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CONTACT

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS

Solid State Circuits

CZT Detectors and CMOS Circuits For Medical Imaging

Dr. Kris Iniewski
Redlen Technologies

Tuesday 23 October 2007
Time changed to 1230pm (was 400pm)
UBC Kaiser Building, Room 2020

CZT is currently the only semiconductor material that is capable of room temperature operation for X-ray and ã-ray radiation detector application. In this talk we will briefly review basic principles of medical imaging modality that is called single photon emission computer tomography (SPECT). We will discuss operation of CZT detectors and associated CMOS signal processing. We will describe various circuit techniques used for signal amplification, filtering, multiplexing, and analog to digital conversion. The talk will conclude with comparison of images taken by ã-ray camera to those obtained using ultra-sound, X-ray and magnetic resonance imaging (MRI).

Speaker: Krzysztof (Kris) Iniewski is managing R&D chip development activities at Redlen Technologies Inc., a start-up company in British Columbia. His research interests are in VLSI circuits for medical imaging and security applications. From 2004 to 2006 he was an Associate Professor at the Electrical Engineering and Computer Engineering Department of University of Alberta where he conducted research on low power wireless circuits and systems. During his tenure in Edmonton he put together a book for CRC Press "Wireless Technologies: Circuits, Systems and Devices".

From 1995 to 2003, he was with PMC-Sierra and held various technical and management positions in Research & Development and Strategic Marketing. Prior to joining PMC-Sierra, from 1990 to 1994 he was an Assistant Professor at the University of Toronto's Electrical Engineering and Computer Engineering department researching high-speed semiconductor devices and circuits. Dr. Iniewski has published over 100 research papers in international journals and conferences. He holds 18 international patents granted in USA, Canada, France, Germany, and Japan. He is frequent invited speaker and has consulted for multiple organizations internationally. He received his Ph.D. degree in electronics (honors) from the Warsaw University of Technology (Warsaw, Poland) in 1988. Together with Carl McCrosky and Dan Minoli he is an author of "Data Networks – VLSI and Optical Fibre", Wiley, 2007.

Info: Resve Saleh, res@ece.ubc.ca

Joint Communications

History of Cordless Phones in North America

Bruce Bernard
CTO Ascalade Communications Inc

Monday 15 October 2007 700 - 900pm
BCIT Town square D

Cordless phones have evolved from a poorly performing product in the 1980's to today's high quality, feature-rich technology. Very few homes are without at least one. The technology has changed from single channel, analog, 27MHz products to the complex digital products operating at 1.9GHz that we have today. This talk will explain the history of the cordless phone in North America from 1980 to the present as well as the different technologies that were developed. It will show how Vancouver was and still is a major center for the design of these products.

Speaker: Prior to joining Ascalade Technologies in 2000, Mr. Bernard served as Vice President of Engineering for VTech Telecommunications Ltd. He was instrumental in the research and development of the first 900 MHz digital cordless telephone in 1990. By the end of his 12 years at VTech, he was responsible for seven research and development offices worldwide, including over 400 engineers. He was also responsible for the development and refinement of automated manufacturing systems, engineering operations, technology research and managed intellectual property on a company-wide basis. Mr. Bernard holds a Bachelor of Applied Science degree in electronic engineering from Simon Fraser University and a Professional Engineer designation.

Info: Joint Communications Chair
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October Contact Updates

- The EMBS event on October 09 , "Talkin Off the Top of Your Head: Current Directions in Direct Brain Interface Research" by Steve Mason has been cancelled. Please see column 3 this page for new EMBS event at the same date and time.
- The Distinguished Lecture "On the Roots of Digital Signal Processing" by Andreas Antoniou (next page) has been updated with the rooms and times.
- The SSCS event "CZT Detectors and CMOS Circuits For Medical Imaging" has a new time of 1230pm - see column 1 this page

Engineering in Medicine and Biology

The Evolution of Rehabilitation Robotics: Technical and Ethical Challenges of Mechatronic Devices and Neurotechnologies

H.F. Machiel Van der Loos
University of British Columbia

Tuesday 09 October 2007 - 400pm
Chemical & Biological Engineering Building
Room 101 - 2360 East Mall, UBC

This presentation will span the history of rehabilitation robotics from its inception in the 1970s to new horizons involving brain computer interfaces in this first decade of the 21st century. During this 40-year timeframe, major technical advancements in robot control and interface design have characterized rehabilitation robotics. The field has also seen an expansion in relevance and application to a large range of clinical populations. Initially focused on persons with spinal cord injury and cerebral palsy, robotic devices are now used widely by people with stroke and autism, among other disabilities. As a growing number of Canadians experience motor or developmental disorders, and especially as ageing becomes an increasing functional issue for the world's population, there is a compelling need to understand not only how the technology has evolved, but where it will take us in the next half century. To this end, I will review major technical and clinical innovations of the field and discuss future challenges, in particular as novel rehabilitation strategies increasingly involve invasive and computer-intensive technologies.

Speaker: Mike Van der Loos, PhD, has been Adjunct Professor in the Mechanical Engineering Department of UBC since the beginning of this academic year, focusing on teaching design courses and setting up research activities in personal robotics. For 15 years prior to his move to Vancouver, he was Principal Investigator on a number of mechatronics projects at the Palo Alto VA Rehabilitation R&D Center in California. These projects explored assistance and therapy applications of robotics for persons who have disabilities as a result of, for example, SCI and stroke. In parallel, he was Consulting Associate Professor with the Department of Mechanical Engineering at Stanford University, being the coaching coordinator for the graduate course "Product Design/Development with Corporate Partners". He also collaborated on innovation research at the Stanford Center for Design Research and in the Computer Science Department on personal robot design. He received the Ingénieur Mécanicien degree from the Swiss Federal Institute of Technology in Lausanne (1979), and an Engineer's Degree (1984) and Ph.D. (1992) from Stanford University in Mechanical Engineering, all in the domain of robot interface design.

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DISTINGUISHED LECTURER PROGRAM

On the Roots of Digital Signal Processing

Andreas Antoniou
Professor Emeritus - University of Victoria

The roots of what we refer to today as digital signal processing are actually the roots of modern mathematics, and to trace the evolution of DSP we need to go back to the 1600s even to the mathematical world of classical Greece. These two lectures, one at SFU and the other at UBC, will attempt in a not-so-rigorous exposition to outline the major historical landmarks that led to DSP.

This subject of study, which has become a multifaceted discipline in recent years, comprises three fundamental processes, namely, discretization (or sampling), processing, and interpolation. Discretization concerns the conversion of a function of one or more continuous independent variables into numbers; processing entails converting or transforming the numbers obtained through discretization into some other form that is in some way or another more desirable; interpolation involves converting the set of processed numbers into a continuous function. Therefore, in our search for the roots of DSP, we must search for the origins of discretization, processing of numerical data, and interpolation.

SFU Lecture
On the Roots of Digital Signal Processing - 300 BC to 1770 AD
Friday 12 October 2007 230 - 330 pm
ASSC-1: Room 10041
Simon Fraser University

The first lecture will deal with certain great achievements over the period 300 BC to 1770 AD. It will demonstrate that in the process of deducing a value for pi, Archimedes of Syracuse was the first person to discretize a continuous function, on the one hand, and to apply interpolation on the other.

The contributions of John Wallis and James Gregory during the 1600s to the concepts of infinity and the limit of a function extended the work of Archimedes and immediately led to the emergence of calculus. Newton continued the work of Wallis on what was known in those days as the method of quadrature and in the process he discovered the binomial series. In due course, he saw the big picture relating to the method of tangents (differentiation) and the method of quadrature (integration) and formulated calculus as we know it today.

This new powerful tool enabled others, such as Stirling, Bessel, and Lagrange during the 1600s and 1700s to develop better and more sophisticated interpolation methods. It turns out that Stirling's interpolation method can be used to design nearly linear-phase lowpass recursive (FIR) filters which were not invented until the 1960s.

UBC Lecture
On the Roots of Digital Signal Processing - 1770 to 1970
Monday 15 October 2007 200 - 300pm
Room KAIS 2020, Fred Kaiser Bldg
2332 Main Mall, University of British Columbia

The second lecture will deal with certain landmark discoveries over the period 1770 to 1970. It will demonstrate that the mathematical tools for spectral analysis were introduced by a group of French mathematicians who studied or taught at Ecole Polytechnic in Paris during or soon after the French Revolution over a period of no more than 50 years or so. Lagrange and Laplace were teachers of Fourier and Poisson, Fourier was a teacher of Derishlet, and Poisson took the Chair of Fourier when the latter was appointed a Prefect in Grenoble by Napoleon. The processing of numerical data by machines was explored by many, including Pascal and Leibniz, but the most ambitious attempt was by Babbage who is often regarded to be the father of computing. However, the presentation will show that contrary to popular belief, what Babbage attempted to do during his entire professional life was to build a mechanical discrete system that would compute the entries of numerical tables and also print the tables in a single consolidated operation. The lecture will also deal with the origins of the sampling theorem which is attributed to Nyquist and/or Shannon. Actually, this famous theorem was discovered independently by several engineers or scientist around the 1930s and 1940s but the underlying principles were known to mathematicians long before that time and are closely related to an interpolation method due to the great Lagrange.

Speaker:
Andreas Antoniou is a Fellow of the IET (previously known as IEE) and the IEEE. He taught at Concordia University from 1970 to 1983, was the founding Chair of the Department of Electrical and Computer Engineering, University of Victoria, B.C., Canada, from 1983 to 1990, and is now Professor Emeritus.

He is the author of Digital Signal Processing: Signals, Systems, and Filters published by McGraw-Hill in 2005 and the co-author with Wu-Sheng Lu of Optimization: Algorithms and Applications published by Springer in 2007.

Dr. Antoniou served first as Associate and later as Chief Editor for the IEEE Transactions on Circuits and Systems from 1983 to 1987, as Distinguished Lecturer of the IEEE Signal Processing Society in 2003, as General Chair of the ISCAS 2004, and is now serving as Distinguished Lecturer of the CAS Society.
He received the Ambrose Fleming Premium for 1964 from the IEE (best paper award), a CAS Golden Jubilee Medal, and the IEEE CAS Technical Achievement Award for 2005.

Registration:
www.ensc.sfu.ca/~jiel/ieee/20071012_Antoniou.html

Info: Jie Liang, jiel@sfu.ca or
Zhen Wang, ajanew@ece.ubc.da

Process Systems: Fitting Models to Data

Dr. Bhushan Gopaluni
Chemical and Biological Engineering, UBC

Friday 28 September 1400-1500
Electrical & Computer Engineering
2332 Main Mall - Kaiser 2020, UBC

Models are needed in the process industry for a variety of tasks such as control, fault detection and diagnosis, performance monitoring and assessment. While phenomenological models, built from mass and energy balance equations, are accurate and physically insightful, they are often high-dimensional and intractable. Empirical models, built from process data, even though approximate, offer an attractive alternative.

This talk will begin by introducing various aspects of data-based modeling for process systems, including experiment design, data collection, and identification algorithms. It will be shown that each of these aspects comes with a variety of problems, the solutions to which shape the final identification algorithm. In particular, problems arising due to the nature of data will be explored. Novel solutions to deal with irregularly sampled and non-linear time series data will be presented. These solutions ensure asymptotically consistent stochastic models. The efficacy of these solutions will be illustrated through examples.

Speaker: Please see September 2007 Contact www.storm.ca/~glyfyx/ieeecontact/sep07_04.pdf

Info: Registration is not required, but recommended, so that we may keep you informed in the unlikely event of any changes.
You can register by via email to Bryan Bell bbell@ieee.org

The Benefits of Abstraction in Patterns
Linda Rising

Tuesday 25 September 2007 300 - 500pm
Electrical and Computer Engineering
Kaiser 2020, 2332 Main Mall, UBC

Pattern writers, like the rest of us—are limited by their own experience. We are biased toward the solutions we have used and tend to view them as the most useful way to solve the problems we face. These solutions are the ones we choose to document if we think about writing patterns and pattern languages. We typically don't examine other domains, looking for similar patterns with different implementation strategies, or try to deal with the challenge of higher or lower abstraction levels. Pattern writing is difficult and time-consuming, and, most of us, as in other areas in our lives, take the shortest possible path. This presentation is about a different kind of journey—unplanned and wobbly—one pattern author's struggle to find the right level of implementation detail and abstraction level.

Speaker: Dr. Linda Rising has a Ph.D. from Arizona State University in the field of object-based design metrics. Her background includes university teaching and industry work in telecommunications, avionics, and strategic weapons systems. She is an internationally known presenter on topics related to patterns, retrospectives, and the change process. She is the author of numerous articles and four books: Design Patterns in Communications, The Pattern Almanac 2000, A Patterns Handbook, and Fearless Change: Patterns for Introducing New Ideas, written with Mary Lynn Manns.
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Tour of Analytic Systems
Friday 12 October 2007 5:00 pm
#207 12448 82nd Ave. Surrey
www.analyticsystems.com

Analytic Systems designs and manufacture reliable and robust power conversion products for the marine, military, automotive, rail, industrial and alternative power sources and manufactures using Lean-Manufacturing processes. During the tour, our guide will give us information on the design and application of the products that they manufacture and how Lean-Manufacturing process has been implemented in their facility. Tour guide: Paul Bowler, Analytic Systems, VP Operations and IEEE Vancouver section chair
Info: Registration is required for this event. Space is limited, so register early. For more information and registration contact Sergio Bertani spbertani@yahoo.com.

Computer

DOUBLE HEADER
Thursday 04 October 2007 - 400 - 630
Electrical and Computer Engineering
Kaiser 2020, 2332 Main Mall, UBC

What Every Developer Should Know About Software Performance On Multicore Processors
Alexandra Fedorova, SFU

Multicore processors are becoming the dominant computing platform. Although software written for conventional, single-core, processors can run on these new processors unmodified, it is important to understand the intricacies of application performance on these processors, in order to make the most out of them and to avoid performance anomalies. In this talk I will describe common performance issues on multicore processors and techniques for addressing them. In particular, I will discuss unpredictable and suboptimal performance due to contention for on-chip resources, performance of applications that share data, and scalability of multithreaded applications. I will draw on real performance data from standard benchmarks and commercial applications executed on latest multicore systems.

Speaker: Dr. Alexandra Fedorova heads the systems research group at the School of Computing Science at Simon Fraser University. She has graduated with Ph.D. in Computer Science from Harvard University, where she has written a thesis on operating system scheduling for multicore and multithreaded processors. During her Ph.D. program, Fedorova also worked as a researcher at Sun Microsystems labs, where she conducted research on operating system design for multicore processor. Fedorova is a lead inventor on nine US patent applications and has numerous publications in leading academic conferences.
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Using Modern Graphics Processors for Non-graphics Applications
Tor Aamodt
UBC

Today's top end graphics cards are capable of close to half a teraFLOP of single precision floating point performance (peak) resulting in enormous potential compared with desktop microprocessors. They achieve this by dedicating far more of their silicon area to actual computation units than desktop microprocessors. However, the challenge is writing software that can actually take advantage of the massive parallelism offered by the hardware. This talk is meant to provide a brief "tutorial" on the subject of how to program GPUs to take advantage of their performance potential. I will give an overview of the recent evolution of graphics processors and illustrate with examples how some important non-graphics applications have been mapped to current graphics hardware. A focus of the presentation will be understanding what is required to achieve good performance of non-graphics applications on current graphics processors.

Speaker: Dr. Tor Aamodt is an assistant professor in the Department of Electrical and Computer Engineering at the University of British Columbia. He earned his B.A.Sc., M.A.Sc. and Ph.D. at the University of Toronto where his graduate studies were supported by NSERC scholarships. Prior to joining the faculty at UBC, he worked at NVIDIA on the GeForce 8 series GPU and, while a Ph.D. student, at Intel Corporation in the Microarchitecture Research Lab
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IEEE EXPERT NOW PILOT PROGRAM ENABLES MEMBERS TO EARN FREE CONTINUING EDUCATION UNITS

IEEE Expert Now courses are available for use by IEEE Regions, Sections, and Chapters interested in participating in the IEEE Expert Now Section-Chapter Program. The program, which began as a pilot in 2006, helps local IEEE volunteers organize an event where attendees can view one or more IEEE Expert Now course(s) and discuss the materials with a local expert on that topic.
There is no charge for participating in this program in 2007, and IEEE Regions, Sections and Chapters who do participate this year will have the ability to award Continuing Education Units (CEUs) to event participants free of charge. IEEE Regions, Sections and Chapters interested in participating will work directly with IEEE Educational Activities (EA) Staff to organize the event. IEEE EA Staff provides access to the selected course(s), can make recommendations or provide "best practices" for organizing the event, can provide surveys for attendees' feedback and CEUs to attendees who return completed surveys.

For more information visit the IEEE Expert Now Section-Chapter Program Web site at http://www.ieee.org/web/education/Expert_Now_IEEE/sc_program.html Web page or send a message to expertnowinfo@ieee.org.

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Institute for Computing, Information & Cognitive Systems
Distinguished Lecture Series

Nanoelectronics
Using Carbon Nanotubes
Gehan Amaratunga Cambridge University
Thursday 27 September 2007

The availability of carbon in tubular form with aspect ratios as high as 1000 and diameters as low as 0.5nm raises the possibility of whole new classes of electronic devices. Coupled with technologies that allow for precise placement of carbon nanotubes (CNTs) as well as control of tube dimensions through deterministic growth, scaling to form practical circuits becomes feasible. In this talk, we review these technologies and present some new devices that take advantage of very high aspect ratio graphite, including nanoelectromechanical switches and memory. When nanotube diameters approach 5nm, they begin to exhibit unique properties not seen in graphite. Technologies for controlled and deterministic growth of these single (double) walled CNTs are not well developed.

We review some approaches that hold promise in terms of SWCNT device scalability for circuits. Aspects of device scaling in ULSI ICs that limit performance are examined to understand the potential of CNTs as replacements for the Si channel in MOSFETs. We present a hetero-transistor system based on SWCNTs and ZnO nanowires that is used to achieve complementary (CMOS) conduction, and discuss its potential as the basis for replacing Si-channelled devices in ICs.

Gehan Amaratunga received his PhD from Cambridge University, where he has held the 1966 Professorship in Engineering since 1998 and heads the Electronics, Power and Energy Conversion Group. He has worked for over two decades on integrated and discrete electronic devices for power conversion, and on the science and technology of carbon-based electronics. Professor Amaratunga has published over 400 journal and conference papers. He was elected a Fellow of the Royal Academy of Engineering in 2004, and in 2007 was awarded the Academy's Silver Medal.

Web
Data Management
Raghu Ramakrishnan Yahoo! Research
Thursday 25 October 2007

The Web is no longer a static repository of documents; it is a dynamic repository of information that connects people with their passions, and on a more prosaic note, the applications they use in their personal and professional lives. How is the Web evolving as an information source, and how does this affect the future of information discovery? What are the implications of the rapid growth of social networks? How does the emergence of the Web as a delivery channel for services affect the future of software?

Technically, these trends have given rise to a new wave of challenges, and led to vigorous research on a number of fronts ranging from social network analysis, information extraction and community information management, massively distributed storage and computing platforms, as well as placing a premium on hosted service architectures. In this talk, I will discuss these issues and outline some of the solutions that are beginning to emerge.

Professor **Raghu Ramakrishnan** is Chief Scientist for Audience and Research Fellow at Yahoo!, and heads the Community Systems Group in Yahoo! Research. He is on leave from the Computer Sciences Department at the University of Wisconsin-Madison. He was founder and CTO of QUIQ, a company that pioneered question-answering communities, powering Ask Jeeves' AnswerPoint as well as customer-support for companies such as Compaq. His research has influenced query optimization in commercial database systems, and the design of window functions in SQL:1999. His paper on the Birch clustering algorithm received the SIGMOD 10-Year Test-of-Time award, and he co-wrote the widely-used text "Database Management Systems."

The ICICS DLS lectures are held in the Hugh Dempster Pavilion, Room 310 (6245 Agronomy Road, UBC).
All lectures are 3:30 to 4:30 PM, with a question and answer period from 4.30-4:50 PM