INSTITUTE FOR COMPUTING, INFORMATION AND COGNITIVE SYSTEMS •I•C•I•C•S•

FOCUS

FALL 2009 | VOL.20 | NO.2

Helping Anesthesiologists Cope

Addressing the flood of information facing anesthesiologists in the operating room. Pg.02

P2P: Peer-to-Peer
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THE UNIVERSITY OF BRITISH COLUMBIA

DIRECTOR'S CORNER

FIRST, LET ME THANK **NIMAL RAJAPAKSE** for his work as ICICS Director over the past two years. As many of you know, Nimal moved to SFU to become Dean of Applied Science this past July. In his two years as director, he developed a strategic plan in consultation with members to chart ICICS' course for five years; formalized the ICICS committee structure; and established a collaboration with the Peter Wall Institute to co-fund workshops and faculty awards. Most significantly, he spearheaded a successful $12.9M multi-themed grant application to the CFI Leading Edge Fund. This grant will produce important multidisciplinary outcomes and greatly heighten ICICS' profile in the coming years. We discuss it in more detail in an article in this issue.

Our cover story describes a collaboration between **Guy Dumont** (ECE) and **Mark Ansermino** (Anesthesiology) that is producing interesting results in the field of anesthesiology.

In another article, **Sathish Gopalakrishnan** (ECE) applies his theoretical advances in real-time systems to help optimize resource allocation at the system design stage.

This issue also includes a pull-out program for our 2009/10 Distinguished Lecture Series.

It's good to be back. I will be ICICS Acting Director until a permanent director is appointed. Meanwhile, I will help promote the collaborative efforts of ICICS members in any way I can.

Rabab Ward, ICICS Acting Director

COVER ARTICLE

Helping Anesthesiologists Cope

PROCESS CONTROL ENGINEER GUY DUMONT AND PEDIATRIC ANESTHESIOLOGIST MARK ANSERMINO ADDRESS THE FLOOD OF INFORMATION FACING ANESTHESIOLOGISTS IN THE OPERATING ROOM.

AT FIRST GLANCE, pulp and paper and anesthesiology don't seem to have much in common. But when process control engineer Guy Dumont (ECE), Director of UBC's Pulp and Paper Centre, co-organized a Peter Wall Institute Exploratory Workshop on automation and robotics in health care in 2002, he knew what he was doing. There he met Mark Ansermino (Anesthesiology), a pediatric anesthesiologist and Director of Research for Pediatric Anesthesiology at BC Children's Hospital. Since then, the two have made important strides in marrying Dumont's signal processing expertise with Ansermino's knowledge of physiological monitoring. The end goal is increased safety for patients under anesthesia.

PLUMBING THE DEPTHS OF HYPNOSIS

In one of their first projects, the researchers developed a technique for assessing the depth of hypnosis of patients under anesthesia. Wavelets with known properties are combined with the patient's EEG signal to extract information from that signal. "We had been using wavelets for a long time in paper-machine control," Dumont says, "and applied that experience to develop a depth-of-hypnosis sensor." The system responds much more quickly than conventional systems, and is being commercialized by Cleveland Medical Devices. It also established the basis for a current collaboration on automated, closed-loop control of drug delivery in anesthesia, with control theorist Meeko Oishi (ICICS/ECE), and Bernard MacLeod and Stephan Schwarz from Anesthesiology.

GOOD VIBRATIONS

Anesthesiologists in a modern operating room are deluged with sensor data about their patient's status. Threshold violations in exhaled gas levels, oxygen saturation, ventilation rate, heart rate, blood pressure, etc., are communicated through auditory or visual alarms. Many of these alarms are false, however, triggered by artifacts or signalling only a temporary, clinically insignificant deviation. "Auditory alarms are so frequent and false," Ansermino says, "that you just don't hear them anymore." The researchers decided to try communicating alarms through tactile means, or the sense of touch, which had not been done before in medicine.

"Most innovations in physiological monitoring have begun with anesthesiology."

- Mark Ansermino

Photo: Martin Dee

> Physiological Monitoring
> Vibrotactile Belt
> Real-time Decision Support

With the help of human–computer interaction specialist Sid Fels (ICICS/ECE), they have devised a vibrotactile belt that communicates clinically significant information to the anesthesiologist through different patterns of vibration, which cannot be ignored. Thus, clinicians can keep their attention focused on the patient while receiving the information, instead of looking at a visual monitor. In an initial test of the belt involving a patient simulator, vibrating motors on the right side of the belt indicated significant changes in peak airway pressure, and on the left in the volume of air exhaled in one minute. Clinicians wearing the belt correctly diagnosed and responded to a simulated case of anaphylaxis more rapidly than those in the control group.

Encouraged, Dumont and Ansermino produced a wireless prototype incorporating change-detection algorithms that signal an alarm only after a certain change in the trend of a variable has been observed, rather than a threshold being exceeded. Variations among patients and over the course of the operation can be accounted for without false alarms being triggered. Other algorithms developed by Dumont and his students filter out artifacts from electrocautery devices, and safety features alert the clinician when the device loses communication with a sensor. In a recent real-time operating room test, anesthesiologists were able to correctly decode four different vibration patterns signalling the parameter being monitored, and the level and direction of change. "The belt is a less intrusive method of sending information to the clinician," Ansermino says. "It's a human–machine interface that gets to the subconscious level of communication." He and Dumont will demonstrate the device at the American Society of Anesthesiologists' annual meeting in October 2009.

CAPTURING EXPERT KNOWLEDGE FOR DECISION SUPPORT

Expert systems that intelligently interpret data to provide real-time decision support are well established in the aviation and atomic energy industries. They are not used in medicine, however, and Dumont and Ansermino believe anesthesiology is a good place to start. They have developed a system that combines their change-detection algorithms with a rule engine based on practitioner consensus. For example, an anesthetized patient's heart rate may go up because they are insufficiently anesthetized, or are bleeding. A rule can be added to the monitoring system based on the heart rate and blood pressure: a decrease in blood pressure with an increase in heart rate indicates the patient is likely bleeding, while an increase in blood pressure suggests the anesthesia is light. By building expert consensus on critical levels, rules such as this can be incorporated into the system to trigger appropriate real-time auditory, visual, or tactile alarms, as well as just-in-time information. The researchers are currently focusing on ventilatory events such as changes in lung compliance, as they are critical and can be missed by clinicians.

Dumont and Ansermino envision an overall monitoring system that incorporates feature extraction, refined auditory, visual, and tactile communication, expert knowledge, and automated drug delivery for use in and beyond anesthesiology, such as in ICU bedside monitoring. Dumont's process control expertise combined with Ansermino's clinical experience makes theirs an ICICS collaboration made in heaven, or at least at the Peter Wall Institute.

Guy Dumont can be reached at 604-822-8564 or guyd@ece.ubc.ca, and Mark Ansermino at 604-875-2711 or mansermino@cw.bc.ca

ICICS Awarded CFI Leading Edge Fund Grant

THE CANADIAN FOUNDATION FOR INNOVATION (CFI) has awarded ICICS a 5-year grant of $5.177M from its Leading Edge Fund (LEF). Matching funds from the BC Knowledge Development Fund and in-kind support from industry bring the grant total to $12,943,900. Initiated and led by Nimal Rajapakse (MECH), ICICS Director from July/07–July/09, the grant builds on a $22.1M New Initiatives Fund grant awarded to ICICS in 2000. That grant enabled ICICS to double its research space and furnish new and existing labs with state-of-the-art equipment. Researchers from across UBC have converged under the ICICS umbrella since, inspiring novel research directions in human-centred systems.

"This grant not only endorses the proposed research," Rajapakse emphasizes, "it acknowledges the many investigators who helped incubate it, and the breadth of expertise ICICS now encompasses." Principal users include Elizabeth Croft (MECH), Larry Goldenberg (Urologic Sciences), Alan Mackworth (CS), José Marti (ECE), Martin McKeown (Medicine/Neurology), Raymond Ng (CS), Dinesh Pai (CS), Nimal Rajapakse (MECH), Tim Salcudean (ECE), and Rabab Ward (ECE). Twenty other prominent ICICS researchers are also involved in the grant.

The grant is structured around five themes linked by their shared focus on human-centred technologies:

Back Row (L–R): Martin McKeown, Larry Goldenberg, Alan Mackworth, Tim Salcudean;
Front Row (L–R): Elizabeth Croft, Rabab Ward, José Marti, Nimal Rajapakse;
Missing from picture: Raymond Ng, Dinesh Pai.

1. **Anatomical Models for Image-Guidance in Medical Procedures (Theme Leader Tim Salcudean).** 3D ultrasound, MRI, X-ray fluoroscopy, and CT images of the human anatomy will be fused in this theme to create models for guidance of a da Vinci surgical robot for minimally invasive robotic surgery. The research will focus initially on prostate and kidney cancer, with anticipated wider applications. The image-guided da Vinci robot will be the only one in Canada dedicated for research and training.

2. **Human Sensorimotor Systems (Theme Leader Dinesh Pai).** This theme will develop sophisticated computational models of human sensorimotor and cognitive systems, which underlie every aspect of human life. Biomechanical models of muscles and tendons will be created, and the gaze system will be simulated. A model of the hand and arm will be tested using robotic hands and arms. These models will enable prediction of surgical outcomes, and may lead to restored function for millions of Canadians who suffer from neuro-muscular disease and disability.

3. **Assistive Technologies (Theme Leader Elizabeth Croft).** Interactive robotic systems will be advanced in this theme to assist elderly people and those with disabilities in their daily activities. Research will be undertaken in mobile assistive devices such as "smart" powered wheelchairs; assisted in-home living and home automation; remotely deployed therapies; adaptive user interfaces;

Continued on Pg. 06 >>

ICICS FALL 2009/SPRING 2010 DISTINGUISHED LECTURE SERIES

FOUR ACADEMIC AND INDUSTRIAL LEADERS PRESENT INNOVATIVE RESEARCH AND ADDRESS THE FUTURE OF COMPUTING AND TECHNOLOGY.

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THE UNIVERSITY OF BRITISH COLUMBIA

2009–2010

ICICS Distinguished Lecture Series

ICICS hosts the 21st annual Distinguished Lecture Series, bringing in academic & industrial leaders in the forefront of their fields.

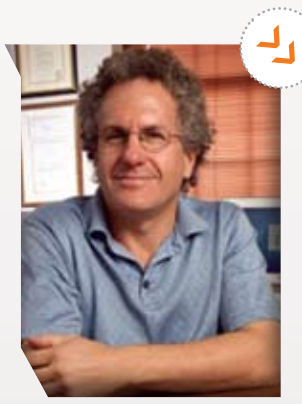
SEPTEMBER 24, 2009

Engineering Nanotechnology at UNC Charlotte: The Top-down Approach

Robert Hocken, University of North Carolina at Charlotte

There are different approaches to nanotechnology; the more classical approach is called "engineering nanotechnology." It involves using classical determinism to build structures with tolerances approaching a nanometer. At UNC Charlotte's Center for Precision Metrology, we have been working in engineering nanotechnology for two decades. We started with scanning tunneling microscopes (STMs) and have since developed longer-range nano-positioning devices. I will talk about two such systems. The first is the Sub-Atomic Measuring Machine (SAMM), which has been modified for picometer resolution (with MIT); the second is the Multi-Scale Alignment and Positioning System (MAPS) for nanoimprinting (with UCLA).

ROBERT HOCKEN began his career at the National Bureau of Statistics, where he developed software correction of Coordinate Measuring Machines (CMMs) and the use of computer-assisted theodolites (with Bill Haight) for large-scale stereotriangulation. He played a lead role in the development of the Automated Manufacturing Research Facility, invented the laser tracker (with Kam Lau), and edited the first American measuring machine standard. In 1988, he came to UNC Charlotte as a chaired Professor, where he built the internationally recognized Center for Precision Metrology. The Center performs research and educates students in manufacturing metrology. Dr. Hocken has continued to perform research in areas ranging from large-scale metrology to nanotechnology. He is also active on the B89 Dimensional Metrology Committee, and is currently working with other universities on nanotechnology projects.



NOVEMBER 26, 2009

Computer (and Human) Perfection at Checkers

Jonathan Schaeffer, University of Alberta

In 1989, the Chinook project began with the goal of building a computer program capable of winning the human World Checkers Championship. The reigning human champion was almost perfect, having rarely lost a game in over forty years. To do better required the computer to be perfect. In effect, one had to solve checkers. Little did we know that our quest would take 18 years to complete. What started out as a research project quickly became a personal quest and an emotional roller coaster. This talk, by the creator of Chinook, is about the interplay between people and technology, the story of man versus machine for supremacy at checkers. To appreciate this story, no detailed knowledge of computer science or checkers is needed.

JONATHAN SCHAEFFER is a professor of Computing Science at the University of Alberta, and is currently the Vice Provost and Associate Vice President for Information Technology. He is the iCORE Chair in High-Performance Artificial Intelligence Systems. His research in artificial intelligence is best known for his work on computer games, including classic games and commercial video games. He is the creator of the checkers program Chinook, the first program to win a human world championship in any game. In 2007, he announced that he had solved checkers. He is a co-founder of BioTools (bioinformatics software and the popular Poker Academy).

OCTOBER 22, 2009

Realizing Programmable Matter

Seth Copen Goldstein, Carnegie Mellon University

The Claytronics Project is working on realizing programmable matter. Programmable matter is any substance that can be programmed to effect a change in one or more of its physical characteristics. In claytronics, the substance is a collection of individual units, each of which can sense, compute, communicate, and actuate. The long-range goal for claytronics is for the collection to behave as a coherent mass and mimic, with high fidelity and in 3-dimensional solid form, the look, feel, and motion of macro-scale objects. In this talk, I will describe possible applications for claytronics and some of the hardware and software challenges.

SETH COPEN GOLDSTEIN is an Associate Professor in the School of Computer Science at Carnegie Mellon University. He received his M.S. and Ph.D. in Computer Science at the University of California at Berkeley. His research focuses broadly on ensembles: large collections of interacting agents. In the area of reconfigurable computing, he has investigated compiling high-level programming languages directly into configurations that can harness the large ensemble of gates for computing. Later work has involved harnessing ensembles of molecules in the area of molecular electronics. Currently, his main focus is on realizing claytronics.

JANUARY 21, 2010

Bioelectronics

Rahul Sarpeshkar, Massachusetts Institute of Technology

Nature is a great analog and digital circuit designer. She has innovated circuits in the biochemical, biomechanical, and bioelectronic domains that operate very robustly with highly imprecise parts and with incredibly low levels of power. I will discuss how analog and bio-inspired circuits and architectures have led to and are leading to novel architectures in sensing and computing, e.g., in ear-inspired radios, architectures for improving operation in noise, ultra-low-power signal-to-symbol conversion, and hybrid analog-digital architectures that model computations within cells. Such techniques can yield more than order-of-magnitude power reductions while maintaining high levels of robustness to several sources of noise. I will provide examples from systems built in my lab for bionic ear processors for the deaf, brain–machine interfaces for the blind and paralyzed, and body sensor networks for patient monitoring.

RAHUL SARPESHKAR obtained Bachelor's degrees in Electrical Engineering and Physics at MIT. After completing his PhD at Caltech, he joined Bell Labs as a member of the technical staff. Since 1999, he has been on the faculty of MIT's Electrical Engineering and Computer Science Department, where he is an Associate Professor and heads a research group on Analog VLSI and Biological Systems. He has received the Packard Fellow Award given to outstanding faculty, the ONR Young Investigator Award, the NSF Career Award, the Indus Technovator Award, and the Junior Bose Award for excellence in teaching at MIT. He holds over 25 patents and has authored more than 100 publications, including one that was featured on the cover of *Nature*. His research interests include analog microelectronics, ultra-low-power circuits and systems, biologically inspired circuits and systems, biomedical systems, feedback systems, neuroscience, and molecular biology.

Lectures are free & are held from 3:30 p.m. to 5:00 p.m. in Room 110, Hugh Dempster Pavilion, 6245 Agronomy Road (between Main Mall and East Mall) Vancouver, BC.

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UBC's Institute for Computing, Information and Cognitive Systems (ICICS) is an umbrella organization that promotes collaboration among researchers from the faculties of Applied Science, Arts, Commerce, Education, Forestry, Medicine and Science. ICICS supports the collaborative computer-oriented research of more than 150 faculty members and over 800 graduate students in these faculties. Reaching out to business and industry, ICICS provides creative solutions to diverse practical problems, including the development of interactive visualization of complex systems; video synthesis and authoring tools for multimedia; haptic displays; telerobotic system agents; automatic control of drug delivery; data mining; active Internet; wireless networks; and pervasive computing. ICICS researchers attract approximately $18 million in annual grants and contracts. Their work will have a positive impact on us all in the future.

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Optimizing Real-time System Performance

SATHISH GOPALAKRISHNAN PUTS THEORY INTO PRACTICE TO DESIGN OPTIMAL REAL-TIME COMPUTER SYSTEMS.

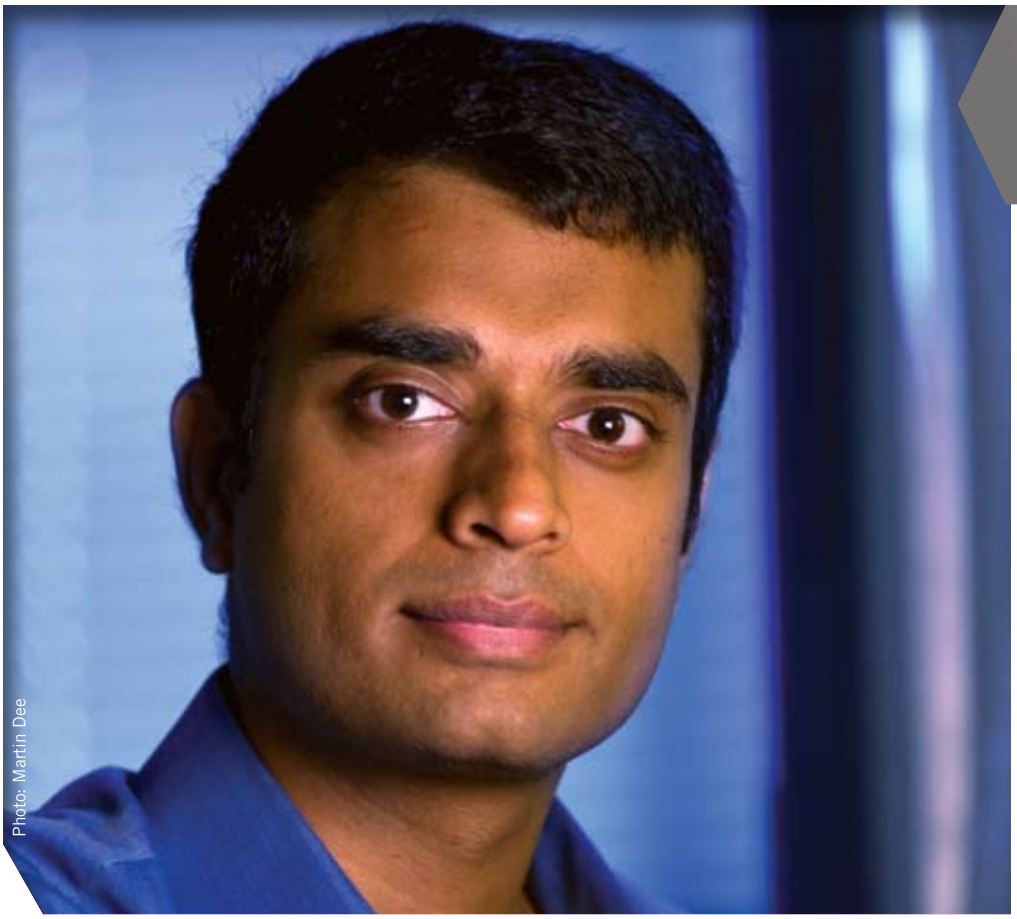

Photo: Martin Dee

- Real-time Systems
- Radar Dwells
- Sensor Networks

REAL-TIME COMPUTING SYSTEMS have various operations with deadlines that need to be scheduled. Systems engineers have long known that they could push the performance of these systems to a certain point, beyond which performance falls off dramatically; they just didn't know why. By establishing the theoretical underpinnings of this widespread phenomenon, Electrical and Computer Engineering Professor Sathish Gopalakrishnan has provided the basis for designing predictable, efficient real-time systems without over-provisioning of resources.

SCHEDULING RADAR DWELLS

For his doctoral dissertation, Gopalakrishnan looked at scheduling of radar dwells, the amount of time that the target remains in the radar's beam during each scan. The send, receive, and processing time dedicated to each potential target need to be scheduled, as well as the time required for the antenna to cool down after each dwell. The conventional approach guaranteed that, given these constraints, potential targets could always be tracked below a prescribed utilization bound, or the sum of the processing times assigned to each scheduled task. This guarantee, however, meant that the bound was set quite low, so that systems were over-provisioned, making them expensive and inefficient. Through exhaustive simulations of tracking tasks with varying utilization levels, Gopalakrishnan found that this bound could be pushed to a sharp threshold, below which most tasks could be scheduled, and above which most could not. Radar systems are "soft" real-time systems, as deadlines can be missed occasionally; an aircraft missed on one scan can be picked up on the next. "Hard" real-time systems, on the other hand, such as those found in passenger aircraft, require absolute guarantees of schedulability. Since most real-time systems are soft, Gopalakrishnan's discovery of a sharp threshold for schedulability of radar dwells is widely applicable. Once located through simulation, it can be used to optimally allocate resources. "My rationale," Gopalakrishnan says, "is that we just have to do the simulation once, which makes it a perfect engineering approach to dealing with these problems."

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ICICS Awarded CFI Leading Edge Fund Grant

and developing technology training strategies for caregivers. The goal is to enhance at-home liveability and maximize independence.

4. **Decision-Support across Critical Infrastructures (Theme Leader José Marti).** ICICS researchers have developed a simulator to coordinate the responses of interdependent infrastructures (power, water, telecommunications, etc.) during major emergencies such as earthquakes. The fixed and mobile R&D facilities to be developed in this theme will enable advanced scenario testing involving stakeholders, necessary to scale the system up to the national level. It is currently being tailored to help provide security for the 2010 Olympics.

5. **Global Communications Systems (Theme Leader Rabab Ward).** This theme will enhance wireless communications networks through innovative techniques in cognitive radio, spectrum sharing and signalling; improve management and protection of multimedia for social-networking sites; and develop middleware for use in energy-monitoring sensor networks and gaming.

A portion of the grant is dedicated to upgrading ICICS' networking and communication infrastructure. It also includes infrastructure operating funds of roughly $295,000 annually for five years. "We are delighted to be able to provide the researchers not only with the equipment they need," Rajapakse says, "but also with the technical and administrative support that will free them to focus on their research." Their work will broaden ICICS' local and global impact, and benefit society in measurable ways.

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Optimizing Real-time System Performance

DESIGNING SENSOR NETWORKS: THE "BLACK BOX" APPROACH

In looking at practical areas to apply his theoretical work, Gopalakrishnan discovered that sharp thresholds exist in distributed real-time systems where messages are sent hop-by-hop, such as sensor networks. The nodes in a wireless agricultural sensor-and-actuator network, for example, might sample temperature, humidity, and soil concentrations to control micro-irrigation. They need to do both computation and communication, and have traditionally been programmed individually. This becomes unfeasible, however, as networks scale up. Gopalakrishnan takes a "black box" approach to the problem: "The goal is to write software that runs thousands of devices but creates the illusion that it is written for just one system," he explains. In determining sensor sampling rates for these systems, he uses their sharp threshold behaviour as a guideline, since at some point the data being fed back into the system overwhelms the network. Gopalakrishnan has been supported by Nokia in this work, to look at using cell phones for accessing sensor data. He is also working with Victor Leung (ICICS/ECE) on routing problems in sensor networks, and with Matei Ripeanu and Tor Aamodt (ICICS/ECE) on virtualization, or running multiple operating system instances on the same piece of hardware.

The promising nature of Gopalakrishnan's work was acknowledged recently when he received the first Early Career Scholar Award jointly funded by ICICS and the Peter Wall Institute. He will also contribute to the Global Communications Theme of the CFI Leading Edge Fund grant recently awarded to ICICS (see Page 4).

Gopalakrishnan is clearly on to something. Sharp thresholds exist in nature; the freezing temperature of water, for example. Being able to predict them mathematically is his Holy Grail. Meanwhile, proving their existence and using them to optimize real-time systems isn't a bad place to start.

A Farewell Message from Nimal Rajapakse *ICICS Director, July/07–July/09*

From the outside, ICICS consists of research space, state-of-the-art equipment, and various programs to encourage multidisciplinary research in human-centred technologies. After two years of being on the inside as Director, it's clear to me that ICICS is really about people. Through the strategic planning process and in preparing the CFI Leading Edge Fund grant application, I came to truly appreciate the creativity and dedication of the ICICS membership. Their willingness to step outside their traditional disciplinary boundaries and find common ground is the glue that holds ICICS together. I am delighted to have had the opportunity to step outside my own mechanical/civil engineering framework and get to know such an interesting, diverse group of people. It is helping me enormously in my new role as Dean of Applied Science at SFU. I would like to take this opportunity to wish ICICS members and their collaborators continued success, and to thank Rabab Ward for assuming the role of Acting Director.

P2P:

<< Continued from back page

The workshop, entitled "Removing Barriers and Enabling Individuals: Ethics, Design, and Use of Adaptive Technologies," brought together researchers from computer science, engineering, social science, humanities, medicine, and the rehabilitative and clinical fields to address the interdisciplinary gap that exists in assistive technology research. The BC Disabilities Health Research Network also supported the workshop.

ECE Professor Part of New International Research Initiative

Robert Schober (ECE) is one of eight Canadian researchers selected for the International Research Chairs Initiative. This program is designed to foster research partnerships between Canada Research Chairs (CRCs) and International Development Research Centre Chairs in the developing world. Schober is a CRC in Wireless Communications, and will be working with Professor Ranjan Mallik from the Indian Institute of Technology in Delhi to tackle key problems in wireless communication systems design. Schober was also recently given the Charles A. McDowell Award for Excellence in Research by UBC.

CAIAC/Precarn Intelligent Systems Challenge

Holger Hoos (CS), president of the Canadian Artificial Intelligence Association (CAIAC), inaugurated the CAIAC/Precarn Intelligent Systems Challenge this past May at UBC Okanagan. Hoos conceived the annual competition along with Morten Irgens, CTO of Actenum, Inc. University, college and high school students from across Canada work in teams on computationally challenging, real-world problems, using technologies and methods from the areas of artificial intelligence and intelligent systems. MacDonald, Dettwiler and Associates, Ltd. (MDA) contributed this year's challenge, to detect suspicious maritime activities with incomplete information. The overall winning team was from UBC.

MECH/ECE Researcher Awarded NSERC SRO Grant

Boris Stoeber has been awarded a three-year, $171,000 NSERC Special Research Opportunity grant through the Inter-American Collaboration on Materials Research (CIAM) program. Stoeber, in collaboration with German Drazer of Johns Hopkins University, will investigate and quantify the mechanisms of particle deposition in microfluidic environments. CIAM is an international, multi-agency initiative that supports collaborations among materials researchers from Argentina, Brazil, Canada, Chile, Colombia, Mexico and the United States.

Izak Benbasat Ranked a Top MIS Researcher

A recent article in the *Communications of the Association for Information Systems* ranked **Izak Benbasat** (Sauder School of Business) as among the top researchers in the management information systems (MIS) field. There's good reason for this: from 2003–07, Benbasat published more papers in the top three MIS journals (MISQ, ISR, JMIS) than any other researcher. Benbasat received an honorary doctorate from the University of Montreal this past spring.

Lutz Lampe Wins Friedrich Wilhelm Bessel Research Award

Lutz Lampe (ECE) has been granted a Friedrich Wilhelm Bessel Research Award by the Alexander von Humboldt Foundation for his outstanding research record. This award is given to internationally renowned scientists and scholars outside of Germany in recognition of their past research and future promise. It will allow Lampe to spend up to one year collaborating on a research project with colleagues at a research institution in Germany. Lampe is an expert in communications and information theory applied to wireless and power-line transmission. Up to 25 Friedrich Wilhelm Bessel Research Awards are granted annually, across all disciplines.

Killam Research Fellowship for Mechanical Engineering Professor

Peter Cripton has been awarded a UBC Killam Faculty Research Fellowship. Cripton directs the Injury Biomechanics Laboratory, which develops improved safety devices to prevent traumatic injuries. One such device to emerge recently from the lab is the "Pro-Neck-Tor" sports helmet, consisting of inner and outer shells. Upon impact, the inner shell pivots within the outer shell, mitigating damage to neck vertebrae. The Killam funding will enable Cripton to conduct further research into devices for preventing severe neck fractures and spinal cord injuries in children involved in motor vehicle collisions.

Best Paper Award

Leah Findlater, Karyn Moffatt, **Joanna McGrenere** (CS), and Jessica Dawson have won a Best Award at the 2009 Conference on Human Factors in Computing Systems (CHI 2009) for their paper, "Ephemeral Adaptation: The Use of Gradual Onset to Improve Menu Selection Performance." Ephemeral adaptation is a new adaptive graphical user interface (GUI) technique that employs gradual onset to draw the user's attention to predicted items: adaptively predicted items appear abruptly when the menu is opened, but non-predicted items fade in gradually. The technique should be applicable to a broad range of visually complex tasks.

FOCUS Archived by UBC Library

Past issues of *FOCUS* can now be searched on a database housed by UBC Archives at **http://ubcpubs.library.ubc.ca/**. Keyword searches can be used to review nearly two decades' worth of ICICS members' research.

P2P: Peer-to-Peer

ICICS Members Contribute to National Network on Computer Security

Computer security experts **Bill Aiello** (CS) and **Konstantin Beznosov** (ECE) are part of the recently announced NSERC Internetworked Systems Security Network (NSERC ISSNET). Hosted by Carleton University, the collaborative network will mentor a new generation of experts in the field, and develop tools to address the vulnerability of government and industrial information networks to attacks. Nine academic institutions across the country are involved, as well as representatives from government and industry. NSERC will provide $5M to the network over 5 years.

ICICS Members Appointed NSERC Chairs in Design Engineering

Philippe Kruchten (ECE) has been appointed a Senior Chairholder in the NSERC Chair in Design Engineering program, and **Antony Hodgson** (MECH) has been named an Associate Chairholder. The researchers will take a multidisciplinary approach to designing intelligent equipment for improving the quality of life of people with debilitating diseases or disabilities. The Chair builds on the first NSERC Chair in Design Engineering awarded to UBC in 2002, held by **Peter Lawrence** (ECE). It is valued at $2 million over five years and is supported by Western Clinical Engineering, Ltd., Jeppesen Sanderson, WorleyParsons Westmar Division, the ALS Society of BC, and Ensemble Systems.

ECE Student Wins ALS Society Design Award

Samuel Chua, a graduate student involved in a pilot project affiliated with the above Chair and supervised by **Philippe Kruchten** (ECE), has received the Principal Award in the ALS Society of BC's Excellence in Engineering Design Competition. His project, "Automated Speech Recognition and Intelligibility Enhancement System for PALS with BiPAP Assisted Breathing," was selected for its potential to improve the quality of life of Persons with Amyotrophic Lateral Sclerosis (PALS). ALS, also known as Lou Gehrig's Disease, is a neurodegenerative disorder that affects motor neurons carrying messages from the brain to muscles.

Neural Interface Research Funded

Karen Cheung (ECE) and co-investigators Jay Kizhakkedathu (Centre for Blood Research), Peter Soja (Pharmaceutical Sciences), and Wolf Tetzlaff (ICORD) have been awarded an NSERC Collaborative Health Research Projects (CHRP) grant of $634,530 over 3 years to develop a biocompatible neural interface for chronic application in patients with neurodegenerative disease or spinal cord injury. Cheung has also received a Canadian Breast Cancer Research Alliance IDEA grant of $99,000 to develop a microfluidic cell culture system for screening of anticancer agents. Cancer cells will be suspended in a hydrogel "scaffolding" to create a three-dimensional environment that more closely resembles the in vivo environment than does traditional Petri dish screening.

Peter Wall Institute–ICICS Early Career Scholar Award

Sathish Gopalakrishnan (ECE) is the recipient of the first Early Career Scholar Award jointly funded by ICICS and the Peter Wall Institute for Advanced Studies (PWIAS). This award acknowledges tenure-track faculty whose multidisciplinary research shows great promise. The aim of the program is to bring outstanding UBC early-career researchers together to share ideas and approaches to research. Please see the article on Page 5 of this issue for a discussion of Sathish's research.

Inaugural Peter Wall Institute–ICICS Exploratory Workshop

Principal Investigator **Meeko Oishi** (ECE), co-investigator **Ian Mitchell** (CS), and **Mike Van der Loos** (MECH) organized the first PWIAS-ICICS co-funded Exploratory Workshop this past July.

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UBC's Institute for Computing, Information and Cognitive Systems (ICICS) is an umbrella organization that promotes collaboration among researchers from the faculties of Applied Science, Arts, Commerce, Education, Forestry, Medicine, and Science, and with industry. ICICS facilitates the collaborative multidisciplinary research of approximately 150 faculty members and 800 graduate students in these faculties. Our members attract approximately $18 million annually in grants and contracts. Their work strengthens Canada's strategic Science and Technology research priority areas, benefiting all Canadians.

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