other intellectual assets may include the know-how retained by its employees, the relationships the company has with others, concepts and innovations for future products and a mature understanding of the company's technological and business environment.

Managing and leveraging these intellectual assets can be a relatively simple task, or it may be extremely complex, depending on a company's goals.

At its simplest, intellectual asset management involves obtaining IP rights for a company's important innovative technologies and then using these rights defensively. A patent portfolio may be used to define the scope of a company's technology, as a warning or threat to others. The portfolio can also be used to shield a company from litigation - if another party claims the company is infringing the other party's right, the company will have some technology to cross-license. Both parties can get access to greater rights and compete in the market rather than endure a costly and expensive battle in court. In a small organization this function may be part-time and may be filled by a technology group leader. In larger or more technology intensive companies, this function may by led by an in-house lawyer or patent agent who works with a technology management committee to identify innovations that are worth protecting and to manage the process of obtaining and maintaining IP protection.

At a highly advanced stage, intellectual asset management can become a visionary activity within a company. A company that prides itself on anticipating future trends and technological changes will stake its claim on portions of that future technology well in advance by developing related concepts and protecting them, using a combination of intellectual assets, particularly patents. The company will then work towards integrating the concepts with the company's current products or developing new products. In some cases, the new concepts may relate to products two, three or more generations removed from their current offerings. In such companies, the intellectual asset management role may be led by a senior executive such as the Chief Technology Officer.

Between these extremes, intellectual asset management includes managing the costs associated with developing and maintaining an IP

by *Bhupinder Randhawa and Tony Orsi*
Bereskin & Parr, Toronto, ON

Abstract

Engineers excel at developing new technologies. Increasingly, they are also recognizing the need to take legal control over innovations so that the inventors, and their employers, can benefit from them.

This article is the first in a series that will discuss intellectual assets, and their role in an organization's technology protection and management strategy.

Sommaire

Les ingénieurs sont des experts dans le développement de nouvelles technologies. En outre, ils reconnaissent de plus en plus l'importance de prendre les moyens légaux pour exercer un certain contrôle sur les innovations et ainsi permettre aux inventeurs, et à leurs employeurs, d'en bénéficier.

Cet article est le premier d'une série portant sur les << capitaux intellectuels >> et leur rôle au sein de la strategie d'une organisation ayant trait à la gestion de la technologie et à sa protection.

Table 1: Basic Facts about IP Rights

IP Right	Subject Matter	Registration / Ownership Requirements	Protection	Filing Requirements	Term
Patent Patent Act	Invention: New and useful art, process, machine, manufacture or composition of matter or any new and useful improvement in an art, process, machine, manufacture or composition of matter.	Invention must be new, non-obvious and useful.	Exclusive right to make, construct, use & sell the invention, or articles made using the invention.	Registration is mandatory. In Canada & US, an application must be filed within 1 year of invention disclosure. In other countries, filing requirements vary, but in general, application must be filed prior to invention disclosure. After a first application is filed, many countries allow a 1 year period during which subsequent applications can be filed.	Term begins on date of registration & ends 20 years after the filing date, subject to payment of maintenance fees. Registration can be challenged by third parties on the basis that the registration requirements were not met.
Trade Secret Common Law	Information that is not generally known to the public.	Information must actually be secret vis-à-vis third parties and the general public.	Right to remedies for breach of confidence. Prevent or delay third parties from using information until they discover it themselves.	None.	Trade secret protection lasts until the secret is publicly disclosed.
Integrated Circuit (IC) Topographies Integrated Circuit Topographies Act	There are 2 definitions of a topography: 1. Design for interconnections, if any, & the elements for making an IC. 2. Elements, if any, & interconnections for making a customized layer to be added to an IC in an intermediate form. For the purposes of this Act, an IC is defined as either an intermediate or final electronic product that (i) has at least one active element and (ii) in the elements and at least some of the interconnections are integrally formed on or in a piece of material.	Topography must be original. The topography may not be copied from another topography or part of another topography. The topography must be the result of an intellectual effort and may not be commonplace among creators of topographies or manufacturers of integrated circuits. A topography that is a combination of commonplace elements or interconnections may be considered original if the combination meets the requirement set out above.	Exclusive right to: 1. Reproduce the topography or any substantial part of it. 2. Make an IC containing the topography or any substantial part of it. 3. Import or commercially exploit the topography or a substantial part of it, or an IC that incorporates the topography or a substantial part of it. A third party that independently creates the topography can freely use their topography without infringing these rights. The Act specifically excludes any idea, concept, process, system, technique or information embodied in a topography from this protection.	Must file an application for registration within two years of first commercial exploitation of the topography. There is no substantive examination of the application, although the Registrar may refuse if it appears that one of the registration requirements are not met.	Term begins on the date of filing the application for registration and ends at end of the 10th calendar year following the earlier of (i) the year in which the topography was first commercially exploited or (ii) the year in which the application was filed.
Industrial Design Industrial Designs Act	Design: A feature of shape, configuration, pattern or ornament that, in a finished article, appeals to and judged solely by the eye.	Design must be novel in comparison to publicly known designs as of the filing date of the application. Solely functional aspects of a design are not protected.	Can stop others from using the design or similar designs.	Registration is mandatory. In Canada & US, application must be filed within 1 year of public disclosure of the design. In other countries, the filing requirements vary, but in general, application must be filed prior to public disclosure of the design. After a first application is filed, many countries allow a 6 month period during which subsequent applications can be filed.	Canada: Ten years from date of registration, subject to payment of a maintenance fee after five years. U.S.: Fourteen years
Trade Mark (Registered) Trade-marks Act	Trade Mark: A word, phrase, slogan, symbol or other indicia that is used to identify the source of goods and/or services.	Registered trade mark must be capable of distinguishing the wares or services of the owner.	Exclusive right to use trade mark anywhere in Canada in association with wares and services for which it is registered.Right to stop others from using confusingly similar marks with similar wares and services.	May file at any time.	Fifteen years - renewable indefinitely.Registration can be challenged by third parties on the basis that the mark is not in use or is not distinctive of the owner.
Trade Mark (Common Law) Common Law codified at a basic level in s. 7 of the Trade-marks Act	Trade Mark: a word, phrase, slogan, symbol or other indicia that is used to identify the source of goods and/or services.	Ownership arises through use and creation of goodwill in the common law trade mark.	Exclusive right to use trade mark in area where it has become distinctive, in association with wares/services with which it is distinctive.	None.	Until the mark is no longer in use or there is no goodwill in the mark.
Copyright Copyright Act	Literary, dramatic, artistic, musical or other work that is expressed in reproducible form. Copyright can be used to protect many different forms of expression. For example, a compilation of existing works is copyrightable to the extent that the compilation itself is original. The compilation could be a set of literary works, a web page, etc.	Work (or the part or aspect of it that is to be protected) must be created by the author. Author is generally the first owner of copyright, except where the work is created in the course of employment.	Owner can stop others from reproducing or publicly exhibiting work or a substantial portion of it as well as many other rights depending on nature of work. Only the expression is protected - not the ideas expressed - copyright is effectively protection against plagiarism. Moral rights allow author to protect his/her reputation.	Registration is optional. Registration raises statutory presumption that the information registered (e.g. authorship) is true. In the U.S. registration is necessary to claim statutory damages.	Generally, copyright arises automatically on creation of a work and expires at the end of the 50th year after death of the author. The term may be different depending on the nature of the work and the owner of the copyright. Outside of Canada the term differs from country to country.

portfolio, developing and implementing strategies for profiting from an IP portfolio, monitoring the intellectual assets of competitors, and integrating the intellectual asset management function with other activities within the company.

Different companies require each of these management activities at different levels. A startup will typically obtain patent protection for the core ideas underlying its anticipated products. In general, however, a startup is not in a position to undertake a visionary intellectual asset program. Even a mature company may not need to be at the visionary level, depending on how quickly the relevant technology changes and the company's role in that technological space.

5.0 Summary and Future Articles

In this article, we have very briefly introduced the need for intellectual property protection, identified some characteristics of different IP rights, introduced the concept of intellectual assets and highlighted a few aspects of intellectual asset management.

In our next article, we will review the various IP rights in greater detail, with a focus on patents, trade secrets and other mechanisms for protecting technological innovation. In a third article, we will discuss intellectual asset management in greater detail. We will also discuss strategies for developing a commercially valuable, but still cost-effective IP portfolio, with a focus on the role of an intellectual asset manager in different organizations to implement these strategies and the roles of outside advisors such as patent attorneys.

This article is intended to provide general information regarding intellectual property and is not intended as legal advice.

Readers wishing to propose topics for further articles to this series may directly contact the authors.

About the authors

Bhupinder Randhawa is a professional engineer, lawyer and a patent agent. He studied computer engineering at the University of Waterloo. He is an IEEE member and can be reached at brandhawa@bereskinparr.com.

Tony Orsi is a technical consultant with Bereskin & Parr in Toronto. He received a bachelors degree in electrical engineering and a masters degree in biomedical engineering from the University of Toronto. He is an IEEE member and can be reached at torsi@bereskinparr.com.

3D User Interface for a File Management System

by David Carter and Luiz Fernando Capretz
University of Western Ontario, London, ON

Abstract

Two-dimensional graphical user interface (GUI) is now firmly established as the preferred interface for most applications. The purpose of this work was to develop a three-dimensional user interface as a front end for a file management system and to evaluate the efficiency of a practical 3D application. In order to create this software, a previously defined 3D graphics engine, called Valve Software's Half-Life, was extended to provide a directory traversal and the basic file management functions (cut, copy, paste, delete). The project was divided into two basic components: generating the 3D "world", and altering the Half-Life engine to provide some features of file management.

Sommaire

L'interface utilisateur graphique bidimensionnelle est l'interface de choix pour la plupart des applications. Le but de ce travail était de développer une interface utilisateur tridimensionnelle (3D) pour un système de gestion de fichiers et d'évaluer l'efficacité d'une application 3D. Un moteur pour graphiques 3D du nom de 'Valve Software's Half-Life' a été amélioré. Ce dernier comporte maintenant une traversée de répertoire et des fonctions de base tel que couper, copier, coller et effacer. Ce projet a été divisé en deux parties : génération du "monde"' en trois dimensions et modification du 'Half-Life engine' dans le but d'offrir quelques caractéristiques d'un gestionnaire de fichiers.

1.0 Introduction

The graphical user interface (GUI) was developed in the late seventies, successfully commercialised in the early eighties, and has since become the integral part of every modern operating system.

Today's computer users are presented with an ever-expanding amount of information. Due to this increasing volume of data, the user eventually becomes overwhelmed with it. Three-dimensional user interfaces cater for the organization of this data and can help the users regain control over the information in a natural way [1].

Currently computer users are bound to the "desktop" metaphor. This metaphor's longevity is a testament to the strength of its design. Of course, over twenty-some years improvements have been made to that original design, but the basic elements (e.g. icons, pop-up and pull-down menus) that implement the *what-you-see-is-what-you-get* idea have remained the same.

Just as decreasing hardware price and increasing hardware capabilities made the pseudo-2.5D GUI affordable in the eighties and widespread in the nineties, these hardware trends will make 3D GUIs affordable in the near future. GUI with 3D capability offers great potential for improvement over today's 2.5D GUIs (in which the xy-plane is clearly defined and the appearance of depth is created through the obscuring of "background" windows). For instance, multiple overlapping windows are hard to identify, iconified windows more so, and one quickly runs out of space trying to group related applications; alleviating the problem of window trashing is one of the main design goals of a 3D-GUI.

The 3D interface is not a new thing [3, 4]. They have existed ever since the first 3D object was output by a computer. Leach et al. [2] presents a metaphor used for a 3D-GUI in which windows are arranged in a *tunnel*. The user is positioned in the middle of the mouth of the *tunnel* looking toward the other end. Windows are displayed with a perspective projection. In addition to the front-end window, there is a "hanging" mode where the windows are hung on the left or right wall of the tunnel. Another new idea is a 3D cursor with six degrees of freedom, called the *magic wand*, which "floats" over the top of objects rather than being part of the screen.

The purpose of this research was to develop and evaluate a 3D user interface as a front end for a file management system (such as Microsoft Windows© Explorer). The implemented software reused a modified version of the user interface used in Valve Software's Half-Life engine.

To make this sort of interface popular, we face two problems: First, within the operating systems domain, the use of 3D graphics is heavily under-used. Secondly, for ordinary users, on-the-fly creation of 3D "worlds" is a totally new trend. However it will soon be available to personal computer users.

2.0 File Manager Requirements

Although it seems reasonable that the home users should be able to fully immerse themselves in a 3D rendered world, it is not always possible to efficiently provide this. Typically, 3D interfaces are often awkward for the developers to represent data, and harder for the users to manipulate than the standard 2D user interface.

In considering 3D graphical user interfaces, it became evident that if an effective 3D user interface were to be developed it needed to be the front-end for a practical application. Thus the idea was to provide the user with a system for managing files, one that incorporated 3D rendered graphics, yet at the same time maintained the same (if not a higher) level of usability as the standard 2D interface to which the home user had become accustomed.

The developed software was intended to be an extension of the standard Microsoft Windows© Explorer. It enables the user to traverse a file system from a first person perspective using a 3D interface, and it provides the functionalities listed in Table 1.

Table 1: Functionalities of 3D Interface

File Manager	User Interface Functionality
Create New Directory	Generate the User Interface
Rename	Inventory
Cut	Return to Root
Copy	Map Layover
Paste	Select All
Delete	Refresh

This set of file management functionalities was provided as they were considered to be the most common tasks performed by the average user. The user interface functionalities were given to aid the user in performing the provided file management functions.

2.1 The User Profile

The software is intended for two different types of users. The first type is the person unfamiliar with the file structure employed by an operating system and who also has trouble visualizing the file system in a two dimensional manner. For him/her, the software is useful since it creates a structured environment that is analogous to a file system and also it allows for a visual learning process to commence. The second type of user is the one familiar with first person perspective employed in many

games; for him/her, the software becomes an interactive means of monitoring the user's file system.

2.2 The User Interface

The software implements a modified version of the Half-Life engine and is employed to represent the directories and files contained within the file system itself.

A directory is represented by a rectangular room. Along two of the four walls in the room transporters to the subdirectories are placed, and along one of the remaining walls a transporter to the parent director is also placed.

Files were originally intended to be represented as their native Microsoft Windows© icons; however, as development progressed, the need for a more reusable representation arose, and files are represented as panes of glass hovering in their appropriate room.

3.0 The Design of 3D File Manager

Originally it was thought that the software would consist of three main components: the file manager, the 3D user interface, and the Half-Life engine. However, as the design was refined portions of these components shifted, and a more efficient design emerged.

Since the Half-Life engine follows the client-server architecture, it was able to absorb the other two components. The file management component was consolidated with the server side, while the client side absorbed the user interface functions. However, it was also necessary to develop software to generate the data needed for the Half-Life engine to represent the file system. Thus the system continued to contain three components.

As depicted in Figure 1, the *InitLevel* class is responsible for generating the data needed for the Half-Life engine. The *Half-Life engine* package contains both the server and client components. The *DirectoryInfo* and *FileInfo* classes are taken from the .NET framework and are used to aid in the file system traversal.

In using the Half-Life engine, it was possible, by reusing the necessary portions of the engine and then adding the file management and user interface functions, to produce the desired 3D user interface. However, in using the Half-Life engine, the major stumbling block became the compatibility issues between Microsoft Windows© and the engine (an OpenGL based system).

4.0 Implementation

The implementation of the 3D file management system took place in two phases. First, the map generator (implemented in Visual C++ .NET) was developed to build the virtual world the user could walk through. Secondly, to add the file management capabilities promised in the requirements, alterations were made to the Half-Life engine.

In originally creating the design for the 3D file management system, it was not clearly understood what was and was not possible with the available development software. That is, a map was generated by the system after recursively searching the directories within it. That map was compiled and passed off to the Half-Life engine, where it was rendered so that the user could traverse it and perform the specified operations.

However, the details of each of these functions altered greatly as three concepts became clear:

1. The ease with which the .NET Framework was able to traverse the file system to provide the basis for the maps.
2. The complexity of generating the map files. Even though before they are compiled the files are plain text, the difficulty in creating these maps, in terms of their size and the order in which each of the brushes or entities must be added became increasingly apparent.
3. The sheer size of the Half-Life engine became overwhelming. The complexity of the source code, in terms of how the various modules of the engine communicate, made understanding it and adapting it rather difficult.

In order to adapt to the changing climate of the project, it was necessary to alter - and in some cases overhaul - the design that was originally created. However, in doing so, the opportunity for constant inspections and revisions were created.

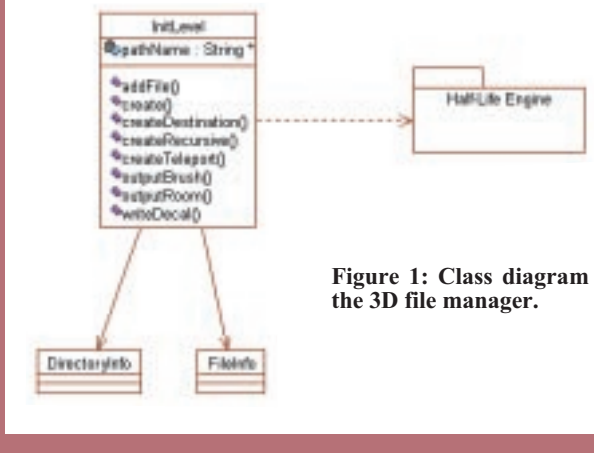

Figure 1: Class diagram for the 3D file manager.

4.1 Communication with the Half-Life Engine

The Half-Life engine is separated into two main components: the "client" and the "server". The "client" basically refers to anything that occurs on-screen (player movement, targeting, animations, etc.…) and the "server" side performs the background functions (entity AI, trajectory calculations, etc.…).

The server is able to send messages to the client by using the following set of macros:

BEGIN_MESSAGE(), WRITE_BYTE(), WRITE_STRING(), WRITE_SHORT(), WRITE_LONG(), WRITE_CHAR()

The server can also receive messages from the client by using the macro:

CMD_ARGV()

The client sends message to the server by using the function:

ClientCmd()

The client reads from the server by using the following macros:

HOOK_MESSAGE(), BEGIN_READ(), READ_BYTE(), READ_STRING(), READ_SHORT(), READ_LONG(), READ_CHAR()

Although each of these functions exist, in server to client communication the data types used for the "write" and "read" operations must be synchronized or the communication does not work.

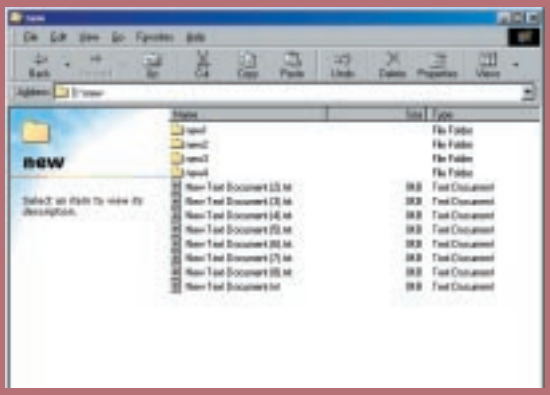

Figure 2: Directory listing of "new" directory.

Figure 3: "cut" is selected from the right-click menu.

5.0 Example of Use

The following sequence of steps describes an example of the "cut" operation. Figure 2 shows a directory listing of the "new" directory, containing the subdirectories "new1", "new2", "new3", "new4", and eight "new text documents". Figure 3 displays one of those text documents being selected, using the 3D user interface. Note the two portals in the background for subdirectories "new3" and "new4". Figure 4 depicts the selected text file being removed from the directory. Finally, Figure 5 shows an updated listing of the "new" directory after the "cut" operation, confirming that there are only seven text documents in the updated directory after "New Text Document (2) has been deleted.

6.0 Conclusions

This paper shows the results of an attempt to create an application that contains an efficient 3D application. The process of creating the 3D file management system started with the identification of a gap within the computing industry; that is, a lack of 3D user interfaces incorporated into an operating system, even though the hardware to enable this exists. Computer games provide compelling evidence that desktop computers are capable of supporting interactive three-dimensional visualization, yet 3D interfaces remain largely tied to niche markets such as CAD/CAM

Having identified this problem, it was necessary to come up with some important requirements for a system that would utilize a 3D GUI but would be based on a piece of software that was currently in use. After much thought it was decided that a file management system would be the best system to implement, as it contains features most users are

Figure 4: The selected file is removed.

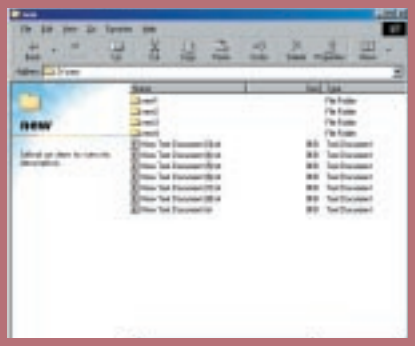

Figure 5: The file is removed from the directory.

aware of and it allows for a friendly 3D GUI to be developed for it.

The design and implementation of the system originally started out as two separate activities plus the expansion of a 3D graphics engine. As the project progressed, these three tasks became intermingled and a very iterative process was followed.

Testing revealed the limitations of the software as it relates to the 3D engine used. Unfortunately the 3D engine chosen placed limitations on the maximum number of directories that could be rendered in the 3D user interface. However, this limitation leaves open the opportunity to develop a better engine to use as the backbone of the system.

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About the authors

David Carter received a bachelor degree in Software Engineering from the University of Western Ontario in 2003, and is currently pursuing his B.Sc. in Applied Mathematics. He was awarded the Western Scholarship of Distinction in 1999 and has been in the Dean's Honour List for the last two years. His 4th year capstone project was among the finalists in the Engineering Design Contest. His research interests include: human-computer interaction, three-dimensional graphical interfaces and computer algebra. Mr. Carter is an IEEE student member, and can be reached at dcarter2@uwo.ca.

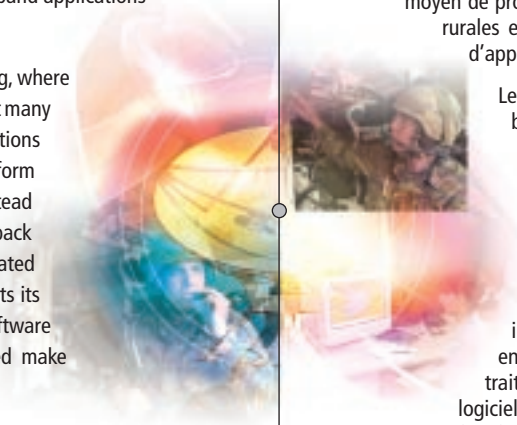
Luiz Fernando Capretz received his Ph.D. from the University of Newcastle upon Tyne (UK), M.Sc. from INPE (Brazil), and B.Sc. from UNICAMP (Brazil); all degrees in computer science. He has worked at both technical and managerial levels, taught and done research on the engineering of software in Brazil, Argentina, England and Japan since 1981; and co-authored a book in the area entitled: Object-Oriented Software: Design and Maintenance. In the Faculty of Engineering at the University of Western Ontario, Dr. Capretz teaches software design in a new program that offers degree in software engineering. His main research areas include: software product lines, software process, and human factors in software engineering. He is a senior member of IEEE, and can be reached at lcapretz@eng.uwo.ca.

Software Defined Radio to improve communications

Imagine a radio technology that could configure any wireless device to work with any communications system. Imagine the cost savings to consumers in purchasing one device that would meet many of their communications needs. And imagine that technology's potential to improve effective communications among military, police and rescue-relief teams working with different radio systems in critical situations.

Communications Research Centre Canada (CRC), an agency of Industry Canada, is developing such a technology. It's called Software Defined Radio (SDR) and it allows a single device to adapt to different communications environments and systems by selecting the most appropriate protocol and frequency needed for a link. For example, one device could work with a wireless local area network protocol in the city, and then be reconfigured to work with terrestrial and satellite protocols to deliver broadband applications to rural and remote areas.

SDR works much like desktop computing, where a single hardware platform can carry out many functions based on the software applications loaded. SDR uses software to perform radio-signal processing functions instead of using resistors, capacitors, feedback loops, or application-specific integrated circuits. CRC's work in SDR complements its expertise in signal processing and software development — work that has helped make CRC a leader in SDR technology.



CRC has developed world-renowned expertise in the Software Communications Architecture (SCA), which is at the heart of SDR. The SCA is a set of specifications that define a radio's operating system by describing the interaction between software and hardware components and by providing software commands. CRC translated the SCA's paper specifications into a software reference implementation, in collaboration with Defence Research and Development Canada. CRC was the first to demonstrate a commercial waveform based on SDR technology. At the 2002 Software Defined Radio Forum in San Diego, CRC showed how they could convert and upload the software code of a CRC Digital Radio Broadcasting receiver to a computer, making it SCA-compatible.

CRC continues to advance SDR technology by updating the SCA implementation and developing software tools that would simplify SDR protocol development and operation.

To find out more about CRC's work in SDR, or to join the more than 6,000 users who have downloaded the SCA software for free, visit **www.crc.ca/rmsc**.

L'amélioration de la communication par la radio réalisée par logiciel

Imaginez une technologie radio qui permettrait de configurer les appareils sans fil pour assurer leur fonctionnement dans tout système de communication. Imaginez les économies réalisées par les consommateurs à l'achat d'un seul appareil qui puisse satisfaire bon nombre de leurs besoins en communication. Imaginez également le potentiel de cette technologie afin d'améliorer les communications actuelles au sein de l'armée, de la police et des équipes de sauvetage et de secours qui se servent de différents systèmes de radio en situation critique.

Le Centre de recherches sur les communications Canada (CRC), un organisme d'Industrie Canada, met au point cette technologie qui a pour nom « radio réalisée par logiciel » (RRL). Celle-ci permet d'adapter un seul appareil à divers milieux et systèmes de communications, afin d'établir une communication au moyen de la fréquence et du protocole les mieux adaptés. Par exemple, l'appareil pourrait fonctionner en ville au moyen d'un protocole à réseau local sans fil, puis être configuré de nouveau pour fonctionner au moyen de protocoles terrestres et satellitaires en régions rurales et éloignées, pour assurer la mise en place d'applications à large bande.

Le fonctionnement de la RRL s'apparente beaucoup à celui d'un ordinateur de bureau, où une seule plate-forme matérielle permet l'exécution de nombreuses fonctions selon les applications logicielles chargées. La RRL fait appel à un logiciel de traitement de signal radio plutôt qu'à des résistances, des condensateurs, des boucles d'asservissement ou des circuits intégrés propres à une application. Le travail en RRL s'ajoute à l'expertise du CRC dans le traitement des signaux et la mise au point de logiciels – travail qui a contribué à faire du CRC un chef de file en matière de technologie de RRL.

Le CRC a acquis une expertise de renommée mondiale en architecture logicielle de communications (SCA), laquelle est au cœur de la RRL. La SCA est un ensemble de spécifications qui définit le système d'exploitation de la radio, par la description des interactions entre les différents composants matériels et logiciels d'une radio et par la prestation des commandes logicielles. À partir des spécifications sur papier de la SCA, le CRC a mis au point une version de référence logicielle en collaboration avec Recherche et développement pour la défense Canada. Le CRC a été le premier à présenter une forme d'ondes commerciales fondée sur la technologie de la RRL. Au Software Defined Radio Forum (Forum de la radio réalisée par logiciel) à San Diego en 2002, le CRC a montré comment convertir et télécharger à un ordinateur le code source d'un poste de radio numérique du CRC pour le rendre compatible avec la SCA.

Le CRC continue d'améliorer la technologie de la RRL par la mise à jour de la version de la SCA et la mise au point d'outils logiciels qui facilitent l'élaboration des protocoles et l'exploitation de la RRL.

Pour en savoir davantage sur le travail en RRL du CRC, ou pour faire comme plus de 6 000 utilisateurs qui ont téléchargé gratuitement le logiciel de la SCA, visitez le **www.crc.ca/rcms**.

Canada

Integrated Stand-alone Renewable Energy System Based On Energy Storage In The Form Of Hydrogen

by *Kodjo Agbossou, Mohan Kolhe, Jean Hamelin, Tapan K. Bose*
Institut de recherche sur l'hydrogène,
Université du Québec à Trois-Rivières, QC

Abstract

Electrolytic hydrogen offers a promising alternative for long-term energy storage of renewable energies (RE). A stand-alone RE system based on hydrogen production has been developed at the Hydrogen Research Institute and successfully tested for automatic operation with designed control devices. The system is composed of a wind turbine, a photovoltaic array, an electrolyser, batteries for buffer energy storage, hydrogen and oxygen storage tanks, a fuel cell, AC and DC loads, power conditioning devices and different sensors. The long-term excess energy with respect to load demand has been sent to the electrolyser for hydrogen production and then the fuel cell has utilised this stored hydrogen to produce electricity when there were insufficient wind and solar energies with respect to load requirements. The RE system components have substantially different voltage-current characteristics and they are integrated on the DC bus through power conditioning devices for autonomous operation by using the developed control system. The experimental results clearly indicate that a stand-alone RE system based on hydrogen production is quite safe and reliable.

Sommaire

L'hydrogène électrolytique offre une alternative prometteuse pour le stockage à long terme des énergies renouvelables (ER). Un système à ER autonome basé sur la production d'hydrogène a été développé et testé avec succès, à l'Institut de Recherche sur l'Hydrogène. Le système est composé d'une éolienne, de panneaux solaires, de batteries comme mode de stockage énergétique tampon, de charges CC et CA, d'un électrolyseur, de réservoirs d'hydrogène et d'oxygène pour le stockage, d'une pile à combustible, d'un module de contrôle, d'appareils d'interface de puissance et de plusieurs capteurs. L'excès d'énergie à long terme, par rapport aux besoins de la charge, est dirigé vers l'électrolyseur pour la convertir sous forme d'hydrogène stocké sous pression. Cet hydrogène est ensuite utilisé pour alimenter la pile à combustible afin de produire de l'électricité lorsque les énergies éoliennes et solaires sont insuffisantes pour satisfaire les besoins de la charge. Les composantes du système à ER ont des caractéristiques tension-courant substantiellement différentes et elles sont intégrées au bus CC via des interfaces de puissance, pour une opération autonome en utilisant le système de contrôle développé. Les résultats expérimentaux indiquent clairement qu'un système à ER autonome basé sur la production d'hydrogène est sécuritaire et fiable.

1.0 Introduction

Energy storage can play an important role in the development and operation of an environment friendly renewable energy (RE) system. The integrated wind and solar energy system, based on long-term seasonal storage as electrolytic hydrogen (H_2), is considered a promising alternative to overcome the intermittence of the RE sources [1-2]. In comparison to commonly used battery storage, H_2 is well suited for seasonal storage applications, because of its inherent high mass energy density. A typical self-sufficient RE system must include both short-term and long-term energy storage. A battery bank is used for short-term energy storage due to its high charging-discharging efficiency, and also to take care of the effects caused by instantaneous load ripples / spikes, electrolyser transients, wind energy peaks. However, batteries alone are not appropriate for long-term storage because of their low energy density, self-discharge and leakage. The combination of a battery bank with long-term energy storage in the form of H_2 can significantly improve the performance of stand-alone RE systems. In such a RE system, electricity production in excess of demand is converted to H_2, using an electrolyser; electricity requirement in excess of production is met by converting H_2 to electricity through a fuel cell. The intent is to demonstrate that H_2 is a practical energy storage medium for RE and that it is safe and reliable.

The overall RE system performance is very sensitive to local weather conditions, and to achieve an adequate performance from such a system requires appropriate components and well-designed control system [3-5]. The control system for proper energy management in a stand-alone RE plant was a real challenge. We have designed and developed a control system with power conditioning devices to integrate the different components of the RE system and to manage the energy flow in the system to assure continuous supply of the load demand. The system parameters are monitored continuously for real time operation and control. The system operation has been tested for autonomous operation and technical feasibility of the stand-alone RE system based on hydrogen production. Our integrated RE system has been in operation for the last 2 years.

2.0 System Description

The stand-alone RE system based on hydrogen production has been tested successfully at the Hydrogen Research Institute (HRI). The system consists of a 10 kW wind turbine generator (WTG) and a 1 kW (peak) solar photo voltaic (PV) array as primary energy sources. The excess energy with respect to load demand has been stored as electrolytic hydrogen through a 5 kW electrolyser and utilized to produce electricity as per energy demand through a 5 kW fuel cell system. The RE system components have substantially different voltage-current characteristics and are integrated through the developed power conditioning devices on a 48V DC bus, which allows power to be managed between input power, energy storage and load. The DC-DC buck and boost converters are connected for power conditioning between the electrolyser and the DC bus, and between the fuel cell and the DC bus, respectively. The schematic of the RE system is shown in Figure 1 and the system components' specifications are given in Table 1.

Current from the DC bus bar keeps batteries (short-term energy storage) charged, feeds power to the load bank via an inverter and also supplies power to electrolyser via power-conditioning device. To simulate any type of electrical load profile, we have used DC and AC programmable loads. Our developed RE system has also a programmable power source at DC bus and can be used to test the system, when there is no power available from wind and solar energy system. The programmable power source can simulate any type of intermittent power output. The electrolyser and the fuel cell are major components of the RE system. We have also studied the polarization characteristics of them, which depend mainly on voltage, current and temperature. The different sensors are used to record real time voltages and currents of WTG, PV array, DC bus / battery, electrolyser, fuel cell, load, H_2 detectors, electrolytic H_2 flow rate from the electrolyser, H_2 consumption rate in the fuel cell, oxidant consumption rate in the fuel cell, H2 and oxidant pressure in the fuel cell, fuel cell stack temperature, electrolyzer cell temperature, DC-DC converter (boost and buck) duty ratio. There are also some sensors in the electrolyzer and the fuel cell system that provide the secondary information.

3.0 RE System Operation and Control

A control system is required for efficient energy management and autonomous operation of the RE plant. The control system is a challenge because the sensor data is required for continuous real time operation and the same control algorithm is needed to send signals to

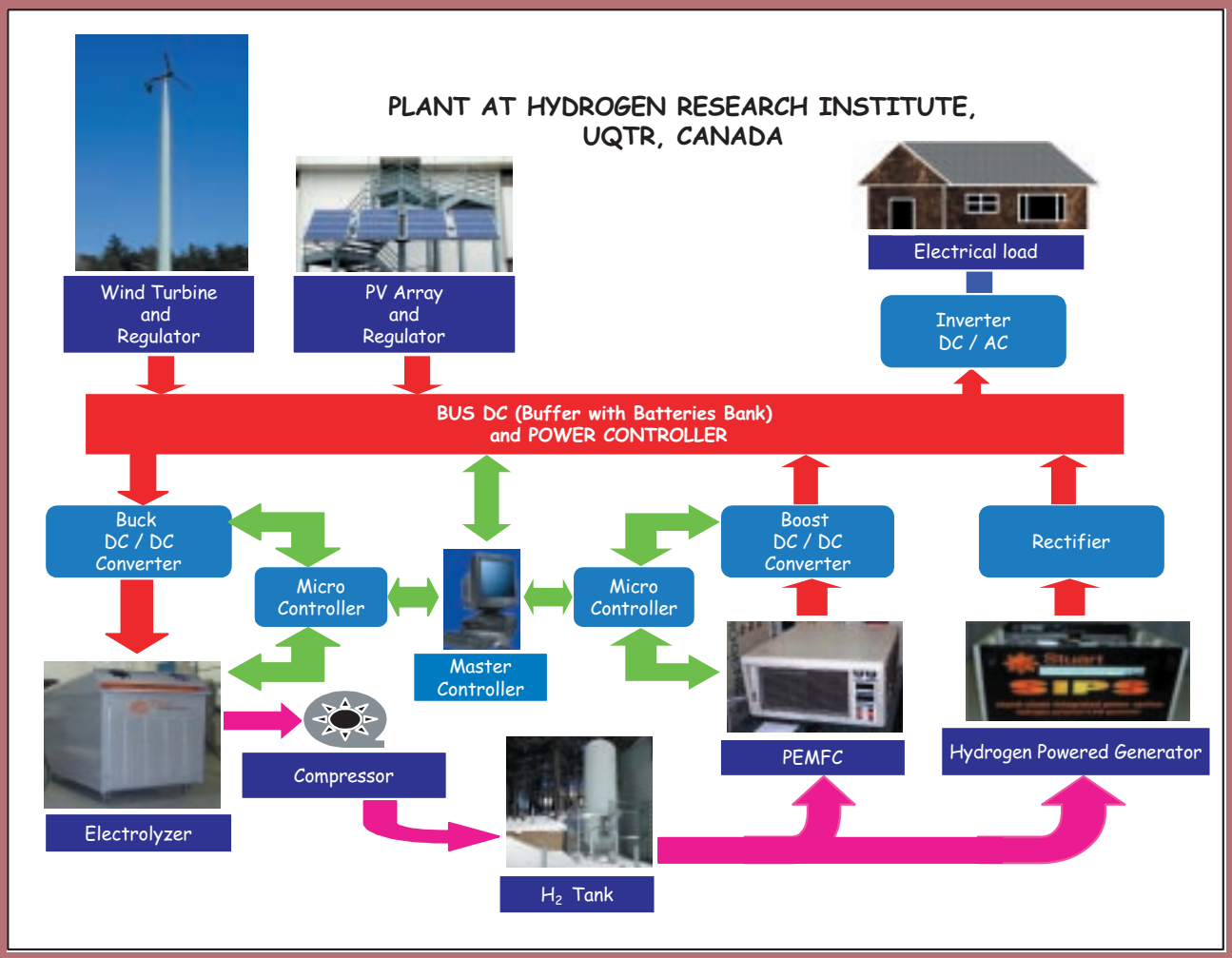


Figure 1: Stand-alone Renewable System of Hydrogen Research Institute

Table 1: Specifications of the RE system components

Component	Specifications
Wind Turbine Generator	10 kW, 3f Permanent Magnet Alternator, VCS-10 - 48 V DC, Bergey - BWC Excel
Photovoltaic Array	1 kW (peak) PV array, Golden Genesis GP 64 PV Modules (4S*4P) with Charge Controller
Electrolyser	5 kW, Alkaline Electrolyser with Compressor, Stuart Energy System
Buck Converter	5 kW, Multiphase PWM, 36-48 Volt, HRI System
Fuel Cell System	5 kW, Proton Exchange Membrane Fuel Cell Stack (MK5-E), 19-35 Volt, Ballard Power System
Boost Converter	5 kW, Multiphase PWM, 24-48 Volt, HRI System
Controller	Energy Management Control System, HRI System
DC Load	12 kW (programmable), Water Cooled, Dynaload
AC Load	3 kW (programmable), California Instruments
Inverter	5 kW, Trace Engineering
Battery	42.240 kWh
Power Source	10 kW (programmable), Elgar
H2 Storage	10 bar, 3.8 m3 represents 125 kWh of stored energy [2]

the power conditioning devices on a real time basis for effective operation of the electrolyser and the fuel cell. The developed control system has the capability to perform the autonomous operation even with intermittent RE sources. The control system has been designed to maximize the direct energy flow from the RE sources to the electrolyser and the load in order to avoid losses in the batteries [6]. The energy level at the DC bus plays an important role for the operation and control of the RE plant. It allows effective energy management among the primary power sources, the electrolyzer input, the fuel cell output and the load. The control system consists of a master controller and two secondary micro controllers (Figure1). The real time data of the RE system has been recorded and used for decision-making in the control algorithm. With respect to energy level at DC bus and pre-defined limits of energy levels in the control algorithm, the master controller sends the conditioned signal (duty ratio) to the secondary controllers for on / off operation of the electrolyser and the fuel cell. The secondary micro controllers manage the power flow with respect to the energy availability at DC bus through the digitally controlled DC-DC converters. The DC-DC converters use multiphase technique to generate pulse width modulation signals to control the power flow. The limits of energy levels in the control algorithm have been managed through double hysteresis strategy. The DC-DC (i.e. buck and boost) converters are important components in the system for effective operation and power flow control of the electrolyser and the fuel cell. The control algorithm has been developed in such a way that the fuel cell and the electrolyser do not operate simultaneously. The limits of energy level in the control algorithm and the load profile have been varied from time to time to check the reliability and the technical feasibility of the control system for autonomous operation. The major parts of the power in the system are intermittent in nature, even though the integrated RE system has operated automatically and effectively by using the developed control algorithm and

power conditioning devices.

The excess energy storage in the form of H2 is done through the H2 production system, which consists of a 5 kW electrolyser with a control unit, a compressor, purification and drying process. The electrolyser input energy has been controlled, with respect to energy available at DC bus, through the duty ratio of DC-DC converter. The H2 produced by the electrolyser is temporarily stored in a water-sealed tank of the electrolyser system, and when this tank is full, the electrolyser compressor starts automatically and sends the H2 at high pressure, through the purification and drying process, to the main storage tank of 3.8 m3 water capacity. The time cycle period, corresponding to the filling and compression of the H2 in the water-sealed tank, depends on the electrolyser input power. The stored electrolytic H2 has been utilized to produce electrical energy as per load requirement through a 5 kW fuel cell. The fuel cell power output has also been managed as per energy requirement via the DC-DC converter. The electrolyser and fuel cell on / off operations have been controlled automatically as per pre-defined limits of energy levels in the control algorithm.

4.0 RE System Performance

The performance of RE system is given for a typical day as well as for long-term operation. The energy available from the WTG and the PV array for a typical day (i.e. Dec. 10th, 2001) is given in Figure 2. On that day of operation, the limits of energy levels in the control algorithm were set to start the electrolyser at 99% of energy level at DC bus or above and to stop the electrolyser at 84%. The fuel cell on and off operation was set to 83% and 85%, respectively. During this operation, the RE source power, the load profile, the electrolyser input power, the hydrogen flow rate, the fuel cell output power, the hydrogen consumption rate are shown in Figure 3. The ripples / peaks in the electrolyser power are due to the cyclic operation of the compressor. The H2 flow rate is measured, when it is sent to main storage tank. The power flow of batteries (i.e. charging / discharging) is also carefully monitored. It has been observed that the power supplied to the electrolyser is mainly from the short-term energy storage (i.e. batteries) due to the non-availability of sufficient energy from the RE sources during the operation. The electrolyser and the fuel cell operation were started and stopped automatically as per pre-defined energy levels in the control algorithm. In the control algorithm, the proper selection of energy levels should be done for the most effective operation of the electrolyser and the fuel cell. However, the choice is a complicated problem, and may be studied only by trial and error, as we have done. The energy levels are chosen in such a way so as to keep the batteries at a near full charge and only allow them to be discharged for a short-term and then recharged. This allows the batteries to act as a buffer for the RE system, when components such as electrolyser or load bank are suddenly turned on. The performances of electrolyser and fuel cell were judged by different efficiencies. It has been found that the electrolyser utilization factor (i.e. current efficiency) was about 85%, and the energy efficiency with the compressor running was about 60% and without the compressor running it was 65%. The fuel cell utilization factor was about 90% and the energy efficiency was more than 45%.

The RE system performance was recorded for long-term operation from Dec. 3rd, 2001 to April 17th, 2002 for daily operation of 6 hours, during working hours. Frequently, no energy was available from the RE sources at our location because of climatic conditions. Therefore, a 10 kW programmable power source was used to simulate the typical RE patterns for those days when no RE power was available. During that period, the power available from primary energy sources is shown in Figure 4. The electrolyser input power, the fuel cell output power, the batteries charging / discharging power at the DC bus, and the load profile are shown in Figure 5 (a) and 5(b). The corresponding hydrogen flow rate is linear to the electrolyser input energy. The electrolyser and the fuel cell operation and power flow have been automatically managed through the digitally controlled DC-DC converters. The master controller has made this entire autonomous operation, with the required decisions and controls by obtaining the information through the sensors. The load profile, the programmed output energy pattern of the DC power source and the energy levels in the control algorithm have been changed from time to time to check the reliability of the system and the validity of the developed control algorithm. The performance analysis shows that an autonomous RE system based on electrolytic hydrogen is safe and reliable.

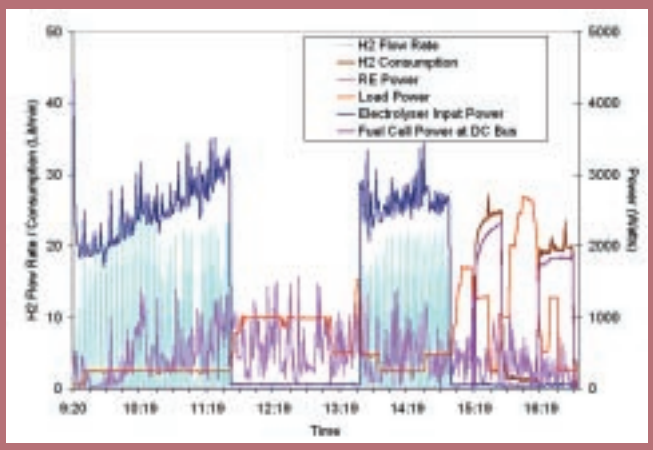


Figure 3: Power, and H_2 flow rate and consumption rate in RE system on 10th Dec 2001.

5.0 Conclusions

The successful long-term autonomous operation and performance show that a stand-alone RE system based on H2 production can be used through a developed control system and power conditioning devices. The components of the RE system, which have substantially different voltage-current characteristics, are integrated through power conditioning devices on the DC bus for effective operation and the system has been tested successfully for autonomous operation. The sensors collect the real time data and utilize this information in the control algorithm for effective energy management in the system. The buffer energy storage, i.e. batteries, were efficient to manage the load transients,

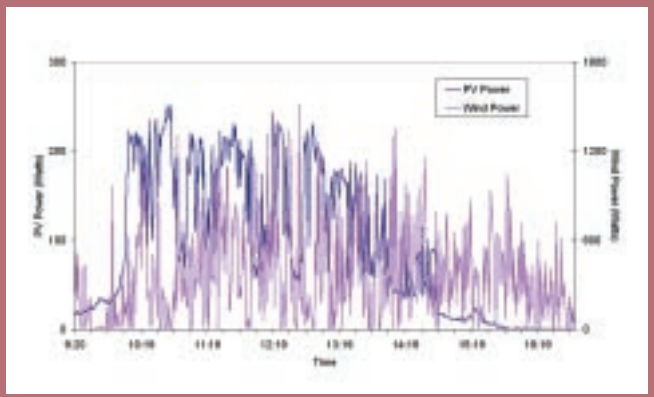


Figure 2: Power available from WTG and PV array on Dec 10th, 2001.

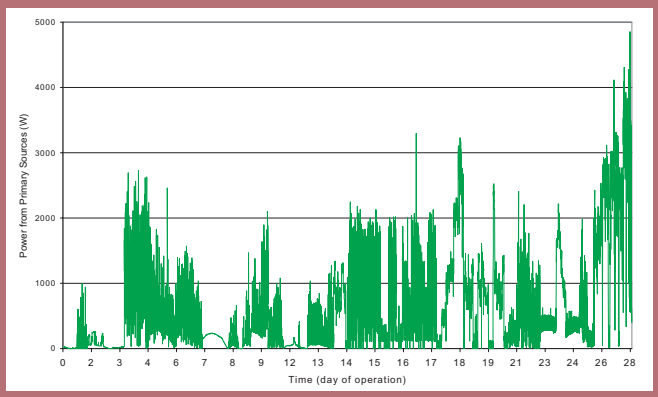
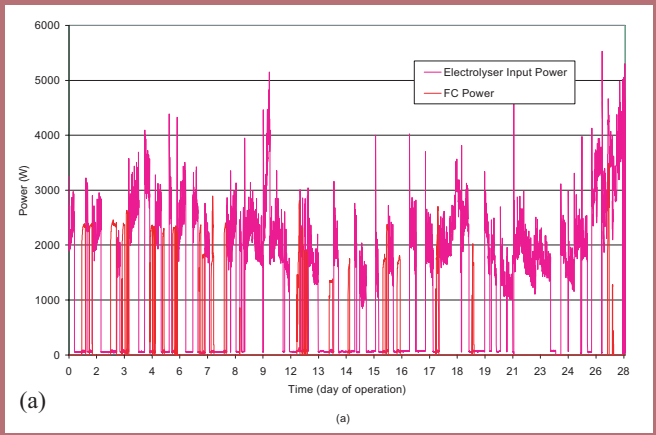
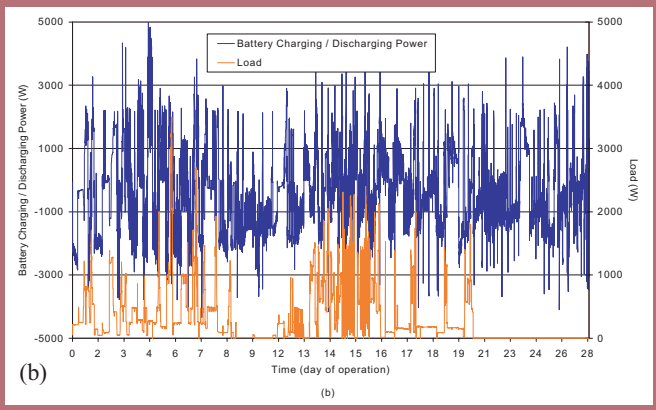


Figure 4: Power available from primary energy sources.





Figures 5a and b: Electrolyser input, fuel cell output, battery charging /discharging and load power

electrolyser ripples and the intermittent power peaks from the RE sources. The developed control system and power conditioning devices have been tested for different load profiles and for various intermittent input power patterns, which were also generated through the programmable DC power source.

We have also used a programmable power source as input to our RE system, which can simulate any type of intermittent power output by using the wind or solar energy profile of any region. The different load profiles are generated through the programmable load to test the system operation and performance. The developed stand-alone RE system of the HRI can be utilized to test the operation and performance of stand-alone RE system based on electrolytic hydrogen.

6.0 Acknowledgement:

This work has been supported in part by the Ministère des ressources Naturelles du Québec, Natural Resources Canada, Natural Sciences and Engineering Research Council of Canada, Canada Foundation of Innovation, the AUTO21 Centre of Excellence. The HRI gratefully acknowledges the Ballard Power System for the fuel cell system and the Stuart Energy Inc. for the electrolyser.

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About the authors

Kodjo Agbossou (M'1998, SM'2001) received his B.S. (1987), M.S. (1989) and Ph.D. (1992) in Electronic Measurements from the Université de Nancy I, France and post-doctoral research at the Electrical Engineering Department of the Université du Québec à Trois-Rivières (UQTR), Canada. He was Project Manager and Research Professional (1994-1998) at UQTR. Since 1998, he is Professor in the Electrical and Computer Engineering Department of UQTR and Director of Graduate Studies. Presently, he is doing research in the area of renewable energy, integration of electrical energy system, control and measurements. He is the author of more than 25 publications and has 3 patents.

Mohan Kolhe was born in India in 1969. He received his doctorate and master degrees in energy system engineering from the Indian Institute of Technology Delhi, India and bachelors in electrical engineering from M.A. National Institute of Technology (MANIT), formerly Regional Engineering College, Bhopal, India. He is a faculty member in Electrical Engineering at MANIT Bhopal, India from 1994, and from 2001, doing post-doctoral research on renewable energy system based on energy storage as hydrogen at the Hydrogen Research Institute, UQTR, Québec, Canada.

Jean Hamelin was born in Canada in 1963. He received his Ph.D. in Energy and Materials Sciences from the Institut National de la Recherche Scientifique in 1996, his M.S. (1991) and B.S. (1987) in physics from the UQTR. He did his post-doctoral research at the National Institute of Standards and Technology (Gaithersburg, MD) from 1996 to 1998. After that, he worked as a development scientist at Hydrogenics Corp. (Mississauga, ON) for a short period. Since 1999, he is professor at the Physics Department of the UQTR and pursues his research at the Hydrogen Research Institute.

Tapan K. Bose did his Ph.D. in physics from the University of Louvain, Belgium and his post-doctoral studies at the University of Brown, United States. Presently, he is professor of physics and director of the Hydrogen Research Institute at the University of Quebec in Canada. He is the President of the Canadian Hydrogen Association, and a member of the Hydrogen Technical Advisory Group of Natural Resources Canada and the Board of Directors of the National Hydrogen Association, United States. Prof. Bose is author and co-author of more than 140 publications, 4 books and 14 patents.

A Genetic Algorithm for Assigning Cells to Switches in Personal Communication Networks

by *Constantin Hedible and Samuel Pierre,*
Mobile Computing and Networking Research Laboratory (LARIM)
Ecole Polytechnique of Montreal, Montreal, QC

Abstract

This paper proposes a genetic algorithm to solve the problem of assigning cells to switches in the planning phase of mobile cellular networks. Well-known in the literature as an NP-hard combinatorial optimization problem, this problem requires recourse to heuristic methods in order to obtain good (not necessarily optimal) solutions within a practical amount of time. Computational results obtained from extensive tests confirm the effectiveness of this algorithm in providing good solutions to practical sized problems.

Sommaire

Cet article propose un algorithme génétique pour résoudre le problème d'affectation de cellules aux commutateurs dans la phase de planification des réseaux cellulaires mobiles. Bien connu dans la littérature comme un problème difficile d'optimisation combinatoire, ce problème requiert le recours à des méthodes heuristiques pour obtenir de bonnes solutions, non nécessairement optimales, dans des temps de calcul raisonnables. Les résultats numériques confirment l'efficacité de cet algorithme pour produire de bonnes solutions à des instances du problème de taille pratique.

1.0 Introduction

Personal Communication Network (PCN) is a wireless communication network which integrates various services such as voice, video, electronic mail, accessible from a single mobile terminal. These various services are offered in an area called *coverage zone* which is divided into *cells*. In each cell is installed a *base station* which manages all the communications within the cell. In the cover zone, cells are connected to special units called *switches* which are located in mobile switching centers (MSC). When a user in communication goes from a cell to another, the base station of the new cell has the responsibility to relay this communication by allotting a new radio channel to the user. Supporting the transfer of the communication from a base station to another is called *handoff*. This mechanism, which primarily involves the switches, occurs when the level of signal received by the user reaches a certain threshold. We distinguish two types of handoffs. In the case of Figure 1 for example, when a user moves from cell B to cell A, it refers to *soft handoff* because these two cells are connected to the same switch. The MSC which supervises the two cells remains the same and the induced cost is low. On the other hand, when the user moves from cell B to cell C, there is a *complex handoff.* The induced cost is high because both switches 1 and 2 remain active during the procedure of handoff and the database containing information on subscribers must be updated.

The total operating cost of a cellular network includes two components: the cost of the links between the cells (base station) and the switches to which they are joined, and the cost generated by the handoffs between cells. It appears therefore intuitively more discriminating to join cells B and C to the same switch if the frequency of the handoffs between them is high. The problem of assigning cells to switches essentially consists of finding the configuration that minimizes the total operating cost of the network. The resolution of this problem by an exhaustive search method would entail a combinatorial explosion, and therefore an exponential growth of execution times. This problem belongs to the class of NP-complete problems, well-known especially in operational research. It relates to the problems of warehouse location [1] and graph partitioning [5]. This paper formulates the problem, proposes an algorithm for its solution, then summarizes and analyzes the computational results.

2.0 Formulation Of The Problem

The problem of assigning cells to switches in a cellular mobile network, as described by Merchant and Sengupta [6], can be formulated as follows: Given n cells and m switches, a matrix of the wiring costs between cells and switches, a matrix of handoff costs between cells, minimize the total cost of the network, by choosing the assigning configuration, under constraints of switches' capacity.

Locations of cells and switches are known. c_{ik} denotes the cost of wiring cell i to switch k, λ_i the call rate generated in cell i, and M_k the capacity (in number of calls) of the switch k. The problem of assigning cells to switches may be regarded as an integer programming one. Let's define the variable:

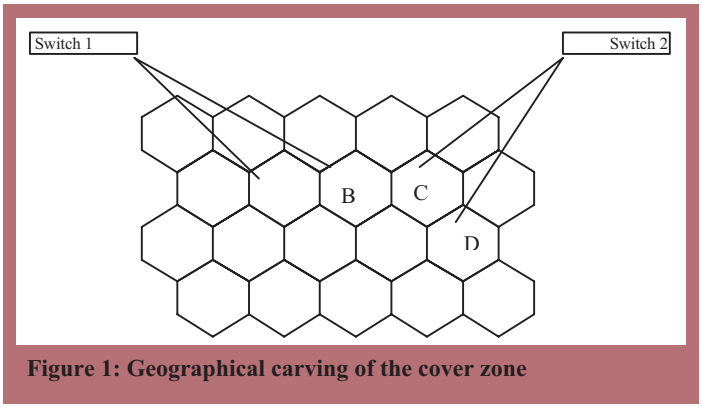

Figure 1: Geographical carving of the cover zone

$$x_{ik} = \begin{cases} 1 \text{ if cell i is assigned to switch k,} \\ 0, \text{ otherwise.} \end{cases}$$

Considering that a given cell can be assigned to only one switch, we have the following constraint:

$$\sum_{k=1}^{m} x_{ik} = 1, i = 1, \ldots, n, i = 1, \ldots, n \qquad (1)$$

The constraint of capacity on the switches are expressed as follows:

$$\sum_{k=1}^{m} \lambda_i x_{ik} \le M_k, k = 1, \ldots, m, k = 1, \ldots, m \qquad (2)$$

On the other hand, the wiring cost is:

$$\sum_{i=1}^{n}\sum_{k=1}^{m} c_{ik} x_{ik} \qquad (3)$$

Let's assume that H_{ij} and H'_{ij} are respectively the handoff cost if cells i and j are assigned to the same switch, and the handoff cost if they are assigned to different switches. These costs are more difficult to handle. We define therefore the additional variables:

$$z_{ijk} = x_{ik}.x_{jk}, i, j = 1, \ldots, n, \text{ and } k = 1, \ldots, m \qquad (4)$$

$$\text{and } y_{ij} = \sum_{k=1}^{m} z_{ijk} \quad i, j = 1, \ldots, n \tag{5}$$

From these definitions, the handoff cost by time unit is given by:

$$\sum_{i=1}^{n}\sum_{j=1}^{n} H_{ij} y_{ij} + \sum_{i=1}^{n}\sum_{j=1}^{n} H_{ij}(1 - y_{ij}) \tag{6}$$

The total cost to be minimized is the sum of the costs of links between cells and switches and those of handoffs between cells. It can be written as follows:

$$F = \sum_{i=1}^{n}\sum_{k=1}^{m} c_{ik} x_{ik} + \sum_{i=1}^{n}\sum_{j=1}^{n} H_{ij} y_{ij} + \sum_{i=1}^{n}\sum_{j=1}^{n} H_{ij}(1 - y_{ij}) \tag{7}$$

3.0 The Proposed Genetic Algorithm

Genetic algorithms (GA) are robust search techniques based on natural selection and genetic production mechanisms. GAs perform a search by evolving a population of candidate solutions through non-deterministic operators and by incrementally improving the individual solutions forming the population using mechanisms inspired from natural genetics and heredity (e.g., selection, crossover and mutation). In many cases, especially with problems characterized by many local optima (graph coloring, travelling salesman, network design problems, etc.), traditional optimization techniques fail to find high quality solutions. GAs can be considered as an efficient and interesting option.

GAs [3] are composed of three phases: a phase of creation of an initial population, a phase of alteration of this population by applying various genetic operators on its elements, and finally a phase of evaluation of this population during a certain number of generations. Each generation is supposed to provide new elements that are better than those of the preceding generation. Intuitively, the larger the number of generations, the more refined the solution. It is hoped that the last generation will provide a good solution, but this solution is not necessarily the optimum.

In our adaptation, we opted for a non-binary representation of the chromosomes [4]. As shown in Figure 2, the genes (squares) represent the cells, and the integers they contain represent the switch to which the cell i (gene of the i^{th} position) is assigned. Our chromosomes have therefore a length equal to the number of cells in the network, and the maximal value that a gene can take is equal to the number of switches.

3.1 Initial population formation

The first element of the initial population is the one obtained when all cells are assigned to the nearest switch. This first chromosome is created therefore in a deterministic way. The creation of other chromosomes of the population is probabilistic and follows the strategy of population without doubles. This strategy ensures the diversity of the population and a good coverage of the search space. All chromosomes of the population verify the unique assignment constraint, but not necessarily the switch capacity constraint. The maximum size of this initial population cannot exceed m^n in order to avoid duplicates. Various operators and functions are then applied to this population.

3.2 Crossover operator

This operator creates two new "child" chromosomes by crossing the parent chromosomes (taking genes 1 … i of one parent and genes (i+1) … n of the other parent for some randomly chosen i). We randomly choose a pair of chromosomes from the population, then either create two new chromosomes by applying the crossover operator, or apply the *inversion* operator to modify the parent chromosomes by reversing the order of their genes. The decision of which operator to apply is governed by a parameter called the crossover probability. In either case, the parent chromosomes are kept in the new population.

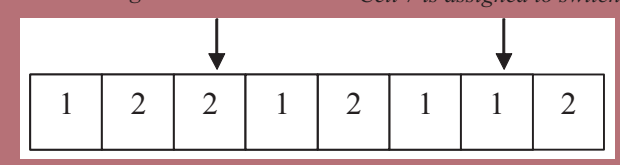

Figure 2: A chromosome representation for a network of 2 switches and 8 cells.

3.3 Mutation operator

This operator randomly modifies (with a certain probability) one or more genes of a chromosome. This is necessary to bring back the genetic material that would have been forgotten during the generations. Note that some of the new chromosomes may violate the switch capacity constraint - such chromosomes will be discarded later. By applying the mutation operator to each element of the population, we create a new population with twice the number of elements (the mutated chromosomes plus the original ones). This new population is evaluated, then sorted.

3.4 Evaluation function

One of the key elements in a GA is the evaluation function which determines how well the chromosomes suit the needs of the problem domain. In the first stage of evaluation, we compute the cost associated with each chromosome and then sort them in ascending order of cost. The second stage of evaluation checks if the chromosomes violate the capacity constraint on the switches. We keep solutions that violate the capacity constraint by 10% or less in a list which will be checked later, since a small modification could make them feasible.

3.5 Selection operator

To select the elements of the new generation, we used the method of the *casino caster*. As the problem that we have to solve is a problem of minimization, we applied the caster to the inverses of the cost values of the chromosomes of the population. We recover then in the new selected population either chromosomes that verify the constraint on the capacity of the switches or those that violate it. The number of generations is fixed at the beginning of the execution. We inserted into our adaptation the concept of *cycle* - each cycle runs several successive genetic processes. At every cycle, a new initial population is created. Figure 3 shows the flow chart of the genetic process.

For i:=1 to Nb_Cycle

Generate a new population

For j:=1 to Nb_Generation

- Apply crossover operator
- Apply mutation operator
- Evaluate the obtained population
- Sort the population
- Verify if the new chromosomes violate the capacity constraint
- Save the best chromosomes
- Apply selection operator

Figure 3: Genetic process flow chart.

4.0 Computational Results

To implement the proposed adaptation, we designed a program (in C++) which has a complexity of mn^2 (m and n being respectively the number of switches and the number of cells). Two files essentially constitute the input data for this program. The program was run on a 450 MHz Pentium III PC running Linux. To verify the performance of our algorithm, we performed some tests on networks of different sizes ranging from 15 cells and 2 switches to 200 cells and 7 switches. Each test was performed 5 times and we report the average costs. We repeated the experiments with various parameter values in order to see which values worked best.

Figure 4 illustrates the effect of the population size on the obtained results. It shows, for 4 input files representing different networks of the

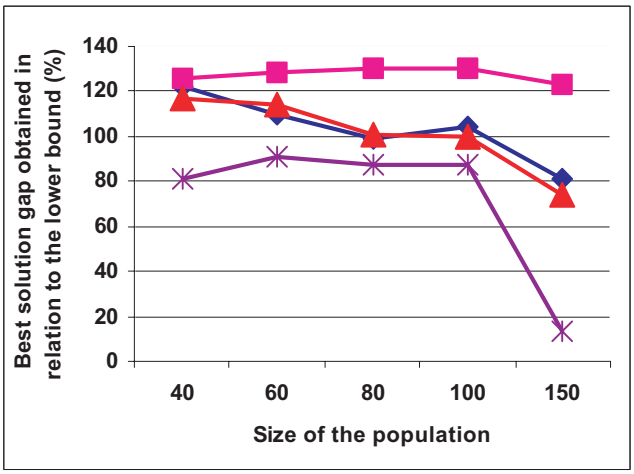

Figure 4: Effect of the population size.

same size (7 switches and 200 cells), the gap between the obtained solutions and the lower bound obtained by assigning each cell to the nearest switch. We executed our algorithm on these networks with population sizes of 40, 60, 80, 100 and 150 elements. The other parameter values were:

- Number of generations: 40
- Number of cycles: 20
- Crossover probability: 0.9
- Mutation probability: 0.08

4.1 Network of 200 cells and 7 switches

The obtained solutions are very near or identical to the optimal ones. Nevertheless, we generally note, for moderate- or large-sized networks, that as the size of the population increases, the gap between the obtained solutions and the lower bound decreases. One could conclude that a larger population gives better results because it introduces a high diversity in the population and permits good coverage of the search space.

We compared the results obtained with our algorithm (GA) with those obtained by application of two other methods that have all been designed to solve the problem of assigning cells to switches in cellular mobile networks. Those methods are the HB heuristic proposed by Beaubrun et al. [2], and the method of simulated annealing (SA). We performed the tests on two series of data. The first set related to a variable number of switches, and the second to a fixed number of switches. These methods have been coded by the authors and we use the same sets of data to achieve the comparison. The results are reported in tables 1 and 2. These results represent the costs of different networks and all the reported solutions are feasible.

The results of this comparative survey are summarized in figures 5 and 6. Our genetic algorithm provides better results than the other methods for small- and moderate-sized networks. As shown in Figure 5, our

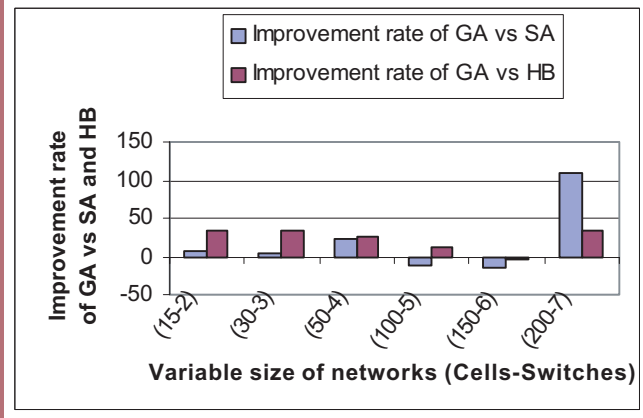

Figure 5: Comparative results obtained for networks of variable size.

algorithm gets results that are about 30% better for networks up to 50 cells and 4 switches (small and moderate-sized networks).

The results provided by GA are always better than those provided by HB, as shown in figures 5 and 6. The improvement rate is in general higher than 20% for the networks having 3 switches and a number of cells lower or equal to 60. And in general, GA provides better results than simulated annealing. Sometimes solutions provided by GA are less good than those generated by SA, especially for networks of 100 and 150 cells.

In summary, considering the overall performance of these different heuristics, the proposed GA generally gives better results than simulated annealing and the heuristic HB proposed by Beaubrun et al. [2].

5.0 Conclusion

In this paper, we have proposed an adaptation of the genetic algorithm to solve the problem of assigning cells to switches in Personal Communication Networks. Computational experiments show that our method compares favorably with 2 other methods (simulated annealing and heuristic HB [2]) when applied to the same problem.

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Table 1: Comparative results for GA, SA and HB (variable numbers of switches)

# of Cells	# of Switches	GA	SA	HB
15	2	114	123	153
30	3	394	405	524
50	4	697	851	873
100	5	2265	1999	2511
150	6	4980	4271	4807
200	7	3721	7801	4963

Table 2: Comparative results for GA, SA and HB (fixed numbers of switches)

# of Cells	# of Switches	GA	SA	HB
15	3	133	139	169
20	3	238	189	292
30	3	395	369	498
40	3	424	611	581
50	3	600	748	816
60	3	917	832	1071

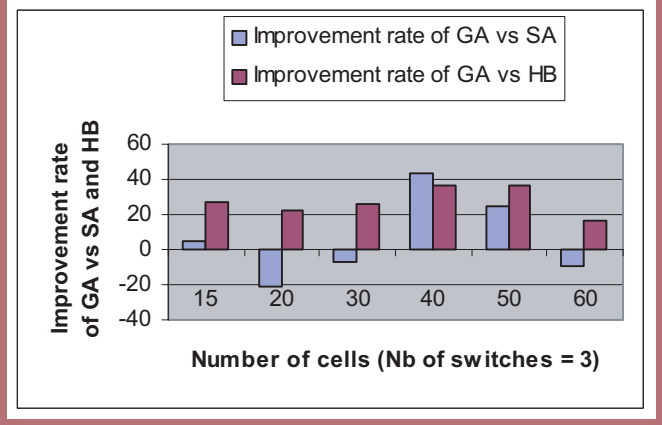

Figure 6: Comparative results obtained for networks of 3 switches and variable number of cells ( ).

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About the authors

Constantin Hedible received a B.Eng degree in electrical engineering in 1997 from Université Nationale du Bénin and an M.Sc.A. in Electrical Engineering from École Polytechnique de Montréal in 2000. From 1999 to 2001, he has been a research assistant in the Mobile Computing and Networking Research Laboratory (LARIM), working in optimization of telecommunications networks. Since 2002, he has been working as network manager in a leading company in telecommunications.

Samuel Pierre is a Professor of Computer Engineering at École Polytechnique de Montréal where he is Director of the Mobile Computing and Networking Research Laboratory (LARIM) and NSERC/Ericsson Industrial Research Chair in Next-generation Mobile Networking Systems. He is the author of four books, co-author of two books and six book chapters, as well as over 200 other technical publications including journal and proceedings papers. His research interests include wireline and wireless networks, mobile computing, performance evaluation, artificial intelligence, and electronic learning. He is a Fellow of the Engineering Institute of Canada, a senior member of IEEE, a member of ACM and IEEE Communications Society. He is an Associate Editor of IEEE Communications Letters and IEEE Canadian Review, and he serves on the editorial board of *Telematics and Informatics* published by Elsevier Science.

President's Comments

First of all, I want to congratulate Guy Olivier and Vijay Sood and all of their organizing committee for an excellent 2003 Canadian Conference. Well-done folks.

I also want to share with you some observations concerning our IEEE Canada membership, which totaled close to 16,000 as of December 31, 2002. This included a healthy student population of close to 3,500 students. The number of voting members was close to 10,000. In a manner similar to the American Regions (1-6) we had a sustained decline in our membership. Clearly, we need to actively pay close attention to our membership retention and activities to retain them. We do well in relation to other regions in terms of the number Senior Members (close to 1,000) and Fellows (over 200). I noted that we have only three women Fellows in our region, and I feel that we have many more worthy candidates that should be considered. Please let me have some names.

The Regional Committee Meeting was held in conjunction with the Canadian Conference on Electrical and Computer Engineering in Montreal. At the Caucus and Regional Committee meetings on Saturday and Sunday May 3-4, 2003, we had many distinguished guests on hand, including Candidates for President-elect. An IEEE Presidential Candidates Forum was a feature of the Caucus meeting.

At the regional meeting, it was decided to expand the scope of the program Pre-College Career Education workshop to all of R7. Dr. Gorham subsequently conducted the workshop in four other eastern Canadian Sections as part of the tour of Eastern Canada Council organized by Dr. Ferial El-Hawary. Dr. Bob Alden gave an update on IEEE Canadian Foundation's activities. The Foundation's Web site now has a French URL. For the Sections Congress 2008 there will be only one Canadian bid. The region is supporting the Québec Section bid.

Now for some news. Witold Kinsner and Xavier Maldaque are assuming the role of co-editors of the Canadian Journal of Electrical & Computer Engineering to succeed Dr. Om Malik. Thanks Om. IEEE Toronto will celebrate its Centennial in October (see special insert in this issue of the CR) and IEEE Winnipeg is celebrating its 50th anniversary in September.

In closing, I wanted to emphasize to our membership the importance of voting in this year's Annual IEEE Elections. Get out and vote because we have Canadian candidates not only for the Regional Director Elect, but also in the Vice President Technical Activities and for Division VII (Power and Energy) profiles.

Mo El-Hawary
20 July 2003

Mo El-Hawary, president of IEEE Canada, presented the three candidates for President-elect of the IEEE to the Region 7 caucus meeting in Montreal in May: (from left to right) Cleon Anderson, Vijay Bhargava (now withdrawn from the race*) and Mike Lightner.

Mo El-Hawary, président de l'IEEE Canada, a présenté les trois candidats pour le poste de président-élu de l'IEEE, région 7, lors de la réunion tenue en mai dernier à Montréal. Il s'agit de (de gauche à droite) Cleon Anderson, Vijay Bhargava (n'est plus dans la course*) et Mike Lightner.

***Vijay Bhargava** *who was also nominated by the IEEE Board of Directors to contest the election has now withdrawn from the race. Vijay has now joined the Department of Electrical and Computer Engineering at the University of British Columbia as a Professor and Head of the Department. The department is poised for significant growth over the next few years and an additional building is under construction. The increased nature of Vijay's administrative duties precludes a very heavy involvement with the affairs of the IEEE. He can be reached at: vijayb@ece.ubc.ca*

Mot du Président

Premièrement, j'aimerais féliciter Guy Olivier et Vijay Sood et le comité organisateur pour une excellente conférence canadienne 2003. Très bon travail.

Je voudrais aussi partager avec vous quelques remarques concernant le membership de IEEE Canada, qui totalise près de 16 000 membres en date du 31 décembre 2002. Ce nombre inclut une participation étudiante de près de 3 500 membres. Le nombre de membres votant se situait à près de 10 000. Nous avons enregistré un déclin du nombre de nos membres, situation qui s'est aussi produite aux Etats-Unis, dans les régions 1-6. De toute évidence, nous devons porter une attention particulière à la rétention de nos membres et aux activités qui permettront de garder ceux-ci au sein de l'IEEE. Nous nous comparons favorablement aux autres régions quant au nombre de membres seniors (aux environs de 1000) et aux membres supérieurs (plus de 200). J'ai remarqué que nous n'avons que trois femmes membres supérieurs de l'IEEE dans notre région. Je crois que nous avons beaucoup plus de candidates qui méritent d'être considérées. S'il-vous-plait, faites-moi part de noms de candidates.

La réunion du comité régional a eu lieu en parallèle avec le Congrès canadien en génie électrique et informatique à Montréal. Les réunions de caucus et de comité régional ont eu lieu les samedi et dimanche 3 et 4 mai 2003. Plusieurs invités de marque étaient présents à ces réunions, dont les candidats au poste de président-élu. Un des faits saillants de la réunion de caucus aura été le forum des candidats au poste de président de l'IEEE Canada. A la réunion régionale, il a été décidé d'étendre le champ d'application de l'atelier du programme "Pre-College Career Education" à toute la région 7. Le Dr Gorham a ensuite dirigé l'atelier dans quatre autres sections de l'Est du Canada. Cela faisait partie du tour du conseil de l'Est du Canada organisé par le Dr Ferial El-Hawary. Un compte rendu des activités de la fondation canadienne de l'IEEE a été donné par le Dr Bob Alden. La version française du site Internet de la fondation est maintenant disponible. Il n'y aura qu'une seule section candidate pour le congrès des sections qui aura lieu en 2008. La région offre son appui à la section de Québec.

Quelques nouvelles. Witold Kinsner et Xavier Maldague occupent maintenant les fonctions de co-rédacteurs pour la Revue canadienne de génie électrique et informatique. Dr. Om Malik occupait précédemment ce poste. Merci, Om. IEEE Toronto célébrera son centième anniversaire en octobre (veuillez consulter la section spéciale dans ce numero de la Revue canadienne de l'IEEE) et IEEE Winnipeg célébrera son cinquantième anniversaire en septembre.

Pour terminer, je voudrais mettre l'emphase sur l'importance de voter à l'élection annuelle de l'IEEE. Allez voter car nous avons des candidats canadiens non seulement pour le poste de directeur régional élu, mais aussi pour les postes de vice-président des activités techniques et division VII (Puissance et energie).

Mo El-Hawary
20 juillet 2003

RAB Award to Toronto Section

The IEEE Toronto Section is a recipient of the 2002 RAB Section Sustained Membership Growth Award for Outstanding Leadership and Results in IEEE Membership Development Activities for the period of 1999 to 2002 in Region 7. This award will be presented to the Section during the Centennial celebration in October 2003.

Canadian Conference on Electrical and Computer Engineering
Congrés canadien en génie électrique et informatique

by Guy Olivier, Vijay Sood and Samuel Pierre,*
Chair, Co-Chair and Tech. Program Chair, respectively
Ecole Polytechnique of Montreal, Montreal, QC
**Hydro Quebec, Varennes, QC.*

1.0 Statistical overview of the conference

A record number of close to 700 papers were submitted to the CCECE 2003 conference. Obviously, this number of papers was impossible to handle for the Technical Program Committee led by Samuel Pierre. The number of papers were cut back to about 500 in a preliminary selection. Subsequently, final submissions that were accepted were around 350 papers from some 21 countries. Nevertheless, even this number of papers made the logistics of accomodation and number of parallel sessions necessary so difficult that extreme prudence had to be excercised.

However, due to the SARs scare, a record number of paper presentators from overseas, particularly China, did not make it to the conference; this caused some concern both in terms of the missing presentations and in the lack of hotel room bookings. But, in the end, a very succesful conference was achieved and the function broke even financially.

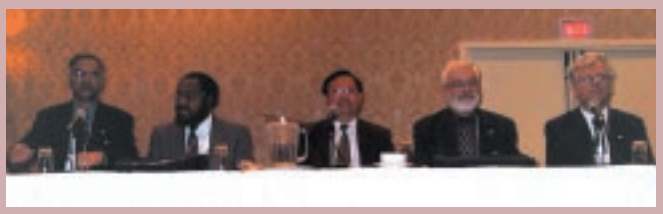
This conference broke all previous records in terms of number of paper submissions/presentations and number of attendees.

2.0 The Plenary Sessions

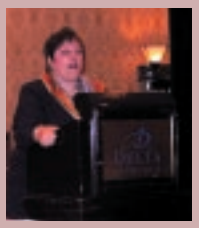
Four successful special plenary sessions were arranged (Table 1):

Table 1: Plenary sessions

Presentator	Topic
Dr. L.Lai, City University, London, UK	Electricity Deregulation – Are We Going the Right Way ?
Dr. G. Brassard, Université de Montréal	Quantum Mechanics and Cryptography
Mme Isabelle Blain, CRSNG/ NSERC, Ottawa	NSERC Funding of Research in Canada
Dr. P. W. Staecker, Director of R&D, M/A-COM, Boston.	2003: The Year of Recovery



Opening Plenary Session on Monday morning (seated left to right): Vijay Sood (Co-Chair and emcee), Samuel Pierre (Technical Program Chair, Dr.L.Lai (speaker) Mo El-Hawary (President IEEE Canada) and Guy Olivier (Chair of the conference).



Photos above (Left to right): Plenary speakers: Dr L.Lai, Mme Isabelle Blain, and K.Wu introducing Dr P. Staeker

3.0 Special Workshop

CANMET Energy Technology Centre (CETC), in collaboration with CCECE'2003, arranged a workshop on Grid-connection of Inverter-based Distributed Generators: Challenges and R&D Needs that was held in Montreal on May 7th 2003. The purpose of this half-day workshop was primarily to allow a technical exchange between Canadian researchers working on renewable energy, small-scale distributed generation and grid interconnection topics.

Selected speakers presented an overview of the topic (Table 2).

Table 2: Special workshop

Presentator	Topic
S.Martel & M.Dostie	Introduction and Agenda
Pat Cusack Arise Technologies Corporation	Grid-connected photo-voltaic systems: Review of inverters technology
Eric Le Courtois Hydro-Quebec	Microturbines technology and R & D needs
Liuchen Chang Univ. of N. Brunswick	Static inverter-based wind systems
Julien Meng Univ. of N. Brunswick	Distributed generation and communication protocols
Mamadou Doumbia Canmet Energy Tech. Centre	Grid connected inverters: Review of R&D activities
Konrad Mauch Xantrex Technology	Round Table Discussion

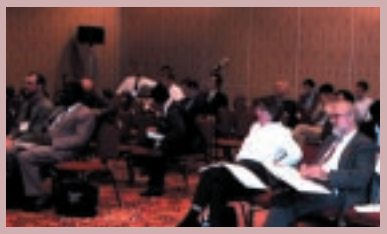


Photo on the left: M.Dostie and S.Martel open the workshop.

Photo on right shows a view of the audience at the workshop.

4.0 Students Competition

A write up is available on page 28 of this issue of the CR.

5.0 Awards Banquet

A write up is available on pages 29-30.of this issue of the CR.

IEEE Canada

At the recent Canadian Conference on Electrical and Computer Engineering, held in Montreal on the 4-7 May 2003, the following Student Competition Winners were announced:

Canadian Student Competition Winners

Name	Institute	Paper #
Ms Yi Liu	University of Ottawa	#458: Vision-based Detection Of Activity For Traffic Control by Y. Liu, P. Payeur
Ms Wei Zhang	University of Ottawa	#452: Iterative Multiuser Detection and Decoding for Highly Correlated Narrow-Band Systems and Heavily Loaded CDMA Systems by Wei Zhang, Claude D'Amours
Ms Jingqiu Shao	University of Calgary	#231: A New Measure of Software Complexity based on Cognitive Weights by Jingqiu Shao and Yingxu Wang
Ms Shahrzad Esmaili	Ryerson University	#108: A Novel Spread Spectrum Audio Watermarking Scheme Based On Time-frequency Characteristics by Shahrzad Esmaili, Sridhar Krishnan, Kaamran Raahemifar

Awards:

All four papers were ranked on a equal basis. All four recipients were presented with their awards at a special luncheon held in their honor. Their awards included a certificate, a cash prize of $250.00, a text book from McGraw Hill, and a computer bag.

The Students Competition Awards Banquet was held at lunchtime on 7 May 2003.

At the Headtable were seated (from left to right): Dr. S.Pierre, Ms Jingqiu Shao, Dr. Guy Olivier, Ms Wei Zhang, W. Read, Ms Yi Liu, Ms Shahrzad Esmaili and Dr. Vijay Sood

Winning Paper Selection Process

All papers from students of Ecole Polytechnic, Montreal were eliminated due to the Organization Committee from the school being host of the conference. All papers had to follow the guidelines for submission of papers to the Conference.

Papers submitted must have the first named author to be a student. Eight papers were first pre-selected by an external committee. Then a final selection of the four papers was made by a selection committee composed of: Drs. G.Olivier, S.Pierre, V.K.Sood, F.Guibault and E. Ngundui

Awards presentation ceremony

Ms Yi Liu receives her award from Ferial El-Hawary. Looking on are the representatives from McGraw Hill Ryerson (Mme. Bissonette and her colleaque).

Ms Jingqiu Shao receives her award. Looking on are the representatives from McGraw Hill Ryerson and Dr Wang (supervisor).

Ms Wei Zhang receives her award from Mo El-Hawary. Looking on are the representatives from McGraw Hill Ryerson (Mme. Bissonette and her colleaque).

Ms Shahrzad Esmaili receives her award. Looking on are the representatives from McGraw Hill and Dr S.Krishnan (supervisor).

Centre picture (from left to right): Dr Wang, Ms Jingqiu Shao, Vijay Sood, Dr Krishnan, Ms Shahrzad Esmaili, Dr S. Pierre, Ms Yi Liu, Dr. G. Olivier, Ms Wei Zhang, Dr W.Kinsner, Dr. M.El-Hawary, Dr. F.El-Hawary, Dr. C. D'Amours and Dr.R.Findlay

Awards Banquet

Canadian Conference on Electrical and Computer Engineering
Congrés canadien en génie électrique et informatique
Awards Presentation / Remise Des Prix
5 May 2003 / 5 mai 2003
Montréal, Québec

Ted Glass Western Canada Council Merit Award / Prix du Mérite du Conseil de l'Ouest Canada de Ted Glass

Daniel Chen-Hung Wong

"For outstanding contribution to the IEEE Southern Alberta Section and exceptional dedication in the effective management of the section's finances"

"Pour contribution trés importante â la section IEEE du sud de l'Alberta et dévouement exceptionel dans la saine gestion des finances de la section"

M.B. Broughton Central Canada Council Merit Award / Prix de Mérite du M.B. Broughton Conseil du Canada Central

Luc C. Matteau

"For exemplary and sustained service to IEEE in Canada for more than 30 years, principally as Treasurer of IEEC Inc. and the IEEE Canadian Foundation"

"Pour service exemplaire et soutenu â IEEE au Canada pour plus que 30 années, principalement comme le Trésorier de IEEC Inc. et la Foundation Canadienne de l'IEEE"

J.J. Archambault Eastern Canada Council Merit Award / Prix d'Excellence du conseil de l'Est du Canada

Ferial El-Hawary

"For Sustained Technical Leadership with Exceptional Dedication and Services to the IEEE/Canadian Atlantic Section and the IEEE/Eastern Canada Council"

"Pour leadership technique soutenu avec dévouement et service exceptionnels â la section atlantique canadien du IEEE et au conseil Est canadien de IEEE"

In the photographs:

Top: Bill Kennedy (Director-elect of IEEE Canada) presents the award to Daniel Wong. Also in the picture background are Abdel Sebak (Awards Committee Chairman) and Vijay Sood (MC for the session and Co-Chair of the conference).

Middle: Bob Alden presents the award to Luc Matteau

Bottom: Ray Findlay (past Director of IEEE) presents the award to Ferial El_Hawary.

Outstanding Engineer Educator Award / Prix de Grande Distinction de L'Educateur

Venkatanarayana Ramachandran

"For his dedication to the welfare of students and contributions to engineering profession and higher learning"

"Pour son dévouement â ses étudiant(e)s et ses contributions â la profession d'ingénieur et â l'enseignement supérieur"

Outstanding Engineer Award / Prix de Grande Distinction de l'ingénieur

C.F. Henville

"For Technical contributions in the field of electrical power system protection, and for service to the electrical engineering profession"

"Pour des contributions techniques dans le domaine de la protection de systém de courant électrique, et pour le service â la profession d'électrotechnique"

Wallace S. Read Service Award / Prix su Service de Wallace S. Read

Michel Lecours

"For sustained outstanding contributions to IEEE Canada"

"Pour des contributions exceptionelles soutenues â l'IEEE Canada"

The award was presented by Wallace Read posthumously to Michel Lecours who passed away recently. The award was received at an emotional setting by Mme Lecourse and her son Jean-Yves Lecours.

Photo on left (left to right): W.Read, A.Sebak, Mme. Lecours, M. J-Y Lecours (son), V.K.Sood and E.Holdrinet.

Photo on right (left to right): Mme. Lecours, A.Sebak and M. Lecours.

Fessenden Medal / Médaille Fessenden

Lot Shafai

"For outstanding contributions to Telecommunications and Satelite Communications as well as establishment of a unique and comprehensive antenna measurement facility"

"Pour des excellentes contributions aux Télécommunication et Communications par Satellite ainsi que l'établissement d'une facilite de mesure unique et compréhensive d'antenne"

Photo above: Since Dr Shafai was unavailable, his colleague Dr. A Sebak received the award from Dr. V.Bhargava (left) and Dr.V.Sood (right).

McNaughton Medal / Médaille McNaughton

Anastasios (Tas) N. Venetsanopoulos

"For outstanding contributions to: the design and implementation of communication systems, digital filters and multimedia systems; IEEE; the engineering profession and the society at large"

"Pour les contributions remarquables en: conception et implantation des systémes de communications, des filtres numériques et des systémes multimédia; IEEE; Profession technique et société en géneral".

IEEE Canada

The McNaughton Medal will be presented in Toronto at the October meeting of IEEE Canada to coincide with the Toronto Centennial Banquet. In the photo on the right, Bob.Hanna (left) of the Toronto Section received the award for Tas Venetsanopoulos from Abdel Sebak (centre) while Vijay Sood (right) looks on.

Président de la Conférence
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RPM Consulting Engineers

Présidents du programme technique
Dr. Kostas Plataniotis
University of Toronto

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Ryerson University

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Présidents IEEE Canada
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Bill Kennedy (2004-05)

Conseil du Centre du Canada
Scott Lowell

Conseiller
Vijay Bhargava

Secrétariat de la conférence
18 Robinhood Drive
Dundas, ON L9H 4G1
Tél: (905) 628-9554
Fax: (905) 628-9554
Courriel: admin@ieee.ca

Webmaster
Bob Alden

Site web:
http://ieee.ca/ccece04

IEEE Canada

CCGEI 2004

L'Innovation, Force Directrice en Technologie

17th Conférence Canadienne de Génie Électrique et Informatique

2-5 mai, 2004 Hôtel Sheraton Fallsview

Niagara Falls, Ontario, Canada

APPEL AUX COMMUNICATIONS

La conférence canadienne de génie électrique et informatique 2004 de l'IEEE offre un forum pour la présentation de travaux de recherche et de développement dans les domaines du génie électrique et du génie informatique provenant du Canada et du monde. Des communications en français ou en anglais sont sollicitées sur des sujets qui incluent, mais ne sont pas limités à :

- Systèmes à base d'agents et sur Internet
- Communications et systèmes sans fil
- Traitement de signal et conception de filtres
- Électromagnétisme, optique et photonique
- Contrôle de procédé/Automation industrielle
- Robotique et mécatronique
- Réseaux et systèmes informatiques
- Réseaux neuronaux et logique floue
- Bases et exploration de données
- Électronique et systèmes de puissance
- Machines électriques et entraînements
- Circuits, Systèmes et ITGE
- Microélectronique et Optoélectronique
- Systèmes en temps réel et embarqués
- Architectures avancées d'ordinateurs
- Production de l'énergie et énergies renouvelables
- Informatique nomade
- Calcul haute performance
- Génie logiciel
- Systèmes intelligents
- Calcul évolutionniste
- Réalité virtuelle et vie artificielle
- Simulation et visualisation
- Interaction personne-machine
- Nanotechnologie et nanorobotique
- Antennes et EMC/EMI
- Micro-ondes et RF
- Bioinformatique
- Télédétection et applications
- Théorie du Contrôle et applications
- Ingénierie biomédicale
- Instrumentation et mesure
- Aérospatiale et Avionique

1.0 Soumission de communications régulières:

Veuillez soumettre par courrier électronique un résumé de 300 mots de votre communication au comité technique par la procédure décrite sur notre site http://ieee.ca/ccece04 avant le 21 novembre 21 2003. Choisissez le lien “Français” et suivez les instructions données sous “Appel de communications”.

2.0 Proposition de tutoriaux, d'ateliers et de sessions sur invitation:

La proposition de sessions invitées, ateliers pré- et post-conférence et tutoriaux sera acceptée jusqu'au 19 décembre, 2003. Veuillez contacter le responsable des ateliers à l'adresse mentionnée ci-haut.

3.0 Compétition de soumission par étudiants

Veuillez soumettre votre article en suivant la procédure décrite ci-haut. S'il vous plaît, lisez les informations trouvées sur la page “Français”, sous “Appel de communications” et “Fonds pour étudiants”.

4.0 Dates Importantes:

Date limite pour la soumission des résumés d'articles:	**Vendredi, 21 novembre, 2003**
Date limite pour la soumission de sessions spéciales:	**Vendredi, 19 décembre, 2003**
Avis d'acceptation:	**Vendredi, 9 janvier, 2004**
Date limite pour la pré-inscription:	**Vendredi, 27 février, 2004**
Date limite pour la soumission finale des articles:	**Vendredi, 27 février, 2004**

5.0 Expositions industrielles:

Veuillez contacter le responsable des liaisons industrielles et des expositions afin d'obtenir des informations au sujet des présentations industrielles durant la conférence.

Si vous êtes intéressés par CCGEI 2004 et voudriez être ajouté à notre liste de distribution, veuillez contacter le secrétariat de la conférence à l'adresse inscrite à gauche. Notre site Internet sera mis à jour régulièrement.

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CCECE 2004
18 Robinhood Drive
Dundas, ON L9H 4G1
Phone: (905) 628-9554
Fax: (905) 628-9554
E-Mail: admin@ieee.ca

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IEEE Canada

CCECE 2004

Technology Driving Innovation

17th Annual Canadian Conference on Electrical and Computer Engineering

May 2-5, 2004 Sheraton Fallsview Hotel

Niagara Falls, Ontario, Canada

CALL FOR PAPERS

The 2004 IEEE Canadian Conference on Electrical and Computer Engineering provides a forum for the presentation of electrical and computer engineering research and development from Canada and around the world. Papers are invited, in French or English, including but not limited to the following topics:

- Advanced Computer Architecture
- Agent-Based & Internet-Based Systems
- Bioinformatics
- Circuits, Systems & VLSI
- Computer Networks & System
- Database & Data Mining
- Electromagnetics, Optics & Photonics
- High-Performance Computing
- Instrumentation & Measurement
- Microelectronics & Optoelectronics
- Nanotechnology & Nanorobotics
- Power Electronics & Systems
- Process Control/Industrial Automation
- RF & Microwaves
- Signal Processing & Filter Design
- Visualization & Simulation
- Teledetection Remote Sensing & Applications
- Aerospace & Avionics
- Antenna & EMC/EMI
- Biomedical Engineering
- Communications & Wireless Systems
- Control Theory & Applications
- Electrical Machines & Drives
- Evolutionary Computation
- Human-Machine Interactions
- Intelligent Systems
- Mobile & Pervasive Computing
- Neural Networks & Fuzzy Logic
- Power Systems & Renewable Energy
- Real-Time Embedded Systems
- Robotics & Mechatronics
- Software Engineering
- Virtual Reality & Artificial Life

1.0 Regular Paper Submission:

Please submit a 300-word abstract of your paper to the Technical Program Committee using the on-line submission process on our web site at http://ieee.ca/ccece04 before November 21, 2003. Click on "Call For Papers" and follow the instructions provided.

2.0 Workshop, Tutorial, and Invited Session Proposal Submission:

Proposals for invited sessions, pre- and post conference workshops and tutorials will be accepted before December 19, 2003. Please contact the Workshops Chair using the same web page as noted above in 1.0.

3.0 Student Paper Competition:

Please submit your paper using the on-line submission process using the same web page as noted above in 1.0. Please read the information provided in the "Call For Papers" and "Student Funding" pages of our web site.

4.0 Important Dates:

Paper abstracts must be received by:	**Friday, November 21, 2003**
Special Session proposals must be received by:	**Friday, December 19, 2003**
Notification of acceptance will be sent out by:	**Friday, January 9, 2004**
Pre-Registration	**Friday, February 27, 2004**
Final papers must be received by:	**Friday, February 27, 2004**

5.0 Industrial Exhibits:

Please contact the Exhibits Chair at the Conference Secretariat for information about industrial exhibits at the conference.

If you are interested in CCECE 2004 and would like to be added to our contact list, please contact the Conference Secretariat at the address on the left. Check our Web site regularly for news and updates.

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