The 4th Annual Emerging Information Technology Conference

Nanotechnology,
MEMS,
System-on-Chip,
Bioinformatics,
C4I
Workshops

October 28 – October 29, 2004,
Friend Center, Princeton University,
Princeton, New Jersey, U.S.A.

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Welcome Message

Dear Conference Participants:

On behalf of the Emerging Information Technology Conference, EITC 2004, we would like to welcome you to the Conference. This Conference is a collaborative effort between the Chinese Institute of Engineers, U.S.A. and the co-organizing associations (Monte Jade Science and Technology Association, Chinese American Academic and Professional Society, and Chinese Association for Science and Technology, U.S.A.) The conference is held annually to provide a forum for professionals from the Pacific Rim and North America to discuss and exchange new information technologies. Its objectives are to strengthen the technical and business ties between the Pacific Rim and North American Information technology industries and to bring together experts and industry leaders to share technological advancements and business experiences.

This year, the organizing committee combines Nanotechnology and MEMS into one program track. System on a Chip (SoC) is another track. The C4I program track consists of four major areas: Next-Generation Convergent Communication, On-Demand Business/IT Bridging Technologies, Embrace Internet - The King of Future Communication Networks? and On-Demand Distributed Computing. And, the Bioinformatics program track covers Proteomics and Bioinformatics Tools, Genomics and Pharmacogenomics, Data Mining and Knowledge Base.

We are pleased to see such a cross-section of academics, industry and government represented at this conference. We encourage all of you to take advantage of this unique conference venture and to engage each other in active discussions about Nanotechnology/ MEMS, SoC, C4I and Bioinformatics and to jointly explore opportunities in emerging information technologies.

This conference would not have been possible without the hard work of many individuals in academics, industry and government. In particular, we would like to thank Michael Hwa Han Wang and the program track chairs among others for their capable leadership. We appreciate all the help from Princeton University and the sponsorship from Investment and Trade Office and Science Division, Taipei Economic and Cultural Representative Office in the United States.

Enjoy the conference, and enjoy your visit to Princeton!

General Conference Chairs

Ruby Lee, Princeton University
Si-Chen Lee, National Taiwan University

Conference Chairs

Sue-Jane Wang, U.S. Food and Drug Administration
Robert Hwang, Brookhaven National Lab

Conference Themes

Nanotechnology Workshop

Nanotechnology, emerging from nanoscience and nanoengineering is expected to lead the next industrial revolution through the 21st century. It is tiny, on the scale of one billionth of a meter (nano-meter or nm), yet its impact on our life will be tremendous. It is expected to change everything from agriculture to medicine and from electronics to mechanics. Nanometer scaled devices are imagined to be the smallest and fastest computer, smart and potent medicine, and self-replicating machines. Two approaches are being adopted to fabricate these devices. The top-down process such as to shrink the MEMS to NEMS and the bottom-up approach by synthesizing nano- parts via self-assembly process.

There is an intense interest in Nanotechnology stemming from the fact that developed countries and visionary businesses are rushing to invest and taking a leading position in. Additionally this vast frontier technology is open to chemists, physicists, molecular biologists, material scientists, engineers and literally anyone with new ideas and a want to explore and discover. If you have a thirst for exploration and wish to make your mark in science history, join us to learn more, make contacts, and share ideas with other experts in this brand new field.

MEMS Workshop

Microelectromechanical systems (MEMS) is an enabling technology that will potentially impact the economy and society every bit as much as microelectronics have these past few decades. Silicon integrated-circuit fabrication technology, through the practice of batch fabrication and reduction of scale, revolutionized the electronics industry. Applying these same principles and similar technologies to MEMS, the future shall bring microsystems in the biological, chemical, optical, electrical or mechanical domains that will create new and unforeseen markets. Already, MEMS products have reached the consumer marketplace. Examples include the silicon accelerometer in the automotive and video/computer games industries and the Texas Instruments Digital Mirror Device for projection displays. Yet, this is only the beginning. MEMS have the potential to provide critical enabling solutions to many new technology areas including wireless communications, optical communications and biotechnology. Examples include RF switches and other passive elements for personal communication systems; micro-optical switches for optical fiber networks; chemical "lab on a chip" and implant systems for biomedical applications.

To further this vision the fourth Emerging Information Technology Conference is being organized by a group of Chinese-American professionals and professional organizations. The conference would be a forum for the latest developments, issues, and trends in MEMS in the areas of 1) Consumer Products (Automobile Industry); 2) Wireless Communications; 3) Optical Systems; 4) Biotechnolgoy; 5) Aerospace Technology, 6) Harsh Environment Industrial Applications. MEMS have reached a stage for real applications in many fields. Experiences and considerations in practical functional systems would be welcome.

The rapid growth and success of high technology industries around Asia have transformed many economies including Taiwan's, which has a thriving semiconductor and electronics industry. Now, with the movement of the high-tech sector into information technology, and biotechnology, MEMS may have a significant future role in these economies.

One goal of this conference is to build and strengthen technical and business relationships among professionals, institutions and industries around the Pacific Rim. The conference would provide an opportunity for experts and industry leaders to exchange research developments in MEMS technologies, business experiences and to jointly explore new directions and opportunities.

System on Chip Workshop

Driven by the rapid growth of the Internet, telecommunication system, wireless technology, pervasive computing, consumer electronics, and multimedia applications, the integration of an entire VLSI system board onto a single silicon chip has become increasingly important in today's networked world.

The proliferation of system-on-chip (SoC) devices is further evidenced by the ubiquity of cellular phones, set-top-boxes, DVD players, and digital cameras, which brought revolutionary changes to the IT industry.

The system-on-chip track of EITC-2004 provides a forum for sharing recent advances in system-on-chip design and discussing new challenges in the development of SoC manufacturing technology, system infrastructure, design methodology, and design automation tools.

It is our goal to bring together SoC experts from both the academics and industry to address the critical hardware and software design issues, such as power management, signal processing and security applications, embedded memory and processor cores, the validation and reuse of intellectual property (IP), platform-based design with common architectures, and network-on-chip.

The successful implementation and integration of these key building blocks will enable us to develop important SoC applications in the future with increased productivity and reduced cost.

Bioinformatics Workshop

The world is in the midst of an information and communication technological revolution that is transforming almost every aspect of our lives. The intersection of information technology and biotechnology has become critically important because of the vast amount of data involved in the study of biology. Bioinformatics is very much a discipline in expansion as evidenced by the convergence of Biology, Computer Science, Information and Communication Technology, Mathematics and Statistics.

Bioinformatics highlights the application of statistics, data mining, artificial intelligence, neural networks, machine learning and natural language processing techniques to computationally difficult problems in molecular biology. It is dedicated to provide researchers the knowledge and skills necessary for the invention of algorithms and the creation of computational systems that facilitate the understanding of biological processes and application of these tools and methods to individuals and communities through public health and prevention programs. The Human Genome Project has transformed molecular biology into an information-based science. However, the lack of agreement over the number of human genes, even with the genome essentially complete, depicts the difficulty of certainty in biology and points to the need for substantially better algorithms and validation techniques. It is envisaged that bioinformatics will help to advance biomedical research *in silico*.

The bioinformatics approaches to biotechnology have broadened the conventional ability to study genomics and proteomics. Pharmacogenomics and pharmacogenetics approaches have further advanced drug discovery and drug development, and disease diagnostics device development. Investigation of the relationship between inter-individual genetic variability (polymorphism) in drug response (including efficacy and safety) or drug metabolism has moved forward the practice of molecular biology and the view of the future potential of medicine such as individualized medicine. Analogous to high throughput/data intensive analytical methods for genomic research, the single nucleotide polymorphism (SNP) array technology will rely on the bioinformatics and statistical algorithms to properly define SNP haplotypes so as to understand individual profiles, which entail individual susceptibility to drug toxicity and/or drug response.

The Bioinformatics Track of EITC-2004 will focus on the current bioinformatics research and development frontiers in both academia and industry, with leading scientist presenting on issues like gene annotation, protein annotation, data integration, tool integration, and data analysis and data mining algorithm development. It will engage dialogues across disciplines and invite discussions in the forefront of the exciting biomedical informatics research.

Content, Computer, Communications, Consumer Electronics, and Integration (C4I) Workshop

There is no doubt that the technologies are changing rapidly all around us in all industries. Comparing to the very first cell phone in 1973, today's cell phone is 10 times smaller and lighter. X-ray shows on computer screen instead of on film. DNA sequence recorded due to the new computing power. The amazing part is that we are getting used to the speed and demand more and want to pay less. In short, the speed of change isn't just felt by engineers or experts in the industries but average consumers. And, the electrical, electronic and computing industries are the driving forces behind all these changes.

Innovation is essential for the leadership and surviving in this new era not only on technology, but also in business process. Voice over IP is a technology innovation which changes the perspective of the telecommunication industry. However, ordering a snack using your PDA or cell phone needs innovation to put together technologies and business process. On demand was a manufacture concept several years back to cut down inventories and manufacture cost. Now, this concept grows into consumer arena as more and more savvy consumers wants to pay for usage only and no more. This trend in turn put on pressure to suppliers' business process and technologies. New processes and technologies are needed to sustain such operation model. To respond to these two major forces of change, innovation and on demand, the C4I (Content, Computer, Communications, Consumer electronics, and Integration) program track will bring together industry leaders and experts to share their insightful views of the corresponding industry technologies in the era of on demand, also, views and thoughts regarding innovation at work place and in people training to excel in the new environment.

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Conference Program

	October 28, 2004 (Thursday)	October 29, 2004 (Friday)
08:00 AM to 09:00AM	**Registration**	**Registration**
09:00 AM to 10:00 AM	**Opening Remarks**	**Opening Remarks**
10:00 AM to 11:10 AM	P1 - Plenary Session I: **Nanotechnology/MEMS**	P3 - Plenary Session III: **Bioinformatics**
10 Minutes	**Break**	**Break**
11:20 AM to 12:30 PM	P2 – Plenary Session II: **System-on-Chip (SoC)**	P4 – Plenary Session IV: **C4I**
12:30 PM to 02:00 PM	**Luncheon**	**Luncheon**
(Parallel) 02:00 PM to 03:45 PM	T1 – Technical Session 1: **Nanotechnology/MEMS (I)**	T9 – Technical Session 9: **Nanotechnology/MEMS (III)**
	T2 – Technical Session 2: **System-on-Chip (I)**	T10 – Technical Session 10: **System-on-Chip (III)**
	T3 – Technical Session 3: **Bioinformatics (I): Proteomics and Bioinformatics Tools**	T11 - Technical Session 11: **Bioinformatics (III): Data Mining and Knowledge Base**
	T4 – Technical Session 4: **C4I (I): Next-Generation Convergent Communication**	T12 – Technical Session 12: **C4I (III): Embrace Internet - The King of Future Communication Networks?**
30 Minutes	**Break**	**Break**
(Parallel) 4:15 PM to 6:00 PM	T5 – Technical Session 5: **Nanotechnology/MEMS (II)**	T13 – Technical Session 13: **Nanotechnology/MEMS (IV)**
	T6 – Technical Session 6: **System-on-Chip (II)**	T14 – Technical Session 14: **System-on-Chip (IV)**
	T7 – Technical Session 7: **Bioinformatics (II): Genomics and Pharmacogenomics**	T15 – Technical Session 15: **Bioinformatics (IV)**
	T8 – Technical Session 8: **C4I (II): On-Demand Business/IT Bridging Technologies**	T16 – Technical Session 16: **C4I (VI): On-demand Distributed Computing**

Day 1 (Thursday, October 28, 2004)

08:00-09:00 AM Registration
Room: Dean's Conference Room Foyer, Friend Center, Princeton University

09:00-10:00 AM Opening Remarks
General Conference Chair: Si-Chen Lee, National Taiwan University
Conference Chair: Robert Hwang, Brookhaven National Lab
Room: Convocation Room 113

Keynote Speeches:

"Introduction to the Nano-Science and Technology Research in National Taiwan University"
Si-Chen Lee, National Taiwan University

"Center for Functional Nanomaterials at Brookhaven National Laboratory"
Robert Hwang, Brookhaven National Lab

10:00-11:10 AM P1 - Plenary Session I: Nanotechnology/MEMS
Chair: Benjamin Chu, State University of New York at Stony Brook
Room: Convocation Room 113

"Nanofabrication with Self-Assembling Block Copolymer Masks"
Richard A. Register, Princeton University

"Nanobiotechnology Development at ITRI"
Jassy Wang, Industrial Technology Research Institute

11:10-11:20 AM Break

11:20 AM-12:30 PM P2 – Plenary Session II: SoC
Chair: Yu-Hen Hu, University of Wisconsin at Madison
Room: Convocation Room 113

"Challenges and Opportunities in SOC Design for Ubiquitous Computing"
Jhing Fa Wang, National Cheng Kung University

"Low-power Interconnection Networks"
Li-Shiauan Peh, Princeton University

12:30-02:00 PM Luncheon
Room: Convocation Room 113

02:00-03:45 PM Parallel Technical Sessions

T1 – Technical Session 1: Nanotechnology/MEMS (I)
Chair: Christopher Li, Drexel University
Room: 006

"Super-Tough Surface-Modified Carbon Nanofiber/UHMWPE Nanocomposites"
Benjamin S. Hsiao, State University of New York at Stony Brook

"Piezoelectric Cantilever Sensors for Emerging Biotechnology: Synthesis, Design, and Applications"
Wei-Heng Shih, Drexel University

Wan Y. Shih, Drexel University

"Nanofiber Technology"
Frank Ko, Drexel University

"Manipulating Carbon Nanotubes with Nucleic Acids"
Ming Zheng, DuPont Central Research and Development

"Synthesis and Characterization of Fe Based Nanoparticles with Polymer Surfactant—Pluronic® F127"
Jriuan Lai, University of Washington

Comment [u1]: The name(s) of the speaker(s).

T2 – Technical Session 2: System-on-Chip (I)
Chair: Pong-Fei Lu, IBM T. J. Watson Research Center
Room: 004

"A Semi-custom Design Flow in High-performance Microprocessor Design"
Pong-Fei Lu, IBM T. J. Watson Research Center

"Ramification of Sub-resolution Semiconductor Technologies"
Fook-Luen Heng, IBM T. J. Watson Research Center

"Multi-Agent Based Reconfigurable Embedded Systems"
Yan Meng, Stevens Institute of Technology

T3 – Technical Session 3: Bioinformatics (I) - Proteomics and Bioinformatics Tools
Chairs: Hai Hu, Windber Research Institute
Li-San Wang, University of Pennsylvania
Room: 008

"Fast Algorithmic Techniques for Reconstructing Large Evolutionary Trees"
Usman Roshan, NJIT

"Using Quasi Consensus Sequences for Protein Family Comparison"
Li Liao, University of Delaware

"Proteomic Biomarker Patterns: Challenges and Opportunities"
Wade Rogers, Cira Discovery Sciences, Inc.

"Genomic characterization of ribitol teichoic acid synthesis in meticillin-resistant *Staphylococcus aureus*"
Jiang Ying, Merck

T4 – Technical Session 4 : C4I (I) - Next-Generation Convergent Communication
Chair: Ut-Va Koc, Bell Labs, Lucent Technologies
Room: 109

"Novel Modulation Techniques for Next-Generation Optical Communication"
Xing Wei, Bell Labs. Lucent Technologies

"Cellular In-building Coverage"
Zhengxiang Ma, Bell Labs. Lucent Technologies

"Emerging Technologies in Converged Next Generation Networks"

Dong Sun, Bell Labs, Lucent Technologies

"Building Applications For the Next Generation Telecom Services"
Dong Liu, Bell Labs, Lucent Technologies

03:45-04:15 PM Break

04:15-06:00 PM Parallel Technical Sessions

T5 – Technical Session 5: Nanotechnology/MEMS (II)
Chair: Lei Zhu, University of Connecticut
Room: 006

"Supramolecular Assembled Fullerenol-Poly(dimethylsiloxane) Nanocomposites"
Shuqin Zhou, City University of New York , College of Staten Island

"Hierarchical Assembly of a Series of Rod-coil Block Copolymers"
Christopher Y. Li, Drexel University

"Creating 3D Microstructures by Interference Lithography: from 3D Photonic Crystals to Biomimetic Microlens Arrays"
Shu Yang, University of Pennsylvania

"An ABC Stacking Structure Inside Supramolecular Nanocolumns"
Shi Jin, City University of New York , College of Staten Island

T6 – Technical Session 6: System-on-Chip (II)
Moderator: Lanrong Dung, National Chao Tung University
Room: 004

"Temperature-aware On-chip Networks"
Li Shang, Queen's University

"Study on Power-Aware Motion Estimation Architecture"
Lanrong Dung, National Chao Tung University

T7 – Technical Session 7: Bioinformatics (II) – Genomics and Pharmacogenomics
Chair: Zhongwei Li, Florida Atlantic University
Room: 008

"Genomic analysis of RNA processing"
Zhongwei Li, Florida Atlantic University

"TIGR Gene Indices: Clustering and Assembling EST and Known Genes and Integration with Eukaryotic Genomes"
Dan Lee, The Institute for Genomic Research

"Semi-parametric Gene Ranking for Microarray Experiments"
Li-San Wang, University of Pennsylvania

"Identification of Molecular Markers in Blood of Patients with Breast Tumors"
Song Yang, Windber Research Institute

T8 – Technical Session 8: C4I (II) On-Demand Business/IT Bridging Technologies

Chair: Henry Chang, IBM T.J. Watson Research Center
Room: 109

"Autonomic Enterprise Security through Orchestration"
Naga Ayachitula, IBM T.J. Watson Research Center

"Model-Driven Business Integration and Monitoring"
Fred Wu, RSM, IBM T.J. Watson Research Center

"Usability Approach to Reducing Concept-to-Code Cycle Time: An Interdisciplinary Practitioner's View"
C. J. Tsai, AT&T Labs

Day 2 (Friday, October 29, 2004)

08:00-09:00 AM Registration
Room: Dean's Conference Room Foyer

09:00-10:00 AM Opening Remarks
General Conference Chair: Ruby Lee, Princeton University
Conference Chair: Sue-Jane Wang, Food and Drug Administration
Room: Convocation Room 113

Keynote Speeches:

"Overview of Research in the Princeton Architecture Lab for Multimedia and Security (PALMS)"
Ruby Lee, Princeton University

"An Update of Current Advances in Pharmacogenomic and Pharmacogenetic Drug Trials Using SNP Profile and Gene Expression Signature"
Sue-Jane Wang, Food and Drug Administration

10:00-11:10 AM P3 - Plenary Session III: Bioinformatics
Chair: Sue-Jane Wang, Food and Drug Administration
Room: Convocation Room 113

Isidore Rigoutsos, IBM T. J. Watson Research Center

"Challenges and Solutions: Integration of Clinical, Genomic, and Proteomic Data in a High Throughput Environment"
Hai Hu, Windber Research Institute <Accepted>

11:10-11:20 AM Break

11:20 AM-12:30 PM P4 – Plenary Session IV: C4I
Chair: Shu-Ping Chang, IBM T. J. Watson Research Center
Room: Convocation Room 113

"Broadband Video Streaming: Promises and Challenges"
Monsong Chen, Infovalue

"VoIP on Wireless Mobile Communications"
Qi Bi, Bell Labs, Lucent Technologies

"Research Challenge: Extending Invention Toward Innovation"
Jeng-Yao Chung, Global Electronics Industry, IBM

12:30-2:00 PM Luncheon
Room: Convocation Room 113

02:00-03:45 PM Parallel Technical Sessions

T9 – Technical Session 9: Nanotechnology/MEMS (III)
Chair: Darrin J. Young, Case Western Reserve University
Room: 004

"MEMS Based Noninvasive Optical Imaging"
Huikai Xie, University of Florida

"Hydrogel-Based MEMS Platforms for Smart Sensing and Active Flow Control"
Babak Ziaie, University of Minnesota

"Programmable and Autonomous Magnetically-Driven Microfluidic Actuators Using Liquid-Phase Photopolymerization (LP^3)"
Hongrui Jiang, University of Wisconsin

"High-Performance Micro-Electro-Mechanical Strain Sensor Technology"
Darrin J.Young, Case Western Reserve University

T10 – Technical Session 10: System-on-Chip (III)
Chair: Win-Bin See, Aerospace Industrial Development Company (AIDC)
Room: 008

"Custom Instruction Synthesis for Extensible Processor Platforms"
Fei Sun, Princeton University

"Design and Implementation of an Embedded Software Development Platform"
Win-Bin See, Aerospace Industrial Development Company (AIDC)

" Opportunities and Challenges for Code Compression"
Kuang-Bin K Lin and Wayne Wolf, Princeton University

"RFID ICBiochip and Bioinformatics"
Pao-Chien (Daniel) Di, Vincogen

T11 – Technical Session 11: Bioinformatics (III) – Data Mining and Knowledge Base
Chair: Zoran Obradovic, Temple University
Room: 006

"Data Cleansing and Knowledge Base"
Katherine Herbert, Montclair State University
Jason T. L. Wang, New Jersey Institute of Technology

"Biological Name Entity Tagging"
Hongfang Liu, University of Maryland at Baltimore County

"Data Mining Approach to Study of Protein Disorder"
Zoran Obradovic, Temple University

"PIRSF Protein Classification System and Sequence Annotation"
Hongzhan Huang, Georgetown University

T12 - Technical Session 12: C4I (III) Embrace Internet - The King of Future Communication Networks?
Chair: Charlie Chia J. Liu, AT&T Labs
Room: 109

"Internet Cyber Security"
Jonathan Chao, Polytechnic University

"Wireless Broadband - A Third Wave for Broadband Access"
Paul S.D. Lin, AT&T Labs

"VoIP on 1xEVDO Wireless Network"
Pi-Chun Chen, Lucent Technologies

03:45-04:15 PM Break

04:15-06:00 PM Parallel Technical Sessions

T13 – Technical Session 13: Nanotechnology/MEMS (IV)
Chair: Shuiqin Zhou, City University of New York
Room: 004

"Molecularly-Engineered Assemblies of Nanoparticles"
Chuan-Jian Zhong, State University of New York at Binghamton

"Probing Bacteria Adsorption on Planar and Nanoparticle-Patterned Surfaces using Atomic Force Microscopy"
Jin Luo, State University of New York at Binghamton

"Phases and Phase Transitions in a Coil-Coil-Disk Triblock Oligomer"
Lei Zhu, University of Connecticut

Chwen-Yang Shew, City University of New York , College of Staten Island

T14 – Technical Session 14: System-on-Chip (IV)
Chair: Xun Liu, North Carolina State University
Room: 008

"Interconnect Optimization with Repeater Insertion for IP-based SOCs"
Xun Liu, North Carolina State University

"Thermal-aware Network-on-chip Design"
Yuan Xie, Pennsylvania State University

"Multilevel Routing with Jumper Insertion for Antenna Avoidance"
Sao-Jie Chen, National Taiwan University

"Statistical Timing Analysis for Global Interconnect Wires"
Yu Hen Hu, University of Wisconsin - Madison

T15 – Technical Session 15: Bioinformatics (IV) - Interface of Computer Sciences and Biology
Chair: Isidore Rigoutsos, IBM T. J. Watson Research Center
Room: 006

"Transcriptional Regulation: Signals, Interactions and Modules"
Sridhar Hannenhalli, University of Pennsylvania

"An *in silico* analysis of Human Cytomegalovirus coding potential"
Eain Murphy, Princeton University

"Mathematical Programming Approaches to Side-Chain Positioning"
Mona Singh, Princeton University

"Accurate Identification of Chromosomal Copy Number Changes on a Genomic Scale"
Olga Troyanskaya, Princeton University

T16 – Technical Session 16: C4I (IV) On-Demand Distributed Computing

Chair: Rong Chang, IBM T. J. Watson Research Center
Room: 109

"Modular Sensor Architecture (MSA) Design for On-Demand Sensor Based Distributed Computing"
Shu-Ping Chang, IBM T.J. Watson Research Center

"Ad hoc Networking with Swarm Intelligence"
Chien-Chung Shen, University of Delaware

"Policy Management and Analysis"
Hong Cheng, Telcordia Technologies

"Proactive SLA Management and License-Aware Resource Management for On Demand IT Services"
Rong Chang, IBM T.J. Watson Research center

Abstracts and Biographies

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Princeton University

BIOGRAPHY

Ruby B. Lee is the Forrest G. Hamrick Professor of Engineering and Professor of Electrical Engineering at Princeton University, with an affiliated appointment in the Computer Science department. She is the director of the Princeton Architecture Laboratory for Multimedia and Security (PALMS). Her current research is in designing security and new media support into core computer architecture, embedded systems and global networked systems, and in architectures resistant to Distributed Denial of Service attacks and Internet-scale epidemics. She teaches courses in *Cyber Security* and *Processor Architectures for New Paradigms*. She is a Fellow of the Association for Computing Machinery (ACM) and a Fellow of the Institute of Electrical and Electronic Engineers (IEEE). She is Associate Editor-in-Chief of *IEEE Micro* and Editorial Board member of *IEEE Security and Privacy*.

Prior to joining the Princeton faculty in 1998, Dr. Lee served as chief architect at Hewlett-Packard, responsible at different times for processor architecture, multimedia architecture and security architecture for e-commerce and extended enterprises. She was a key architect in the definition and evolution of the PA-RISC architecture used in HP servers and workstations, and also led the first CMOS PA-RISC single-chip microprocessor design. As chief architect for HP's multimedia architecture team, Dr. Lee led an inter-disciplinary team focused on architecture to facilitate pervasive multimedia information processing using general-purpose computers. This resulted in the first desktop computer family with integrated, software-based, high fidelity, real-time multimedia. Dr. Lee also co-led a multimedia architecture team for IA-64. Concurrent with full-time employment at HP, Dr. Lee also served as Consulting Professor of Electrical Engineering at Stanford University. She has a Ph.D. in Electrical Engineering and a M.S. in Computer Science, both from Stanford University, and an A.B. with distinction from Cornell University, where she was a College Scholar. She is an elected member of Phi Beta Kappa and Alpha Lambda Delta. She has been granted 115 United States and international patents, with several patents pending.

Research web page: http://palms.ee.princeton.edu
Personal web-page: http://www.princeton.edu/~rblee

General Conference Chairs

Si-Chen Lee

Professor
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BIOGRAPHY

Si-Chen Lee is a professor in the Department of Electrical Engineering of the National Taiwan University. He received the B.S. degree in electrical engineering from National Taiwan University in 1974 and Ph.D degree in electrical engineering from Stanford University in 1981. He served as the chairman of the Department from 1988 to 1992 and the Dean of academic affairs of National Taiwan University from 1996 to 2002. His current research interests are in the device applications and the growth kinetics of InGaAs/GaAs strained layer quantum dot device, InGaAs/InAs room temperature infrared light emitting diode and photodetector with applications to the pollution detection and biological reaction of cells. In addition, he is also interested in hydrogenated and deuterated amorphous and poly-silicon (carbon, germanium) hydrogen material and devices, such as thin film transistors and neural network image sensors. Prof. Lee is an IEEE Fellow.

Conference Chairs

Sue-Jane Wang

The Lead Senior Pharmacogenomics/Pharmacogenetic Biostatistics
FDA Inter-Center Pharmacogenomics/Pharmacogenetics Working Group
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BIOGRAPHY

Sue-Jane Wang joined the U.S. Food and Drug Administration in 1994, where she is currently an expert biostatistician in genomic drug trials. Before joining FDA, she was a senior biostatistician at the medical genetics division, Cedars-Sinai medical center, California. As a steering committee member of the Pharmacogenomic/Pharmacogenetic Working Group at FDA, Dr. Wang is currently involved in planning the third PG workshop on "Pharmacogenomics in Drug Development and Regulatory Decision-Making: Three Years of Promise, Proposals and Progress on Optimizing the Benefit/Risk of Drug Development and Therapy" as a chair for Strategies and Challenges in Retrospective Validation of Genomic Biomarker. Dr. Wang received her master degree from University of California, Los Angeles, CA and Ph.D. from University of Southern California, CA. Her major research and application activities include adaptive (flexible) designs in controlled (genomic) clinical trials; genetic and epidemiologic studies; statistical methods for analysis of microarray data and pharmacogenomics/ pharmacogenetics data in drug/diagnostic test development; and teaching in biostatistics. Her professional activities in the pharmacogenomics/ pharmacogenetics area are mainly chairs and invited speakers. Dr. Wang received FDA Award of Merits, FDA outstanding service awards, FDA/CDER Excellence in communication Award, and FDA/CDER Excellence in Analytical Science Award.

Conference Chairs

Robert Hwang

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BIOGRAPHY

Robert Q. Hwang is the director of the Brookhaven National Laboratory Center for Functional Nanomaterials (CFN), which is one of 5 DOE Office of Science sponsored Nanoscale Science Research Center national user facilities. Prior to this position, he managed the Thin Film and Interface Science department at Sandia National Laboratories. He earned his BS in physics from UCLA and his PhD from the University of Maryland. He was a post-doc at Lawrence Berkeley Lab and UC Berkeley and a Humboldt Fellow at the University of Munich. Bob's interests include atomistic mechanisms in thin film growth and metal alloying, thin film and interfacial strain, corrosion and nano-scale properties of metals.

Conference Program Chairs

Benjamin Chu

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BIOGRAPHY

Professor Chu obtained his B.S., magna cum laude degree from St. Norbert College and his Ph.D. in physical chemistry from Cornell University. He was a post-doctoral student with the late Professor Peter J. W. Debye for four years before he started his academic career at the University of Kansas. In 1968, he moved to Stony Brook University where he is now a Distinguished Professor.

Professor Chu was an Alfred P. Sloan Fellow, a John Simon Guggenheim Fellow, a Fellow and Visiting Professor of the Japan Society for the Promotion of Science, and a Humboldt Awardee for Senior U.S. Scientists from the Alexander von Humboldt Foundation in Germany. He is a Fellow of the American Physical Society and of the American Institute of Chemists. In 1992, he was appointed an Honorary Professor of the Chinese Academy of Sciences; in 1996, an Honorary Professor of Nankai University; in 1998 an Honorary Professor of Xiamen University; and in 2004, an Honorary Professor of Wuhan University, all of PR China. In 2004, he became a member of the St. Norbert College Board of Trustees.

In 1993, Professor Chu received the High Polymer Physics Prize from the American Physical Society. He was the Langmuir Distinguished Lecturer sponsored by the Division of Colloid and Surface Science of the American Chemical Society in 1994, received the Award for Distinguished Service in Advancement of Polymer Science, sponsored by the Society of Polymer Science, Japan, in 1997, and the 1998 Outstanding Achievement Award of Chinese Institute of Engineers/USA.

Conference Program Chairs

Darrin J. Young

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BIOGRAPHY

Darrin J. Young received his BS with honors, MS, and PhD degrees from the Department of Electrical Engineering and Computer Sciences at University of California at Berkeley in 1991, 1993, and 1999, respectively. His doctoral dissertation emphasizes on microelectromechanical devices design and fabrication technologies for radio frequency analog signal processing. Between 1991 and 1993, he worked at Hewlett-Packard Laboratories in Palo Alto, California, where he designed a shared memory system for a DSP-based multiprocessor architecture. During the summer of 1997, he worked at Rockwell Semiconductor Systems in Newport Beach, California, where he designed silicon bipolar RF analog circuits for cellular telephony applications. Between 1997 and 1998, he was also at Lawrence Livermore National Laboratory, working on the design and fabrication of three-dimensional RF MEMS coil inductors for wireless communications. Dr. Young joined the Department of Electrical Engineering and Computer Science at Case Western Reserve University as an assistant professor in 1999. His research interests include MEMS and nano-electro-mechanical devices design, fabrication, and integrated analog circuits design for communications, inertial sensing, biomedical implant, and general industrial applications.

Conference Program Chairs

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BIOGRAPHY

Yu Hen Hu is a faculty member at the Department of Electrical and Computer Engineering, University of Wisconsin, Madison. He received BSEE from National Taiwan University, and MSEE and PhD degrees from University of Southern California. Prior to joining University of Wisconsin, he was faculty in the Electrical Engineering Department of Southern Methodist University, Dallas, Texas. His research interests include multimedia signal processing, artificial neural networks, fast algorithms and design methodology for application specific micro-architectures, as well as computer aided design tools. He has published more than 200 technical papers, edited two books in these areas.

Dr. Hu has been an associate editor for the IEEE Transaction of Acoustic, Speech, and Signal Processing, IEEE signal processing letters, European Journal of Applied signal Processing, and Journal of VLSI Signal Processing. He has served as the secretary and an executive committee member of the IEEE signal processing society, a board of governors of IEEE neural network council representing the signal processing society, the chair of signal processing society neural network for signal processing technical committee, and is the current chair of IEEE signal processing society multimedia signal processing technical committee. He is also a steering committee member of the international conference of Multimedia and Expo on behalf of IEEE Signal processing society.

Dr. Hu is a fellow of IEEE.

Conference Program Chairs

Cathy Wu

Georgetown University Medical Center

BIOGRAPHY

Dr. Cathy Wu is the Director of Protein Information Resource (PIR) and Professor of Biochemistry and Molecular Biology at the Georgetown University Medical Center, Washington, D.C. She has a M.S. and a Ph.D. in biology and a second M.S. in computer science. She has conducted bioinformatics research for almost 15 years, taught Computer Science for five years, and developed several protein family classification systems and databases, including one with a US patent. She has managed large software and database projects and led the PIR projects since 1999. Dr. Wu has served on several scientific advisory boards, many bioinformatics grant review panels for NIH, NSF and DOE, and on numerous program committees for international bioinformatics conferences. She has published about 100 papers and three books, and is a frequent invited speaker for lectures and tutorials at universities, companies, and conferences.

An integrated public bioinformatics resource, PIR has provided protein databases, data mining and sequence analysis tools to support genomic and proteomic research for over three decades. PIR recently joined the European Bioinformatics Institute and Swiss Institute of Bioinformatics to establish UniProt—the Universal Protein Resource—to produce a single worldwide resource of protein sequence and function, by unifying the PIR, Swiss-Prot, and TrEMBL database activities.

Conference Program Chairs

Hai Hu

Windber Research Institute Hai Hu, Ph. D.
Director of Biomedical Informatics
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BIOGRAPHY

Dr. Hai Hu is currently Director of Biomedical Informatics at Windber Research Institute, jointly appointed as Research Assistant Professor in the Department of Surgery at USUHS. He has nearly 5 years of direct experiences applying computational and statistical technologies to solving high-throughput biological problems, including developing data mining, data analysis, and data tracking systems. Proceeding to it he conducted research as a molecular biophysicist/biologist for 4 years after obtaining Ph. D. degree. Besides, he had several years of industrial computer engineering experiences. His educational background includes physics, computer engineering, statistics, and biophysics. Currently he is heading the development of the biomedical informatics infrastructure at the Institute, including developing a data warehouse and a clinical laboratory workflow system. At the same time, he is leading several research projects involving human subjects. He has published many peer-reviewed papers, and presented at numerous national and international scientific and business conferences, often as an invited speaker recently. He has also been a key co-organizer in several scientific conferences.

Conference Program Chairs

Shu-Ping Chang, Ph. D.

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BIOGRAPHY

Shu-Ping Chang is currently a researcher at IBM T.J. Watson Research Center. He works on the research and design for next generation high speed computer cluster technologies for high volume information analysis and decision making system.

In his previous assignment, he was the Manager of Integrated Content Management Solution developing the Media Production Suite (MPS) product which is currently used by CNN Library as their news center archive. He worked with customers to understand their business and technical needs, and developed the turnkey technologies for the overall solution. Shu-Ping worked on this product from 2000 to 2003.

Shu-Ping Chang was awarded his Ph. D. and Master degrees in Computer and Information Sciences by the University of Minnesota. His Bachelor degree is in Communication Engineering from Chao-Tung University, Taiwan, ROC with first-place honor.

He joined IBM T.J. Watson Research Center in 1990 developing microcode for Logical-Link Control in FDDI station. In 1992, he moved to Broadband Networking where he developed high speed memory based packet switch and latter ATM LAN/WAN edge controller. Dr. Chang jointed Industrial Solution Unit in 1996 as senior architect/engineer where he developed several products for Media and Entertainment industries especially in Media Asset Management area.

Conference Coordinators

Li-San Wang

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BIOGRAPHY

Li-San Wang received his B.S.E.E. ('94) and M.S.E.E. ('96) from the National Taiwan University; he then received his M.S. ('00) and Ph.D. ('03) from the University of Texas at Austin, both in Computer Sciences. Currently he is a postdoctoral fellow at the University of Pennsylvania. His research interest includes theory of algorithms, phylogenetics, and microarray analyses.

Conference Coordinators

Chang Hong Lin

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BIOGRAPHY

Chang Hong Lin received the B.S. degree and the M.S. in Electrical Engineering from National Taiwan University, Taipei, Taiwan R.O.C. in 1997 and 1999 and the M.A. degree in Electrical Engineering in 2003 from Princeton University, Princeton, NJ, USA, where he is currently pursuing the Ph.D. degree in Electrical Engineering.

His research interests include design and implementation of real-time distributed camera systems, fault-tolerance in distributed system, code compression and encryption and hardware/software co-synthesis.

Day1

Opening Remarks

Keynote Speech

Introduction to the Nano-Science and Technology Research in National Taiwan University

Si-Chen Lee

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ABSTRACT

The National Taiwan University (NTU) had established a research center in 2002 for coordinating the interdisciplinary research on Nano-sceinces and technologies. The center consists of four subdivisions: nano-materials, nano-devices, nano electro-mechanical systems (NEMS) and bio-nano. In this talk, I will introduce the research programs and representative results of the center which include (1) the discovery of giant magnetic susceptibility of carbon nano-rings and strain induced metal-semiconductor transition, (2) on-chip Si/Ge quantum dot light emitting diode and photodetector, (3) detection of the 3D motion of protein molecule IgG, and (4) surface plasmon resonance biochip and systems.

BIOGRAPHY

Si-Chen Lee is a professor in the Department of Electrical Engineering of the National Taiwan University. He received the B.S. degree in electrical engineering from National Taiwan University in 1974 and Ph.D degree in electrical engineering from Stanford University in 1981. He served as the chairman of the Department from 1988 to 1992 and the Dean of academic affairs of National Taiwan University from 1996 to 2002. His current research interests are in the device applications and the growth kinetics of InGaAs/GaAs strained layer quantum dot device, InGaAs/InAs room temperature infrared light emitting diode and photodetector with applications to the pollution detection and biological reaction of cells. In addition, he is also interested in hydrogenated and deuterated amorphous and poly-silicon (carbon, germanium) hydrogen material and devices, such as thin film transistors and neural network image sensors. Prof. Lee is an IEEE Fellow.

Keynote Speech

Center for Functional Nanomaterials at Brookhaven National Laboratory

Robert Hwang

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ABSTRACT

Nanotechnology offers tremendous promise to improve nearly all aspects of our quality of life. To accelerate the scientific breakthroughs that are required, the Department of Energy is constructing and supporting the Center for Functional Nanomaterials (CFN) at Brookhaven National Lab as one of 5 Nanoscale Science Research Centers user facilities in the U.S. In this talk, I will describe the capabilities and the research thrust areas of the CFN.

BIOGRAPHY

Robert Q. Hwang is the director of the Brookhaven National Laboratory Center for Functional Nanomaterials (CFN), which is one of 5 DOE Office of Science sponsored Nanoscale Science Research Center national user facilities. Prior to this position, he managed the Thin Film and Interface Science department at Sandia National Laboratories. He earned his BS in physics from UCLA and his PhD from the University of Maryland. He was a post-doc at Lawrence Berkeley Lab and UC Berkeley and a Humboldt Fellow at the University of Munich. Bob's interests include atomistic mechanisms in thin film growth and metal alloying, thin film and interfacial strain, corrosion and nano-scale properties of metals.

P1 - Plenary Session 1: Nanotechnology/MEMS

Session Chair

Benjamin Chu

Distinguished Professor, Chemistry Department
State University of New York at Stony Brook
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BIOGRAPHY

Professor Chu obtained his B.S., magna cum laude degree from St. Norbert College and his Ph.D. in physical chemistry from Cornell University. He was a post-doctoral student with the late Professor Peter J. W. Debye for four years before he started his academic career at the University of Kansas. In 1968, he moved to Stony Brook University where he is now a Distinguished Professor.

Professor Chu was an Alfred P. Sloan Fellow, a John Simon Guggenheim Fellow, a Fellow and Visiting Professor of the Japan Society for the Promotion of Science, and a Humboldt Awardee for Senior U.S. Scientists from the Alexander von Humboldt Foundation in Germany. He is a Fellow of the American Physical Society and of the American Institute of Chemists. In 1992, he was appointed an Honorary Professor of the Chinese Academy of Sciences; in 1996, an Honorary Professor of Nankai University; in 1998 an Honorary Professor of Xiamen University; and in 2004, an Honorary Professor of Wuhan University, all of PR China. In 2004, he became a member of the St. Norbert College Board of Trustees.

In 1993, Professor Chu received the High Polymer Physics Prize from the American Physical Society. He was the Langmuir Distinguished Lecturer sponsored by the Division of Colloid and Surface Science of the American Chemical Society in 1994, received the Award for Distinguished Service in Advancement of Polymer Science, sponsored by the Society of Polymer Science, Japan, in 1997, and the 1998 Outstanding Achievement Award of Chinese Institute of Engineers/USA.

P1 - Plenary Session 1: Nanotechnology/MEMS

Nanofabrication with Self-Assembling Block Copolymer Masks

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ABSTRACT

Block copolymers spontaneously self-assemble into "microdomain" structures: simple repeating patterns with a size scale controlled by the polymer molecular weight (typically 10-100 nm, so "nanodomains" might be a better term). Similar patterns are obtained when these block copolymers are deposited in layers a single nanodomain thick. Such thin films make excellent contact masks for patterning, and we have used them as templates to fabricate dense arrays of 20 nm metal or semiconductor particles (dots) or lines (wires). For applications where these nanoscopic entities are to be individually addressed, controlling the long-range order and orientation is a key problem, since the nanodomains naturally form a polygrain structure in both thin films and bulk, with a grain size which is typically microns at most. We have developed both scanning electron microscope (SEM) and *in-situ* atomic force microscope (AFM) methods to study the grain growth and alignment processes in these films. By sequentially imaging the same region of a film by AFM, "movies" of microdomain motion are obtained which directly reveal the mechanisms of defect annihilation in these thin film masks. Moreover, we have recently demonstrated that shear can align the nanodomains in these films over centimeter-square areas, producing truly long-range orientational order.

BIOGRAPHY

Richard A. (Rick) Register joined Princeton University in 1990, where he is currently Professor of Chemical Engineering, a founding member of the Princeton Institute for the Science and Technology of Materials, and Associate Director of the Princeton Center for Complex Materials, a Materials Research Science and Engineering Center at Princeton funded by the National Science Foundation. He is also presently the Chair of the Division of Polymer Physics of the American Physical Society. Rick received his undergraduate and master's degrees from MIT, and his Ph.D. from the University of Wisconsin – Madison. Rick's current research interests revolve around micro- and nanostructured polymers, such as block copolymers, polymer blends, semicrystalline polymers, and ionomers. His 100+ peer-reviewed publications span from polymer synthesis, to morphological characterization, to materials applications ranging from packaging film to electroluminescent devices. A particular interest is in the design of self-assembling materials, ones where a desired mesoscale structure can be "built into" the molecule during synthesis to achieve robust control of material properties. Rick received the Unilever Award (ACS) in 1992, and has also been named an NSF Young Investigator, a DuPont Young Professor, a Fellow of the American Physical Society, and the NEC Preceptor at Princeton.

P1 - Plenary Session 1: Nanotechnology/MEMS

Nanobiotechnology Development at ITRI

Shian-Jy (Jassy) Wang

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ABSTRACT

Nanotechnology is blooming at the last decade of the 20th century. Since then, many researchers from academia, research institutes and industries have worked in the area world-wide. Up to now, many products based on nanotechnology has commercialized or going to be realized. The influence of nanotechnology will impact in many industries. Among them, bio industry is anticipated to be one of the most significant one. Many market survey points out that the total of nanotechnology market size will be one trillion US Dollars at 2008, while nanobio market was estimated to be 18% of them.

In this presentation, the author will review the various fields of bio industry which will be affected the most by nanotechnology. Further more, the challenge of these fields and the possible solutions from nanotech will be discussed. Finally, the author will introduce the current status of nanobiotechnology development at ITRI (Industrial Technology Research Institute).

BIOGRAPHY

Shian-Jy Wang was awarded her Ph.D. degree in Chemistry Department by Iowa State University at Ames, Iowa 1988. Her major is Organometallic Chemistry.

She is currently the Deputy General Director of Union Chemical Lab., ITRI (a non-profit research institute at Taiwan). Her responsibilities include nanobio technology and combinatorial chemistry. In her previous assignment, she was the division director of electronic chemical technology (1998-2001). She was working together with photoresist companies and IC fabs on developing 193nm (dry and wet) and 157nm PR. She also was devoted herself in the metallocene polymerization catalyst from 1993 to 1998.

She is the member in ACS and Chinese Chemical Society. She was awarded the Young Research Award (1993) from Chinese Chem Eng Society, and Best Research Award (1994,1996) from ITRI. She has published 24 papers and graned 33 patents. She also received Annual Best Patent Award from UCL 1998.

P2 - Plenary Session 2: SoC

Session Chair

Yu-Hen Hu

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BIOGRAPHY

Yu Hen Hu is a faculty member at the Department of Electrical and Computer Engineering, University of Wisconsin, Madison. He received BSEE from National Taiwan University, and MSEE and PhD degrees from University of Southern California. Prior to joining University of Wisconsin, he was faculty in the Electrical Engineering Department of Southern Methodist University, Dallas, Texas. His research interests include multimedia signal processing, artificial neural networks, fast algorithms and design methodology for application specific micro-architectures, as well as computer aided design tools. He has published more than 200 technical papers, edited two books in these areas.

Dr. Hu has been an associate editor for the IEEE Transaction of Acoustic, Speech, and Signal Processing, IEEE signal processing letters, European Journal of Applied signal Processing, and Journal of VLSI Signal Processing. He has served as the secretary and an executive committee member of the IEEE signal processing society, a board of governors of IEEE neural network council representing the signal processing society, the chair of signal processing society neural network for signal processing technical committee, and is the current chair of IEEE signal processing society multimedia signal processing technical committee. He is also a steering committee member of the international conference of Multimedia and Expo on behalf of IEEE Signal processing society.

Dr. Hu is a fellow of IEEE.

P2 - Plenary Session 2: SoC

Challenges and Opportunities in SOC Design for Ubiquitous Computing

Jhing-Fa Wang

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NCKU, Tainan, Taiwan

ABSTRACT

Ubiquitous computing becomes more and more important for our digital life in the future. Future digital home, digital office and digital classroom will be some of the main research areas and industry for the ubiquitous computing. There are many challenges and opportunities in these areas including SOC design and multimedia signal processing.

Several topics listed below will be addressed in this talk.

1. What will be the future digital home, digital office and digital classroom?
2. What roles of SOC will play in the future digital home, digital office and digital classroom?
3. How the information technology, social science and architecture/industrial design will be cooperated in these areas?

BIOGRAPHY

Jhing-FaWang (F'99) received the M.S. and B.E.E. degrees in electrical engineering from National Cheng Kung University, Tainan, Taiwan, R.O.C, in 1979 and 1973, respectively and the Ph.D. degree in computer science and electrical engineering from Stevens Institute of Technology, Hoboken, NJ in 1983. He is now Professor in National Cheng Kung University, Tainan, Taiwan, R.O.C. He is now a board Chairman of Journal of The Chinese Institute of Electrical Engineering. His current research areas include VLSI/CAD, speech recognition, speech coding, optical character recognition, and natural language processing. He has developed a Mandarin speech recognition system called Venus-Dictate known as a pioneering system in Taiwan. He has published about 79 journal papers and 192 conference papers since 1983. Dr.Wang received outstanding awards from Institute of Information Industry in 1991 and National Science Council in 1990, 1995, and 1997, respectively. He is on the Board of Governors of IEEE Taipei Section. He was elected as an IEEE Fellow in 1999 for contributions to software-hardware co-development of large-vocabulary Mandarin speech processing and recognition systems.

P2 - Plenary Session 2: SoC

Low-power interconnection networks

Li Shiuan Peh

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ABSTRACT

Systems from microprocessors to supercomputers, from embedded systems-on-a-chip to Internet routers are becoming increasingly interconnected, relying on network fabrics to scale up. With networks taking up a substantial portion of a system's imited power budget, it is now critical to explore low-power interconnection networks. In this talk, I'll first discuss the challenges faced as we move from high-performance networks, to networks that have to deliver the high performance requirements under tight power budgets. These challenges span fairly disparate areas, from theoretical analysis, to design tools, architectures as well as circuits. I'll briefly survey my group's research into each of these areas, before zooming in on several of the efforts, from theoretical power analysis, to network thermal modeling and management.

BIOGRAPHY

Li-Shiuan Peh has been an Assistant Professor of Electrical Engineering at Princeton University since 2002. She graduated with a Ph.D. in Computer Science from Stanford University in 2001, and a B.S. in Computer Science from the National University of Singapore in 1995. She is a recipient of the 2003 National Science Foundation's CAREER award and 2004's recipient of Princeton University's School of Engineering and Applied Sciences' E. Lawrence Keys/Emerson Electric Co. Faculty Advancement Award. She is the guest co-editor of the IEEE Transactions of Parallel and Distributed Systems Special Issue on On-Chip Networks. She has been a program committee member on several conferences (HPCA, SIGMETRICS, Hot Interconnects, ICPP, HiPC, etc) and workshops (PACS, TACS, SAN, etc). Her research focuses on power-aware interconnection networks, on-chip networks and parallel computer architectures, and is funded by several grants from the National Science Foundation, the DARPA MARCO Gigascale Systems Research Center as well as Intel Corporation.

T1 - Technical Session 1: Nanotechnology/MEMS (I)

Session Chair

Christopher Y. Li

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Comment [u2]: The name(s) of the speaker(s).

BIOGRAPHY

Christopher Li received his Ph.D. from department of polymer science, The University of Akron. He joined Drexel University, department of Materials Science and Engineering in 2002 as an assistant professor. He was a visiting professor at the Air Force Research Laboratory from Jun. 2004-Aug. 2004. His research interests include liquid crystals and block copolymer self-assembly and nano-patterning, interface behavior of hybrid materials (*e.g.* CNT and polymers) and controlled structure through polymer folding.

Christopher Li has received PERKIN ELMER - ICTAC (international confederation for thermal analysis and calorimetry) Young Scientist Award 2004, NRC/US AFOSR Summer Faculty Fellowship Award 2004, Mettler-Toledo Thermal Analysis Educational Award 2003, NSF-CAREER Award 2003-2008, and 3-M Non-Tenured Faculty Award. He has published 7 review papers and book chapters and 30 peer-reviewed papers.

T1 - Technical Session 1: Nanotechnology/MEMS (I)

Super-Tough Surface-Modified Carbon Nanofiber/UHMWPE Nanocomposites

Benjamin S. Hsiao

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ABSTRACT

The super-tough performance of nanocomposite films comprising ultra-high molecular weight polyethylene (UHMWPE) and modified carbon nanofiber (MCNF) was investigated by in-situ synchrotron small-angle X-ray scattering (SAXS) and wide-angle X-ray diffraction (WAXD) techniques. Surface modification of carbon nanofibers consisted of oxidation and subsequent chemical reaction with octadecylamine. The MCNF acts as a solvent carrier in the very stiff polymer matrix, where the short chains on the MCNF surface would soften the stiff matrix in the nanoscale, and therefore increase the toughness of the polymer dramatically. At room temperature, the toughness of melt-pressed nanocomposite films was found to increase over 10 times by the addition of 0.2 wt% and 5 wt% of MCNF. A martensitic crystal transformation in UHMWPE was also detected in all samples during deformation, where the transformation mode could be assigned as T12. At high temperature (118 ^{o}C), the toughness of the MCNF/UHMWPE composite films was still about 2 times higher than that of the pure UHMWPE films. The mobile chains at the UHMWPE/MCNF interface appeared to be the key to overcome the barrier of the chain entanglement restraints in the solid UHMWPE matrix and induce the super-tough performance. This work is a joint research project with Prof. Benjamin Chu.

BIOGRAPHY

Benjamin S. Hsiao received his B.S. in Chemical Engineering from National Taiwan University in 1980 and his Ph.D. in Polymer Science and Engineering from University of Connecticut in 1987. He carried out his postdoctoral training with Prof. Richard Stein at University of Massachusetts. He worked for DuPont Fibers, and then Central Research and Development for eight years prior to his joining of the Chemistry Department in the Stony Brook University in 1997. Currently, he is a Full Professor in the Chemistry Department, an affiliated member in the Biomedical Engineering Department at Stony Brook, a Guest Professor at Changchun Institute of Applied Chemistry, Chinese Academic of Sciences, and the spokesperson for Advanced Polymer PRT (X27C) Beamline at the National Synchrotron Light Source, Brookhaven National Laboratory. He became a Fellow of the American Physical Society in 2002. He is on the editorial advisory boards of Polymer; Journal of Macromolecular Science – Physics; Journal of Polymer Research; High Performance Polymers; and Chinese Journal of Applied Chemistry. He is also a co-founder (together with Benjamin Chu and Dufei Fang) of Stonybrook Technology and Applied Research, Inc., a biomedical start-up company located at Stony Brook, New York.

Benjamin Hsiao's current research interests include polymer physics (structure, morphology, property and processing) with an emphasis of nanostructured materials, and bioabsorbable polymers for biomedical applications. His research activities have been supported by National

Science Foundation, National Institutes of Health, National Institute of Standards and Technology, Department of Energy, Department of Defense, Center of Biotechnology in the New York State and several industrial companies. He has authored and coauthored over 200 reviewed scientific papers, 21 chapters in books, encyclopedias and reviews (including Chemical Reviews), 7 newsletters, 1 tribute, 1 book review, 1 book, 5 patents, 7 patent applications and 139 conference proceedings.

T1 - Technical Session 1: Nanotechnology/MEMS (I)

Nanofiber Technology

Frank K. Ko

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ABSTRACT

Materials in fiber form are of great practical and fundamental importance. The combination of high specific surface area, flexibility and superior directional strength makes fiber a preferred material form for many applications ranging from clothing to reinforcements for aerospace structures. The availability of fibers in the nanoscale greatly expands the performance limit and application opportunities in technical textiles. We are witnessing the birth of a new nanofiber-based industry. Specifically, the significant role of fiber size has been recognized in the remarkable increase in surface area (1000 m^2/g)]; in bio-reactivity (7X proliferation rate); electroactivity (>10X response rate); and in mechanical properties (exponential increase in strength as fiber diameter decreases). Motivated by the potential opportunities provided by nanofibers, there is an increasing interest in nanofiber technology. Amongst the processing technologies for nanofiber fabrication, including the template method , vapor grown, phase separation and electrospinning which has attracted the most intense interest as evident in a recent ACS conference. In this presentation the processing and structure of nanofibers produced by the electrospinning process will be reviewed. The technical challenges and opportunities will be discussed in terms of specific examples of recent developments in chem./bio protective membranes; carbon nanotube strengthened fibers; electronic textiles; and multi-functional scaffolds for tissue regeneration.

BIOGRAPHY

Frank Ko is Director of the Fibrous Materials Laboratory and Professor of Materials Science and Engineering at Drexel University. He received his B.S. degree from Philadelphia College of Textiles and Science. He holds an M.S. and a Ph.D. degree in Textile Engineering from the Georgia Institute of Technology. A SAMPE Fellow and recipient of the Fiber Society Award for Distinguished Achievement and the Drexel Research Award, He has co-authored three books and contributed to 29 book chapters. He has presented and published over 300 papers in the engineering design and analysis of fibrous structures for medical, industrial and advanced composite applications. He is serving on the editorial board of several textile and composite journals. He served on the Roadmap team for the Aerospace Industry Association and as a member of the advisory committee on soldier protection for the Army Board of Sciences of the National Research Council. He was a group leader in the gradient composite armor program for the Army Research Office sponsored Multidisciplinary University Research Initiative (MURI), During this MURI program, his research was expanded to the electrospinning of multifunctional nanoscale fibers, nanofibrous structures and nanocomposites.

Comment [u5]: Biography, IEEE style. The guideline here is adapted from "Preparation of Papers for IEEE TRANSACTIONS and JOURNALS (March 2004)".

T1 - Technical Session 1: Nanotechnology/MEMS (I)

Piezoelectric Cantilever Sensors for Emerging Biotechnology: Synthesis, Design, and Applications

Wei-Heng Shih and Wan Y. Shih

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ABSTRACT

Detection of pathogenic species such as molecules, proteins, virus, and cells is critical to the prevention and diagnosis of diseases. We have developed piezoelectric cantilever sensors (PECS) that offer the advantages of in-situ, direct, and simple electrical detection and better capabilities to withstand damping in aqueous environment. Binding of antigens to the antibody immobilized on the cantilever surface increases the cantilever's mass and reduces its resonance frequency, which is detected by monitoring the resonance frequency shift. Demonstration of in-situ detection of cells, proteins, and specific antigen-antibody binding have been shown using lead zirconate titanate (PZT)/stainless steel cantilevers of less than 0.5 mm in length with picogram sensitivity. Furthermore, as illustrated by experimental and theoretical results, a cantilever's mass detection sensitivity increased dramatically with a decreasing cantilever size.

For PECS synthesis and miniaturization, we have developed a novel nanocoating method that offers the advantages of enhanced powder chemical and thermal stabilities, improved slurry consolidation and rheological properties, increased processing additives distribution homogeneity, and lowered sintering temperatures. Coating of $Mg(OH)_2$ layer on Nb_2O_5 particles resulted in a direct, one-step, sintering of perovskite lead magnesium niobate (PMN) ceramics below 1000°C, 250 °C lower than the typical sintering temperature. The thus synthesized piezoelectric powders produced fully dense freestanding piezoelectric layers with only a few grains thick at <1000°C, which permits fabrication of highly piezoelectric microcantilever sensors with better than 10^{-12} g/Hz detection sensitivity for rapid, direct detection of cells, bacteria, viruses, and protein molecules in water. Using micromachining and microfabrication techniques, PECS arrays have been fabricated creating rapid, sensitive, high throughput, multiplexing sensors for emerging biotechnology that will greatly benefit human health.

BIOGRAPHY

Wei-Heng Shih received a B.Sc. in physics in 1976 from Tsing-Hua University in Taiwan and completed his Ph.D. degree in Physics in 1984 from Ohio State University. He joined the Department of Materials Science and Engineering at Drexel University in 1991 and was promoted to Professor in 2003.

His research has covered a wide range of areas of materials science and engineering including colloidal processing of ceramics; sol-gel processing of microporous and mesoporous ceramic powders; and chemical treatment of combustion wastes. His current research interests are fabrication, characterization and design of piezoelectric cantilever sensors for biomedical applications and the development of environmentally friendly synthesis of photoluminescent nanocrystalline nanoparticles (quantum dots). Prof. Shih has one patent and four provisional patents. He received the 1999 Edward C. Henry Electronics Division Best Paper Award from

The American Ceramic society. In Drexel University, he has received several awards including the Faculty Achievement Award, Professor of the Year, and the Research Achievement Award. He has been inducted to Drexel's 10^6 Club. He has active collaboration with National Taiwan University.

Wan Y. Shih, Research Associate Professor of Department of Materials Science and Engineering, Drexel University. She received her BS in Physics from Tsing-Hua University, Taiwan, and her Ph.D in Physics from Ohio State University, Columbus, Ohio. Her broad research areas include ferroelectricity, colloids, piezoelectric materials and sensors. She has one patent and four provisional patents and her work on "Electromechanical Behavior of PZT-Brass Unimorphs," J. Am. Ceram. Soc. 82[7], 1733-1740 (1999), won the 1999 Edward C. Henry Electronics Division Best Paper Award of the American Ceramic Society. Her current research is focused on the piezoelectric microcantilevers/devices for real-time, in-water, in-situ detection of pathogens/viruses and protein profiling, in-situ tissue stiffness characterization and other bio-applications. She has been inducted to Drexel's 10^6 Club.

T1 - Technical Session 1: Nanotechnology/MEMS (I)

Manipulating Carbon Nanotubes with Nucleic Acids

Ming Zheng

DuPont Central Research and Development

ABSTRACT

Single-stranded DNA (ssDNA) forms stable complex with CNT and effectively disperses CNT into aqueous solution. We found that a particular ssDNA sequence (d(GT)n, n = 10 to 45) self-assembles into an ordered supramolecular structure around individual CNT, in such a way that the electrostatic properties of the DNA-CNT hybrid depend on tube type, enabling CNT separation by anion-exchange chromatography. Optical absorption and Raman spectroscopy showed that the separation is bimodal based on both electronic properties and the diameters of CNTs: early fractions are enriched in the smaller diameters and metallic tubes, whereas late fractions are enriched in the larger diameters and semiconducting tubes. In this talk, I will show the separation of single (n, m) type carbon nanotubes and use of the material in novel solution chemistry and device applications. This work comes from the Molecular Electronics group at DuPont CR&D.

BIOGRAPHY

B.S. 1984, Beijing Univiersity
M.S. 1987, Beijing University
M.S. 1990, University of Utah
Ph.D. 1995, Princeton University
Postdoctoral Fellow, 1996-2000, NIH
Research Associate, 2000-now, DuPont Central Research and Development

T1 - Technical Session 1: Nanotechnology/MEMS (I)

Synthesis and Characterization of Fe Based Nanoparticles with Polymer Surfactant—Pluronic® F127

Comment [u6]: Title

Jriuan Lai

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ABSTRACT

Nanotechnology is one of the current major research fields. Due to numerous applications, magnetic nanoparticles have become one of the most interesting areas of research. In a previous study Mn-Fe mixed oxide nanoparticles were synthesized by irradiating the solution of Mn and Fe carbonyls with high intensity ultrasound. They exhibited crystal structure and magnetism which changed with the Mn:Fe ratio. However, since these materials were amorphous, they had to be annealed and this led to aggregation decreasing the surface:volume ratio. In order to prevent this sintering, we have now adopted a wet chemical method in which organometals were decomposed by heating to form metals or metal oxides. Micelles of the polymer Pluronic®, were used for dimensional confinement, leading to the control of the particle size. Pluronic® stabilizes the surface of the particles and the heating crystallizes the particles, so that the resulting products are non-aggregated crystals. By using this synthetic method, we have accomplished the following objectives.

- Iron/iron oxide particles are obtained from thermo decomposition of $Fe(CO)_5$ solution. The size of the particles is controlled by adjusting the concentration of surfactant. The particles size changed from 5.6 to 22.3 nm from high to low concentration of Pluronic®.
- Mn-Fe or Co-Fe mixed oxide particles are obtained by the thermal decomposition of $Mn_2(CO)_{10}$ and $Fe(CO)_5$ or $Co_2(CO)_8$ and $Fe(CO)_5$ solutions. We observed crystal structure and magnetism transformations when the Mn:Fe or Co:Fe ratio was increased.
- Heterostructure core/shell nanoparticles were obtained by using Fe nanoparticles to catalyze the decomposition of chromium hexacarbonyl. The resulting particles have a Cr core and a □-Fe_2O_3 shell.

The materials were characterized by synchrotron power XRD for their crystal structure, SQUID and Mössbauer spectra for their magnetic properties, and TEM and HRTEM for their morphology.

BIOGRAPHY

Jriuan Lai is currently in the transition between two positions. He just finished his Ph.D. degree in Chemical Engineering at Polytechnic University and will soon join Stayton/Hoffman Lab in Bioengineering Department at the University of Washing in Seattle, Washington. His research is about the synthesis of magnetic nanoparticles.

In his Ph.D. study, he uses polymer micelles as dimensional confinement for the synthesis of nanoparticles. He was a visiting research fellow in both IPCMS/CNRS Center (Strasbourg, France) and MCII/Universität Bayreuth (Bayreuth, Germany). He studied the magnetic properties of the nanoparticles and the anionic polymerization for block copolymer synthesis in

those places. He was invited to attend Spring College on Science at the Nanoscale in ICTP (Trieste, Italy). He is interested in using the nanoparticles for biological studies.

Dr. Lai is a member of American Chemical Society.

T2 - Technical Session 2: System-on-Chip (SoC) (I)

Session Chair

Pong-Fei Lu

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BIOGRAPHY

Pong-Fei Lu received the B.S.E.E degree from National Taiwan University, Taipei, Taiwan, R.O.C., in 1978 and the Ph.D. degree in electrical engineering from Princeton University, Princeton, N.J., in 1986. He joined IBM T. J. Watson Research Center, Yorktown Heights, N.Y., in 1985 as a Research Staff Member, working on the device design for high-speed bipolar transistors. Since 1989, he has been with the High-Performance Circuit Group. He worked on the L1 and L2 cache SRAMs for the IBM S390 G3 micro-processor, and the branch predict circuitry in the Instruction Fetch Unit of IBM Power4 microprocessor. He was the lead for the L2/L3 Circuit Team for IBM Power5 microprocessor. His current interests include high-frequency microprocessor design and technology scaling issues in 65nm node and beyond.

T2 - Technical Session 2: System-on-Chip (SoC) (I)

A Semi-custom Design Flow in High-performance Microprocessor Design

Greg Norhrop, **Pong-Fei Lu (presenter)**

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ABSTRACT

The development of high performance microprocessors requires concurrent design at many levels (logical, circuit, physical) with large teams and tightly interlocked schedules. Often the best design flow is one that most effectively addresses the natural conflicts within this flow (e.g., logic stability vs. timing closure), in contrast to one that simply applies the most modern or aggressive approach in each domain. This paper describes such a case, in the development and use of a semi-custom design methodology which has significantly enhanced several generations of IBM zSeries (S/390) processors, as well as the IBM POWER4 processor. The coordinated use of a common parameterized gate representation, standard cell generation capabilities, place and route merged with custom physical design, static transistor level timing + formal circuit tuning, and gain-based synthesis have all led to significant improvements in both quality-of-result and time-to-market in the conventional static CMOS design domain.

BIOGRAPHY

Pong-Fei Lu received the B.S.E.E degree from National Taiwan University, Taipei, Taiwan, R.O.C., in 1978 and the Ph.D. degree in electrical engineering from Princeton University, Princeton, N.J., in 1986. He joined IBM T. J. Watson Research Center, Yorktown Heights, N.Y., in 1985 as a Research Staff Member, working on the device design for high-speed bipolar transistors. Since 1989, he has been with the High-Performance Circuit Group. He worked on the L1 and L2 cache SRAMs for the IBM S390 G3 micro-processor, and the branch predict circuitry in the Instruction Fetch Unit of IBM Power4 microprocessor. He was the lead for the L2/L3 Circuit Team for IBM Power5 microprocessor. His current interests include high-frequency microprocessor design and technology scaling issues in 65nm node and beyond.

T2 - Technical Session 2: System-on-Chip (SoC) (I)

Ramification of Sub-resolution Semiconductor Technologies

Fook-Luen Heng

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ABSTRACT

In the good old days of sub-micron semiconductor (180nm and before) technologies, physical layouts of a chip design hid the details of the manufacturing process from the chip design process. The physical layout is the handoff point from design to manufacturing. When a layout of a chip design is free of design rule violation, it is taped out and the design is considered finished.

In the sub-*resolution technologies* (90nm and beyond) era, increasing complexity is introduced to the manufacturing process. The traditional design to manufacturing handoff process is at the brink of falling apart. In order to ensure manufacturability of a physical layout in this era, more and more data processing steps are occurring after a design is taped out, e.g. Optical Proximity Correction (OPC), Alternating Phase Shift Mask (altPSM), Sub-Resolution Assist Features (SRAF). The data processing demands more design rules and non-intuitive methodology requirements during the design process. In addition, it is producing exotic mask features which add to the production cost of the lithographic masks which are used to print the original designs.

In this presentation, I will describe the manufacturing challenges of the sub-resolution semiconductor era with the hope of bringing appreciation to the seriousness of the problem. After which, I will discuss the solution trends and how they can fundamentally change the future design and manufacturing practices.

BIOGRAPHY

Fook-Luen Heng received the B .Math degree in computer science, combinatoric and optimization from University of Waterloo, Ontario, Canada, in 1983, and the M.S. and Ph.D. degrees in computer science from Princeton University, Princeton, NJ in 1984 and 1988, respectively.

He has been a Research Staff Member at IBM T.J. Watson Research Center since 1988. He currently manages a Design Automation group doing research in VLSI layout analysis and optimization. His work has focused on VLSI CAD with particular emphasis in design migration, layout automation and optimization. Recent interest includes layout scaling, layout solutions for Resolution Enhancement Techniques, design methodology to integrate design and manufacturing considerations.

T2 - Technical Session 2: System-on-Chip (SoC) (I)

Multi-Agent Based Reconfigurable Embedded Systems

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ABSTRACT

The multi-agent system, which is so prevalent in distributed artificial intelligent software systems, can also be extended to the design of digital hardware systems. The recent advances in the capability of reconfigurable hardware has made the multi-agent systems to be more attractive and feasible to implement in the hardware design system using the hardware agents, which can be defined as the partitioned hardware space entities. One big possible advantage of the multi-agent based hardware system design is that it shares a common design methodology with the software components. Therefore it will provide more efficiency for the hybrid system design. It is also believed that the flexibility, scalability, efficiency, fault tolerance of the overall system will be greatly improved.

BIOGRAPHY

Yan Meng received B.Eng. and M.Eng. from Xian Jiaotong University, Xian, P.R. China, in 1991 and 1994 respectively, M.Eng. from Nanyang Technological University, Singapore, in 1996, and Ph.D. from Florida Atlantic University in 2000, all in Electrical Engineering.

She is currently an assistant professor in the Department of Electrical and Computer Engineering at Stevens Institute of Technology, Hoboken, NJ. Before she joined Stevens in 2004, she has worked as a faculty member in Jackson State University for one year and as an embedded software engineer in several industrial companies. Her research interests include real-time embedded systems, autonomous mobile robots, computer vision and image processing.

T3 - Technical Session 3: Bioinformatics (I) - Proteomics and Bioinformatics Tools

Session Chair

Hai Hu

Windber Research Institute Hai Hu, Ph. D.
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BIOGRAPHY

Dr. Hai Hu is currently Director of Biomedical Informatics at Windber Research Institute, jointly appointed as Research Assistant Professor in the Department of Surgery at USUHS. He has nearly 5 years of direct experiences applying computational and statistical technologies to solving high-throughput biological problems, including developing data mining, data analysis, and data tracking systems. Proceeding to it he conducted research as a molecular biophysicist/biologist for 4 years after obtaining Ph. D. degree. Besides, he had several years of industrial computer engineering experiences. His educational background includes physics, computer engineering, statistics, and biophysics. Currently he is heading the development of the biomedical informatics infrastructure at the Institute, including developing a data warehouse and a clinical laboratory workflow system. At the same time, he is leading several research projects involving human subjects. He has published many peer-reviewed papers, and presented at numerous national and international scientific and business conferences, often as an invited speaker recently. He has also been a key co-organizer in several scientific conferences.

T3 - Technical Session 3: Bioinformatics (I) - Proteomics and Bioinformatics Tools

Session Chair

Li-San Wang

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BIOGRAPHY

Li-San Wang received his B.S.E.E. ('94) and M.S.E.E. ('96) from the National Taiwan University; he then received his M.S. ('00) and Ph.D. ('03) from the University of Texas at Austin, both in Computer Sciences. Currently he is a postdoctoral fellow at the University of Pennsylvania. His research interest includes theory of algorithms, phylogenetics, and microarray analyses.

T3 - Technical Session 3: Bioinformatics (I) - Proteomics and Bioinformatics Tools

Using Quasi Consensus Sequences for Protein Family Comparison

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ABSTRACT

A method is proposed for sensitive detection of distant relationships among protein families and for prediction of structural alignment via comparison of hidden Markov models based on quasi consensus sequences. Two models are considered as highly similar if the consensus of one model is very probable in the other model. For a given HMM, finding its exact consensus is also NP-hard. As surrogates to the consensus sequences, we use quasi consensus sequences, which are the most probable sequence emitted from the most probable state path of a given HMM. Alignment between the seed sequences of the two profile HMMs being compared can be induced by first aligning one model's quasi consensus sequence to the other model via the Viterbi algorithm.

The utility and effectiveness of our method are tested using a benchmark data set from an earlier published work, SUPERFAMILY database, which contains 569 proteins. The method gives better homology detection, yields improved alignments, and runs significantly faster, in comparison to a state-of-the-art profile-profile method.

BIOGRAPHY

Dr. Liao is currently an assistant professor of computer and information sciences at the University of Delaware. His research interests and experience span a wide range, including computer simulation of molecular systems, genome sequencing, protein homology detection, and genome comparisons.

Before joining the Univ of Delaware, Dr. Liao was a senior research physicist at the Central Research and Development of DuPont Company in Wilmington, Delaware, from 1998 to 2002.

Dr. Liao received his Ph.D. degree in theoretical physics from Peking University, and was an assistant professor of physics there from 1992 to 1995. His work in theoretical physics was on quantum groups and algebra and their applications to field theory and statistical physics.

T3 - Technical Session 3: Bioinformatics (I) - Proteomics and Bioinformatics Tools

Fast Algorithmic Techniques for Reconstructing Large Evolutionary Trees

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ABSTRACT

Phylogenetic trees are commonly reconstructed based on hard optimization problems such as maximum parsimony (MP) and maximum likelihood (ML). Conventional MP heuristics for producing phylogenetic trees produce good solutions within reasonable time on small datasets (up to a few thousand sequences), while ML heuristics are limited to smaller datasets (up to a few hundred sequences). However, since MP (and presumably ML) is NP-hard, such approaches do not scale when applied to large datasets.

In this talk I present a new technique called Recursive-Iterative-DCM3 (Rec-I-DCM3), which belongs to the family of Disk-Covering Methods (DCMs). We tested this new technique on ten large biological datasets ranging from 1,322 to 13,921 sequences and obtained dramatic speedups as well as significant improvements in accuracy (better than 99.99\%) in comparison to existing approaches.

BIOGRAPHY

Usman Roshan received his PhD in Computer Sciences from the University of Texas at Austin in May 2004. His research interests are in designing and studying fast algorithmic approaches for solving problems in computational biology and bioinformatics. He is a member of the CIPRES group (Cyber Infrastructure for Phylogenetic Research) and has published in bioinformatics conferences and journals, and a book chapter as well. He lives in Springfield, New Jersey with his wife and daughter.

T3 - Technical Session 3: Bioinformatics (I) - Proteomics and Bioinformatics Tools

Proteomic Biomarker Patterns: Challenges and Opportunities

Wade T. Rogers, Ph.D.

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ABSTRACT

The era of the individual protein biomarker for diagnosing disease is over. The era of "The New Diagnostics" is being ushered in, where complex patterns of proteins in biological fluids are used to detect and dissect disease. The opportunity is clear - a complex proteomic pattern has a far greater expressive power than any individual marker can have. However, the challenges are manifold. There are many thousands of proteins in plasma. Diagnostic species are expected to be present in low concentrations, in the presence of other plasma proteins at orders-of-magnitude higher concentrations. Finding the markers that collectively predict disease with high accuracy is a daunting task, both for experimental proteomics and for the informatic tools that seek to mine the experimental data. The problem is often described as a needle-in-a-haystack problem, but of course it is much worse than this. There are lots of needles in the haystack, and the task is akin to finding only the needles pointing "north". The difficulty is further exacerbated since we don't know how many needles we're looking for in the first place, so how do we know when we're finished? This talk discusses these issues in the context of projects aimed at developing the "New Diagnostics".

BIOGRAPHY

Wade T. Rogers is President and Chief Executive Officer of Cira Discovery Sciences. Prior to founding Cira, Dr. Rogers was Senior Principal Investigator at Bristol-Myers Squibb, where he led programs in computational approaches to target validation, and lead discovery and optimization. Dr. Rogers received a BS degree in Physics from the University of Delaware, an MS degree in Engineering Physics from the University of Virginia, and a Ph.D. degree in Physics from the University of Colorado. He was a National Research Council Postdoctoral Fellow at the National Bureau of Standards (now NIST) before coming to the DuPont Company in 1981. While at DuPont he led the research team that developed forerunners to Cira□s pattern discovery algorithms. He later left DuPont to join DuPont Pharmaceuticals.

T3 - Technical Session 3: Bioinformatics (I) - Proteomics and Bioinformatics Tools

Genomic characterization of ribitol teichoic acid synthesis in meticillin-resistant *Staphylococcus aureus*

Jiang Ying

Merck

ABSTRACT

MRSA (Meticillin Resistant *S. aureus*) is a major community and hospital acquired pathogen. Understanding its cell wall synthesis is crucial to the study of its antibiotic resistance. Teichoic acid is an essential component of the cell wall and its biosynthesis in *Staphylococcus* is not well understood. Studies in *B. subtilis* discovered two different pathways, namely teichoic acid ribitol (*tar*) and tecichoic acid glycerol (*tag*), contributing to teichoic acid biosynthesis in two different strains W32 and 168 respectively. Detection of ribitol in cell wall suggests that *S. aureus* H may utilize the *tar* pathway. However, only one or two *tar* pathway genes have been reported in *S. aureus* so far. Since the genome sequence of several MRSA strains: Mu50, MW2 and N315, are now available, we performed comparative genomics analysis and identified all genes, which are homologous to those known essential to *tag* or *tar* pathway and could contribute to cell wall teichoic acid biosynthesis in *S. aureus*. Our data support the notion that *tar* could be the main teichoic acid biogenesis pathway in *S. aureus*. We further analyzed the genomic organization of *tar* genes in those *S. aureus* strains. Unlike the divergon organization in *B. subtilis*, *S. aureus tar* genes are organized into several clusters. Most interestingly, compared to genes in *B. subtilis tag* pathway or *tar* pathway, the *S. aureus* genes specific to the *tar* pathway (*tarIJK*) are duplicated in all three MRSA genomes studied. It remains to be tested whether this gene duplication plays a role in antibiotic resistance.

BIOGRAPHY

Ying Jiang, Ph.D. Graduated from UCLA in 1994. Joined Johnson & Johnson in 1996, I have been working in pharmaceutical industry ever since. Currently I am working for Merck. My research interest in pharmaceutical research and development includes: Bioinformatics and Genomics in drug targets, biologics identification and validation; GPCR ligand identification; Toxicogenomics, Biomarker study and safety data integration, as well as pharmacogenomics data standards and submission to regulatory agency.

Academic experience: adjunct professor at Peking University from 2001 to 2003, adjunct professor at Kean University, New Jersey.

T4 - Technical Session 4: C4I (I): Next-Generation Convergent Communication

Session Chair

Ut-Va Koc

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Comment [u8]: Next-Generation Convergent Communication

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BIOGRAPHY

Ut-Va Koc received Ph. D. degree in electrical engineering from the University of Maryland, College Park in 1996 and B. S. degree in electronics engineering from National Chiao Tung University in 1989.

He is currently a Distinguished Member of Technical Staff (DMTS) at High Speed Electronics Research, Bell Labs, Lucent Technologies, Murray Hill, New Jersey. He joined Bell Labs, Lucent Technologies in 1996. He has worked on various projects including: system and chip design of the 2nd-generation Switched Digital Video (SDV) project (an early form of Very High Speed Digital Subscriber Line, or VDSL), and SONET/SDH chip sets for optical networks. Currently he is involved in several projects including high speed ADC design for software defined radio (SDR) and optical/electronic compensation for optical networks. He has published one book, a number of peer-reviewed journal/conference papers and book chapters on signal processing in communications and multimedia, in addition to 5 patents being approved or submitted. His current research interest includes electronic and optical signal processing for optical/electronic wireline/wireless communication, analog/mixed signal processing for high-speed data conversion, and multimedia signal processing.

Dr. Koc has been active in serving as reviewer of various journals and conferences, editor for EURASIP Journal of Applied Signal Processing (JASP), guest editor for special issue in JASP, and guest co-chair in several international or local conferences.

T4 - Technical Session 4: C4I (I): Next-Generation Convergent Communication

Novel modulation techniques for next-generation optical communication

Comment [u10]: Title

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ABSTRACT

Recent advances in optical modulation techniques, in conjunction with other technological development, have dramatically improved the performance of high-capacity fiber-optic transmission without electrical data regeneration. This talk will review some of these newly developed optical modulation methods, with the focus on the reduction of nonlinear effects.

BIOGRAPHY

Xing Wei received the B.S. and M.S. degrees in physics from Fudan University, Shanghai, China, in 1990 and 1992, respectively, and the Ph.D. degree in physics from the University of California at Berkeley in 2000.

While at Berkeley, he studied molecular structures at surfaces and interfaces of various materials including ice and polymers using nonlinear optical spectroscopy. He joined Bell Laboratories, Lucent Technologies, Murray Hill, NJ, as a Member of Technical Staff in the Physical Sciences Research Division in January 2001. Since then, he has engaged in basic research related to optical fiber communication with the focus on novel modulation techniques.

Dr. Wei is a member of APS, OSA, and IEEE.

T4 - Technical Session 4: C4I (I): Next-Generation Convergent Communication

Cellular In-building Coverage

Zhengxiang Ma

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Comment [u11]: Title

Comment [u12]: The name(s) of the speaker(s).

ABSTRACT

The cellular wireless industry has witnessed a tremendous growth in the past two decades. In the past few years, the growth of wireless revenues in North America has been fueled by long distance toll displacement and to a lesser degree residential wireline displacement. While wireless data services are growing rapidly, there is still a huge space for wireless voice growth, especially in the lucrative enterprise voice market. At this point, only 20% of all phone calls are made by cell phone. Wireless Service Providers (WSPs) are in a unique position to pursue the enterprise voice and data market because of their capability to provide full mobility with a single personal device and seamless integration of multiple locations at a competitive cost. However, this requires WSPs to provide reliable, high capacity in-building coverage. In this talk, I will review some of the exiting in-building coverage solutions out in the market, and describe some of our recent work in this area.

BIOGRAPHY

Zhengxiang Ma received his B.S. in physics from University of Science and Technology of China, Hefei, China, in 1989, M.S. and Ph.D. in applied physics from Stanford University, Palo Alto, California, in 1991 and 1995 respectively.

He joined AT&T Bell Labs in 1995, which became Bell Labs, Lucent Technologies later that year. He has worked on high temperature superconducting thin film RF filter, digital baseband radio architecture, digital signal processing for controlling peak to average power ratio in wideband cellular air-interface signal and digital baseband predistortion for power amplifier linearization. He is currently leading a team in developing cellular in-building coverage solutions.

T4 - Technical Session 4: C4I (I): Next-Generation Convergent Communication

Emerging Technologies in Converged Next Generation Networks

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Comment [u13]: Title

Comment [u14]: The name(s) of the speaker(s).

ABSTRACT

In recent years, there has been increasing the convergence of mobile networks and fixed networks, e.g., mobile networks, which are being adopted as users' main or only means of voice communication, are now also able to deliver a range of data and multimedia services, including access to the Internet. At the same time, fixed networking technology has evolved to allow broadband data services to be provided besides the legacy voice service. The convergence is regarded as not only one of main driving forces in the evolution to next generation networks and but also the most salient capability of next generation networks. In this talk, I will discuss the key challenges and critical technologies to support converged NGNs, e.g. SIP technology, IMS architecture, QoS control and policy management; and present a new converged NGN architecture based on these emerging technologies.

BIOGRAPHY

DONG SUN is a Member of Technical Staff in the Networking Technologies and Performance Department at Bell Labs in Holmdel, New Jersey. He holds a B.S. degree from the University of Electronic Science and Technology of China, an M.S. degree from Communications Telemetry and Telecontrol Research Institute, China, and a Ph. D. degree from Stevens Institute of Technology in Hoboken, New Jersey, all in electrical engineering. Dr. Sun's current work focuses on ATM and IP/MPLS data network planning, design and optimization, VoIP network technology and 3G wireless network architecture, modeling and cost analysis. His research interests include all aspects of wireline and wireless architecture, service and network convergence, and network design, optimization, and engineering. He is a senior member of the IEEE.

T4 - Technical Session 4: C4I (I): Next-Generation Convergent Communication

Building Applications for Next Generation Telecom Services

Comment [u15]: Title

Dong Liu

Comment [u16]: The name(s) of the speaker(s).

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ABSTRACT

The next generation of telecom services will be based on converged technologies. They will not only provide wireline and wireless voice communication, but also provide multimedia services such as data, images and video. A key aspect of the future converged network is that all of these services will be seamlessly integrated together. For example, a group of friends can chat over their smart phones and share a web page about a movie review, then they can watch the movie trailer together, while still discussing the movie over their voice channel. Another aspect of the future telecom environment is that more and more intelligence will shift to the end user's devices. In the traditional POTS (Plain Old Telephony Service) network, the phone is a very dumb device; all the intelligence resides within the network. But in the future, the phone (either wireline or wireless) itself is basically a computer, a very smart device. Many of the traditional services that could only be provided by the service provider can now be implemented in the phone itself, for example multi-line conferencing. Also, the signaling protocol is becoming more open and more powerful. The result is that the telecom market is becoming more open and competitive. You will no longer need a huge initial capital investment to get into it. In this talk, I will discuss the creation of next generation telecom services and how the telecom service providers will meet the challenge of the new more open more competitive market.

BIOGRAPHY

Dong Liu was awarded his Masters and Bachelor degrees in Electrical Engineering by the Shanghai Jiao Tong University in Shanghai, China.

He is currently a member of Services Infrastructure Research Department in Holmdel, NJ. His department is part of the Converged Networks and Services Research Center, a division of Bell Labs Research. The mission of the department is to invent, analyze, and prototype novel concepts related to networking protocols and infrastructure servers for next-generation communication services. His work areas include signaling and networking edge protocols, services and call control, next-generation application servers, and architectures for integrating Internet and Web technology with traditional voice services. Before joining the Service Infrastructure Research Department, he worked on Lucent's first version of SoftSwitch developed in Bell-Labs research.

T5 - Technical Session 5: Nanotechnology/MEMS (II)

Session Chair

Lei Zhu

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Comment [u17]: The name(s) of the speaker(s).

BIOGRAPHY

Lei Zhu was born in Shanxi Province, China (02/07/1972). He obtained his B.S. degree in Materials Chemistry (1993) and M.S. degree in Macromolecular Chemistry and Physics (1996) from Fudan University, Shanghai, China. In 2000, he earned his Ph.D. degree in Polymer Science from University of Akron, OH.

He currently is an assistant professor at Institute of Materials Science and Dept. of Chemical Engineering, University of Connecticut, Storrs, CT 06269. He has (co)-authored 34 peer-reviewed journal publications, one book chapter [*Polymer Handbook* (4th ed.), Wiley : New York, 1999, pp. V1-V19], and 14 conference proceedings and preprints. His research focuses on discotic liquid crystalline oligomers and their supramolecular self-assemblies on nanometer scales. Other research activities include study of biodegradable block copolymers and organic/inorganic nanocomposites.

Dr. Zhu was awarded NSF CAREER award in 2004. He is also members of ACS, APS, MRS, and NATAS.

Comment [u18]: Biography, IEEE style. The guideline here is adapted from "Preparation of Papers for IEEE TRANSACTIONS and JOURNALS (March 2004)".

T5 - Technical Session 5: Nanotechnology/MEMS (II)

Supramolecular Assembled Fullerenol-Poly(dimethylsiloxane) Nanocomposites

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ABSTRACT

Multihydroxylated [60]fullerene (fullerenol) surfactants were complexed with the amino end-functionalized poly(dimethylsiloxane) (PDMS) in tetrahydrofuran. Light scattering results reveal that the size and size distribution of the fullerenol-PDMS complexes depend on the ratios of components and total concentrations. Small angle X-ray scattering (SAXS) results indicate that the increase of fullerenol content in the nanocomposites increases the size of fullerenol nanodomains. This novel structural feature results in superior thermal and thermal mechanical stability, severely suppressed crystalline phase, elastic mechanical response, and unique dielectric properties of the nanocomposites, e.g., high content of fullerenol increases the permittivity but dramatically decreases the loss factor.

BIOGRAPHY

Shuiqin Zhou was born in Zhejiang, China. She received her B.S. (1988) and M.S. (1991) degrees from Department of Chemistry, Xiamen University, P.R.China, and the Ph.D. (1996) degree from The Chinese University of Hong Kong. She worked as a Postdoctoral Research Associate in SUNY at Stony Brook with Professor Benjamin Chu during 1996-2000, and a Senior Chemist in Union Carbide/The Dow Chemical Company during 2000-2002 before she joined to CUNY-CSI.

Shuiqin Zhou is currently an Associate Professor of the Department of Chemistry, College of Staten Island and Graduate Center, City University of New York. Her group is currently focusing on the researches of (1) nanostructured functional materials from fullerene derivatives, fullerene-polymer composites, and conjugated polymers; (2) supramolecular assembled polymer-lipid complexes as well as polyelectrolyte-surfactant complexes for personal care products; (3) microcapsules and thin films from smart polymer hydrogels for drug delivery. Her researches are currently supported by the National Science Foundation and The Dow Chemical Company. She has published 60 research papers and book chapters.

Shuiqin Zhou is a member of American Chemical Society and American Association for the Advancement of Science.

T5 - Technical Session 5: Nanotechnology/MEMS (II)

Hierarchical Assembly of a Series of Rod-coil Block Copolymers

Comment [u19]: Title

Christopher Y. Li

Comment [u20]: The name(s) of the speaker(s).

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ABSTRACT

Liquid crystalline (LC) block copolymers play a major role in creating hierarchical self-assembled structures in different length scales. Most of the LC block copolymer studies focus on side chain LC polymers, in which one end of the LC mesogens are attached to the polymer backbones through “soft” spacers, such as methylene groups. By laterally linking the “waist” of LC mesogens directly to polymer backbones (without spacers), mesogenic jacketed LC polymers (MJLCP) can be achieved. Because of the semi-rigid nature of the polymer chains induced by the strong interaction between the side chain mesogens and the polymer backbone, MJLCPs could serve as “rod” to form *rod-coil* block copolymers, which represent a new category of self-assembling. Recently, using MJLCP as the rod segment, a new series of rod-coil block copolymers, PS-b-PMPCS, have been synthesized. In this presentation, we report, the hierarchically *ordered* rod-coil polymer structure with MJLCP as the rod segments. The confined LC phase behavior within the microphase separated block copolymers will be discussed. Both symmetric and asymmetric PS-b-PMPCS have been investigated. It has been found that the symmetric PS-b-PMPCS forms the bilayer smectic A phase while perforated layered structures have been observed in the asymmetric PS-b-PMPCS. For low molecular weight BCPs, temperature dependence of the lamellar d-spacing has been observed, and, is tentatively attributed to the Smectic A_d phase to bilayer smectic A phase transition.

BIOGRAPHY

Christopher Li received his Ph.D. from department of polymer science, The University of Akron. He joined Drexel University, department of Materials Science and Engineering in 2002 as an assistant professor. He was a visiting professor at the Air Force Research Laboratory from Jun. 2004-Aug. 2004. His research interests include liquid crystals and block copolymer self-assembly and nano-patterning, interface behavior of hybrid materials (*e.g.* CNT and polymers) and controlled structure through polymer folding.

Christopher Li has received PERKIN ELMER - ICTAC (international confederation for thermal analysis and calorimetry) Young Scientist Award 2004, NRC/US AFOSR Summer Faculty Fellowship Award 2004, Mettler-Toledo Thermal Analysis Educational Award 2003, NSF-CAREER Award 2003-2008, and 3-M Non-Tenured Faculty Award. He has published 7 review papers and book chapters and 30 peer-reviewed papers.

T5 - Technical Session 5: Nanotechnology/MEMS (II)

Creating 3D Microstructures by Interference Lithography: from 3D Photonic Crystals to Biomimetic Microlens Arrays

Comment [u21]: Title

Shu Yang

Comment [u22]: The name(s) of the speaker(s).

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ABSTRACT

Photonic crystals hold the promise of numerous applications in integrated optical circuits such as enhancing the performance of semiconductor lasers, waveguides, and all on chip optical transistors. However, it remains technologically challenging to rapidly create highly ordered 3D structures with periods on the order of sub-micrometer length scale. By interference of four beams of visible laser light in a continuous wave mode based on photosensitized cationic polymerization of epoxy, a series of 3D defect-free porous structures, such as face-centered cubic lattices with periods of ~1 μm were created within seconds in an area with diameter of 3 mm. An appropriate concentration of amine was added as a neutralizer to eliminate non-zero background. The polymerization of the epoxy (SU-8) is controlled in a two-step reaction without perturbing the interference patterns during exposure. We recently extend this approach to create triply periodic bicontinous 3D structures that could have large photonic band gaps. Here we demonstrate three structures, (with simple cubic, fcc and bcc translational symmetry) each of which is fabricable by interference lithography and has a complete 3D band gap. For the three structures presented, the recording beams are all launched from the same side of the substrate. Of particular importance is the fact that the simple cubic P structure is size scalable.

Biology provides a multitude of varied, new paradigms for the development of adaptive optical networks. Using 3-beam interference lithography, we present a first example of synthetic, biomimetic microlens arrays with integrated pores, whose appearance and function are strikingly similar to their biological prototype – a highly efficient optical element formed by brittlestars. We show that (i) the microlenses have strong focusing ability and the structure can be, therefore, used as an adjustable lithographic mask, and that (ii) light-absorbing liquids can be transported in and out of the pores between the lenses, which provides a wide range of tunability of the lens optical properties.

BIOGRAPHY

Ph.D., Chemistry and Chemical Biology, Cornell University, 1999
M.S., Chemistry and Chemical Biology, Cornell University, 1997
B.S., Material Science, Fudan University, China, 1992

Research Interests
Synthesis, characterization and fabrication of functional polymers, and organic/inorganic hybrids. Special interests include preparation of functional block copolymers and investigation of their nanostructures; understanding the self-organization process at surfaces and interfaces;

development of novel photosensitive materials and non-conventional approaches for nano- and micropatterning of complex 2D and 3D structures; controlling liquid wetting/dewetting behavior on polymer thin films.

T5 - Technical Session 5: Nanotechnology/MEMS (II)

An ABC Stacking Structure Inside Supramolecular Nanocolumns

Comment [u23]: Title

Shi Jin

Comment [u24]: The name(s) of the speaker(s).

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ABSTRACT

An ABC stacking intra-column supra-structure was discovered in a supra-molecular discotic columnar liquid crystalline phase as the consequence of hierarchical self-assembly. Disc-shaped supra-molecular hexamers were constructed via strong complementary inter-molecular donor-donor-acceptor (DDA) and acceptor-acceptor-donor (AAD) triple hydrogen bonds. These discs stack together in a highly tilted fashion to form a discotic columnar phase in which nanocolumns are arranged into a two-dimensionally ordered lattice. Inside each column, discs are rotated in a manner that after stacking of three discs the original symmetry is restored. Simulation suggests that this packing scheme can be attributed to the subtle balance among π-π interaction, electrostatic interaction and steric hindrance between neighboring hexameric discs..

BIOGRAPHY

Shi Jin was awarded his Ph. D. degree in polymer science by the University of Akron (Akron, Ohio) in 2001.

He is currently an Assistant Professor in department of chemistry at the College of Staten Island, the City University of New York. He worked in Maurice Morton Institute of polymer science at the University of Akron from 2002 to 2004. His research interests include charge transport liquid crystals for photonic applications, highly conjugated conducting polymers and ionic conducting polymers.

He is a member of the American Chemical Society and the American Physical Society.

T6 - Technical Session 6: System-on-Chip (II)

Session Chair

Lanrong Dung

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BIOGRAPHY

He received a BSEE and the Best Student Award from Feng Chia University, Taiwan, in 1988, an MS in electronics engineering from National Chiao Tung University, Taiwan, in 1990, and Ph.D. in electrical and computer engineering from Georgia Institute of Technology, in 1997. From 1997 to 1999 he was with Rockwell Science Center, Thousand Oaks, CA, as a Member of the Technical Staff. He joined the faculty of National Chiao Tung University, Taiwan in 1999 where he is currently an assistant professor in the Department of Electrical and Control Engineering. He received the VHDL International Outstanding Dissertation Award celebrating in Washington DC in October, 1997. His current research interests include VLSI design, digital signal processing, hardware-software codesign, and System-on-Chip architecture. He is a member of Circuits and Systems society of the IEEE.

T6 - Technical Session 6: System-on-Chip (II)

Temperature-aware On-chip Networks

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ABSTRACT

Due to the wire delay constraints in deep sub-micron technology and increasing demand for on-chip bandwidth, networks are becoming the pervasive interconnect fabric to connect processing elements on chip. With ever-increasing power density and cooling costs, the thermal impact of on-chip networks needs to be urgently addressed.

In this talk, I will present one of our recent projects -- Temperature-aware on-chip networks, which addresses thermal modeling, characterization and management of on-chip networks. We first present an architectural thermal model we developed for on-chip neworks that takes into account the thermal correlation between routers across the chip and factors in the thermal contribution of on-chip interconnects. We next present ThermalHerd, a distributed, collaborative run-time thermal management scheme for on-chip networks that uses distributed throttling and thermal-correlation based routing to tackle thermal emergencies. Our simulations show ThermalHerd effectively ensuring thermal safety with little performance impact. With Raw as our platform, we further show how our work can be extended to the analysis and management of entire on-chip systems, jointly considering both processors and networks.

BIOGRAPHY

Li Shang received his B.E. degree with honors from the Department of Electrical Engineering, Tsinghua University, China in 1997. He received his Ph.D. degree from the Department of Electrical Engineering, Princeton University in 2004. In August 2004, he joined the Department of Electrical and Computer Engineering at Queen's University, Canada, as an assistant professor. His research mainly focuses on computer architecture and design automation. His research interests include: Computer architecture/Interconnection networks, Computer-aided design of VLSI systems, Power/thermal analysis and optimization, Hardware/software co-synthesis, and Mobile computing.

T6 - Technical Session 6: System-on-Chip (II)

Thermal-aware Network-on-chip Design

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ABSTRACT

Networks-on-Chip (NoC), a new SoC paradigm, has been proposed as a solution to mitigate complex on-chip interconnect problems. NoC architecture consists of a collection of IP cores or processing elements (PEs) interconnected by on-chip switching fabrics or routers. Hardware virtualization, which maps logic processing units onto PEs, affects the power consumption of each PE and the communications among PEs. The communication among PEs affects the overall performance and router power consumption, and it depends on the placement of PEs. Therefore, the temperature distribution profile of the chip depends on the IP core virtualization and placement. In this paper, we present an IP virtualization and placement algorithm for generic regular Network on Chip (NoC) architecture. The algorithm attempts to achieve a thermal balanced design while minimizing the communication cost via placement. Our framework can also realize hardware virtualization which can further accomplish better performance. A case study on Low Density Parity Checks (LDPC) decoder is presented to evaluate our algorithm.

BIOGRAPHY

Yuan Xie received his B.S. degree from Electronics Engineering Department, Tsinghua University in Beijing, China, his M.S. and Ph.D. degrees in computer engineering from Electrical Engineering Department, Princeton University. After graduated from Princeton, he worked for IBM Microelectronics Division's Worldwide Design Center, SOC Design and Methodology group. In Fall 2003, Dr. Xie left IBM and joined Pennsylvania State University to be a faculty member in Computer Science and Engineering department. Dr. Yuan Xie's research interests include VLSI Design, Computer Architecture, Embedded Systems Design, Electronics Design Automation.

T6 - Technical Session 6: System-on-Chip (II)

Study on Power-Aware Motion Estimation Architecture

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ABSTRACT

Motion estimation (ME) has been notably recognized as the most critical part in many video compression applications, such as MPEG standards and H.26x, which tends to dominate computational and hence power requirements. With increasing demand of battery-powered multimedia devices, an ME architecture that can be flexible in both power consumption and compression quality is highly required. The requirement is driven by user-centric perspective. Basically, users have two thoughts on using portable devices. Sometimes, users might want extremely high video quality at the cost of reduced battery lifetime. At other times, users might want acceptable quality for extending battery lifetime. This paper, therefore, intends to presents a novel power-aware ME architecture using a content-based sub-sample algorithm, that can adaptively perform tradeoffs between power consumption and compression quality as the battery status changes. The proposed architecture is driven by a content-based sub-sample algorithm that allows the architecture to work at different power consumption modes with acceptable quality degradation. Since the control mechanism and data sequences at different power consumption modes are the same in the architecture, the power-aware algorithm can switch power consumption modes very smoothly on the fly. According to the power mode, the power-aware architecture sets the sub-sample rate and calculates the motion vector (MV) for motion compensation. Note that most portable multimedia devices, in practice, have the battery monitor unit and power management subroutines. The host processor and battery monitor unit should not be considered as the overhead of using the power-aware architecture.

BIOGRAPHY

He received a BSEE and the Best Student Award from Feng Chia University, Taiwan, in 1988, an MS in electronics engineering from National Chiao Tung University, Taiwan, in 1990, and Ph.D. in electrical and computer engineering from Georgia Institute of Technology, in 1997. From 1997 to 1999 he was with Rockwell Science Center, Thousand Oaks, CA, as a Member of the Technical Staff. He joined the faculty of National Chiao Tung University, Taiwan in 1999 where he is currently an assistant professor in the Department of Electrical and Control Engineering. He received the VHDL International Outstanding Dissertation Award celebrating in Washington DC in October, 1997. His current research interests include VLSI design, digital signal processing, hardware-software codesign, and System-on-Chip architecture. He is a member of Circuits and Systems society of the IEEE.

T7 - Technical Session 7: Bioinformatics (II): Genomics and Pharmacogenomics

Session Chair

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BIOGRAPHY

Zhongwei Li obtained his Ph.D. in Microbiology from Chinese Academy of Sciences (CAS), 1989, and M.S. in Computer Science from Univ. of Miami (2001). He has been working on plant-microbe interactions (CAS, Assistant Researcher, 1989-1991); signal transduction in the CNS (Yale, Postdoc, 1995); RNA metabolism (UCONN, Postdoc1991-1994; U. of Miami, Res. Assist. Prof., 1996-2000; Florida Atlantic University, Assistant Professor, 2002-present); and microbial genomics and bioinformatics (U. of Miami, DuPont, Sr. Bioinformatics Specialist, 2000-2002; Florida Atlantic University, Assistant Professor, 2002-present). His research interest is RNA metabolism and RNA therapy.

T7 - Technical Session 7: Bioinformatics (II): Genomics and Pharmacogenomics

Genomic Analysis of RNA Processing

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ABSTRACT

RNA processing is a challenging problem in all biological systems. While some activities and pathways are well conserved, others are diversified. The availability of genome sequences from numerous organisms allows us to compare RNA processing at the levels of RNA sequence determinants and enzymes involved. This greatly facilitates our understanding of different RNA processing mechanisms. In this study, the processing of bacterial tRNA has been investigated. A strong correlation between sequence arrangement of tRNA precursors and the processing enzymes has been observed. The fact that various bacteria employ different tRNA processing pathways raises an interesting question on the evolution of the pathways.

BIOGRAPHY

Zhongwei Li obtained his Ph.D. in Microbiology from Chinese Academy of Sciences (CAS), 1989, and M.S. in Computer Science from Univ. of Miami (2001). He has been working on plant-microbe interactions (CAS, Assistant Researcher, 1989-1991); signal transduction in the CNS (Yale, Postdoc, 1995); RNA metabolism (UCONN, Postdoc1991-1994; U. of Miami, Res. Assist. Prof., 1996-2000; Florida Atlantic University, Assistant Professor, 2002-present); and microbial genomics and bioinformatics (U. of Miami, DuPont, Sr. Bioinformatics Specialist, 2000-2002; Florida Atlantic University, Assistant Professor, 2002-present). His research interest is RNA metabolism and RNA therapy.

T7 - Technical Session 7: Bioinformatics (II): Genomics and Pharmacogenomics

TIGR Gene Indices: clustering and assembling EST and known genes and integration with eukaryotic genomes

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ABSTRACT

While the list of completed genome sequencing projects has expanded rapidly, sequencing and analysis of Expressed Sequence Tags (ESTs) remains a primary tool for discovery of novel genes in many eukaryotes and a key element in genome annotation. The TIGR Gene Indices (http://www.tigr.org/tdb/tgi) are a collection of 77 species-specific databases that use a highly refined protocol to analyze gene and EST sequences in an attempt to identify and characterize expressed transcripts and to present them on the web in a user-friendly, consistent fashion. A Gene Index database is constructed for each selected organism by first clustering, then assembling EST and annotated cDNA and gene sequences from GenBank. This process produces a set of unique, high-fidelity virtual transcripts, or Tentative Consensus (TC) sequences. The TC sequences can be used to provide putative genes with functional annotation, to link the transcripts to genetic and physical maps, to provide links to orthologous and paralogous genes, and as a resource for comparative and functional genomic analysis.

BIOGRAPHY

Dan Lee was awarded BSc in biochemistry in 1986 by Anhui University, Hefei, China, MSc in plant physiology in 1993 by University of Guelph, Guelph, Cananda and PhD in molecular genetics in 2000 by Ohio State University, Columbus, Ohio, US.

He joined The Institute of Genomic Research (TIGR) as a postdoctoral research fellow in 2000 and later moved to a permanent position as bioinformatics analyst in 2002. He has been co-authors of about 20 scientific articles and papers, which have been published in various journals including Bioinformatics, Genome Research, Genome Biology, Science, Nature, Nucleic Acid Research, Plant Physiology etc. He coauthored a chapter with Dr. John Quackenbush, “Using the TIGR Gene Index Databases for Biological Discovery” which was published in 2003 in Current Protocols in Bioinformatics. He has reviewed articles for Bioinformatics, Genomics etc. His research interests mainly focus on bioinformatics and comparative and functional genomics. He and his team have been involved in various projects including TIGR Gene Index, Eukaryotic Gene Ortholog (EGO), Resourcerer, maize genome sequencing etc.

Dr. Lee has been a member of American Association for the Advancement of Science, and American Society of Plant Biologists.

T7 - Technical Session 7: Bioinformatics (II): Genomics and Pharmacogenomics

Semi-parametric Gene Ranking for Microarray Experiments

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ABSTRACT

Many biomedical studies involve the selection of genes using small-scale microarray experimental design. In these studies, the experimenter sets conditions in the experiment so the expression profiles of candidate genes should conform to some expected target pattern as conditions vary. Often the pattern is qualitative rather than quantitative: the experimenter only knows in certain conditions the expression level should be higher, lower, or roughly equal to some other conditions. Traditional approaches such as clustering, threshold filtering, or regression-based approaches such ANOVA all have limitations in characterizing qualitative patterns. We developed a new approach using isotonic regression, a standard procedure in nonparametric statistics, in ranking how each gene fits the qualitative target pattern. We analyzed a published microarray experiment for identifying direct targets of the plant specific transcription factor LEAFY in the transition to reproductive development in *Arabidopsis*. Of the 9 genes ranked highly by the new criterion but not tested previously, 3 new genes were further confirmed as direct targets of LEAFY using RT-PCR.

This is joint work with Junhyong Kim, Yanhui Su, and Doris Wagner.

BIOGRAPHY

Li-San Wang received his B.S.E.E. ('94) and M.S.E.E. ('96) from the National Taiwan University; he then received his M.S. ('00) and Ph.D. ('03) from the University of Texas at Austin, both in Computer Sciences. Currently he is a postdoctoral fellow at the University of Pennsylvania. His research interest includes theory of algorithms, phylogenetics, and microarray analyses.

T8 - Technical Session 8: C4I (II): On-Demand Business/IT Bridging Technologies

Session Chair

Hung-yang (Henry) Chang

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BIOGRAPHY

Henry Chang, IBM Thomas J. Watson Research Center (hychang@us.ibm.com) Dr. Chang is a senior technical staff member and a manager in Business Informatics department at the IBM T.J. Watson Research Center. Before joining IBM at the Thomas J. Watson Research Center, he received Ph.D. and MS. in Computer Sciences from U. Wisconsin-Madison at 1987 and a B.S. in Electrical Engineering from National Taiwan University in 1979, respectively. His recent research interests include sense-and-respond adaptive business process design, event-based business monitoring, and business collaboration across design chain and supply chain. In 2000, he received an IBM Innovate Award for his work on B2B collaboration solutions. He is a member of ACM.

T8 - Technical Session 8: C4I (II): On-Demand Business/IT Bridging Technologies

Autonomic Enterprise Security through Orchestration

Naga Ayachitula*(Speaker), Suresh Chari, Josyula Rao, Michael Steiner, Maheswaran Surendra

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ABSTRACT

As IT environments have increased in complexity, new technologies and expansion over time have left most organizations with distributed islands for security vulnerabilities and security events including security scan non-compliance, intrusion detection, and out-of-band notifications. Orchestration is fundamental to automation strategy to the next level of on demand security. Orchestration can pro-actively and intelligently drive the remediation of IT security events within defined business and corporate security policies.

While there is a considerable focus in the IT industry on increasing the accuracy and automation of security incident detection, there are significant gaps in the response and recovery procedures for these incidents and tend to be manual and somewhat ad-hoc. This talk aims at an overview on identifying the gaps that exist today and bridging these gaps by strategies through policy-enabled systems for effective security incident response and recovery procedures to achieve graceful degradation and reinstatement of services. Security incidents range from non-compliance with a security policy to vulnerability and infection by worms and viruses.

This presentation will give an example of a solution capable of managing the security posture of properly enabled clients, based on defined policies. The solution will address detection of violations to compliance policies and scenarios to fix policy violations. The compliance spectrum ranges from fully automated application of security, patch, anti-virus, firewall fixes to manual application of fixes. The solution is integrated with Cisco's Network Admission Control offering in support of the IBM-Cisco Alliance. The solution is not specific to the Cisco Network Admission Control deployment model, and can also be used in other deployment models. The talk will also highlight experiences from a project called "Elix0r" – A System for Planning Orchestrated Remediation of Security Incidents.

BIOGRAPHY

Naga Ayachitula*(Arun) is currently a Senior Software Engineer of the IBM Research (Autonomic Computing) division in Thomas J Watson Research Center, Hawthorne, NY. Arun is currently involved in developing innovative approaches to automating management of Information Technology systems, designing strategies and workflows to evaluate and implement response and recovery actions, and provide architectures for scalable distributed solutions for response and remediation in IT security events. These events include security scan non-compliance, intrusion detection, and out-of-band notifications. In particular, these approaches are based on control theoretic and planning technologies. Arun has 6+ years of leadership, architectural and development experience in the roles of an Architect and Team Leader at IBM. Arun has architected, led the development of IBM products like Media Production Suite, Digital Library Connection for Avid and several content management solutions for the media industry. Arun holds a Masters degree in Technology from D.A. University – Indore, India and Masters Degree in Science from Nagarjuna University - Vijayawada, India. He has four patents pending and several publications in the field of

databases, application servers, content management, records management and on-demand computing.

T8 - Technical Session 8: C4I (II): On-Demand Business/IT Bridging Technologies

Model-Driven Business Integration and Monitoring

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ABSTRACT

Many enterprises are investing in information technology (IT) to assist their employees as they carry out the business processes essential to their companies' operations. To achieve this goal they need to bring together discrete applications, legacy databases, and business partner links into a unified solution that can be used and managed in a coherent fashion. An important requirement is that the solution be easily adaptable to changes that must be made to the business processes in response to competitive pressures or government regulations. The use of models in both the business and IT domains show promise of meeting these requirements. In Model-Driven Business Integration and Monitoring (MDBIM), models are created at various levels, ranging from high-level business strategy and business operations, down to the detailed specification of user interfaces and data models that will implement the business processes. Most importantly, all these models are linked together to ensure that the IT solution closely matches the intent of the business models. The business models include specification of quantitative business performance measures that are directly mapped to elements of the IT solution; as a result the deployed solution generates near-real-time data that reports to business executives on the performance of the business processes.

In this talk we will describe the multi-level models used in our MDBIM methodology, the tools we have used and built, and the linkages between models. We will describe our experience applying this approach in a project to build a business integration solution for a major healthcare company.

BIOGRAPHY

Fred Wu is a Research Staff Member at the IBM T.J. Watson Research Center in Yorktown Heights, NY. He is engaged in development of modeling concepts for business process integration and automation.

Dr. Wu received the B.S. degree in Physics from MIT, and M.S. and Ph.D. in Electrical Engineering from MIT. After working at the Perkin-Elmer Corporation, he joined IBM Research in 1987. At IBM he has worked in automated inspection systems, schedule optimization for manufacturing, and electronic marketplaces. He has patents and publications in the fields of optical engineering, optimization and decision support, and electronic commerce.

T8 - Technical Session 8: C4I (II): On-Demand Business/IT Bridging Technologies

Usability Approach to Reducing Concept-to-Code Cycle Time: An Interdisciplinary Practitioner's View

Chia-jer Tsai, Ph.D.

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ABSTRACT

End-to-end, enterprise-scale software development is usually a labor-intensive process that produces a variety of intermediate informational products used by various team members. As such, beside innovative software engineering technologies that help to improve the cycle time and quality of software development, usability principles and methods can and should be applied to reduce errors and increase efficiency plus long-term maintainability without incurring high capital cost. These methods may be novel to engineers but are standard tools to a usability professional or an information designer. Examples of the methods are needs assessment, target audience analysis, taxonomy control, structured writing and labeling, design checklist, formative evaluation, and summative evaluation. Application of these methods to the informational products of software development is discussed and illustrated.

BIOGRAPHY

Dr. Chia-jer Tsai is a senior member of the Workflow Management and Automation Design and Systems Engineering Division of AT&T Labs. Dr. Tsai's current professional role is systems and user experience engineer. He develops graphical user interface (GUI) requirements of the Web-based workflow management system of AT&T business IP services. Dr. Tsai's earlier project roles included systems and user experience engineer of AT&T WorldNet® Service's help desk system and member services Web site, and product realization project manager of a network-based voice mailbox service.

Prior to joining AT&T Bell Labs in 1995, Dr. Tsai worked for the Training Systems and Simulators Department of Southwest Research Institute (SwRI), a leading not-for-profit institution providing contract R&D services to domestic and international clients. At SwRI he developed technical documentation and research reports, computer-based multimedia training systems, and electronic performance support systems (EPSS) for various clients such as the U.S. Air Force, Ford Motor Company, and Westinghouse. Dr. Tsai holds a B.S. degree in electrical engineering and both an M.S. degree and a Ph.D. degree in instructional systems technology (IST).

Day2

Opening Remarks

Keynote Speech

Overview of Research in the Princeton Architecture Lab for Multimedia and Security (PALMS)

Ruby Lee

Princeton University

BIOGRAPHY

Ruby B. Lee is the Forrest G. Hamrick Professor of Engineering and Professor of Electrical Engineering at Princeton University, with an affiliated appointment in the Computer Science department. She is the director of the Princeton Architecture Laboratory for Multimedia and Security (PALMS). Her current research is in designing security and new media support into core computer architecture, embedded systems and global networked systems, and in architectures resistant to Distributed Denial of Service attacks and Internet-scale epidemics. She teaches courses in *Cyber Security* and *Processor Architectures for New Paradigms*. She is a Fellow of the Association for Computing Machinery (ACM) and a Fellow of the Institute of Electrical and Electronic Engineers (IEEE). She is Associate Editor-in-Chief of *IEEE Micro* and Editorial Board member of *IEEE Security and Privacy*.

Prior to joining the Princeton faculty in 1998, Dr. Lee served as chief architect at Hewlett-Packard, responsible at different times for processor architecture, multimedia architecture and security architecture for e-commerce and extended enterprises. She was a key architect in the definition and evolution of the PA-RISC architecture used in HP servers and workstations, and also led the first CMOS PA-RISC single-chip microprocessor design. As chief architect for HP's multimedia architecture team, Dr. Lee led an inter-disciplinary team focused on architecture to facilitate pervasive multimedia information processing using general-purpose computers. This resulted in the first desktop computer family with integrated, software-based, high fidelity, real-time multimedia. Dr. Lee also co-led a multimedia architecture team for IA-64. Concurrent with full-time employment at HP, Dr. Lee also served as Consulting Professor of Electrical Engineering at Stanford University. She has a Ph.D. in Electrical Engineering and a M.S. in Computer Science, both from Stanford University, and an A.B. with distinction from Cornell University, where she was a College Scholar. She is an elected member of Phi Beta Kappa and Alpha Lambda Delta. She has been granted 115 United States and international patents, with several patents pending.

Research web page: http://palms.ee.princeton.edu
Personal web-page: http://www.princeton.edu/~rblee

Keynote Speech

An Update of Current Advances in Pharmacogenomic and Pharmacogenetic Drug Trials Using SNP Profile and Gene Expression Signature

Sue-Jane Wang

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FDA Inter-Center Pharmacogenomics/Pharmacogenetics Working Group
FDA Interdisciplinary Pharmacogenomics Review Group
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Adjunct Professor, Johns Hopkins University, Engineering Programs for Professionals, Maryland

ABSTRACT

Following last year's plenary presentation in the Bioinformatics program on "A Regulatory Perspective of Bioinformatics Data Generated for Pharmacogenomics and Pharmacogenetics Studies," many pharmaceutical drug development activities and advances had taken place. In April this year, FDA collaborated with drug companies that are members of the PhRMA and initiated a public workshop on genomics (microarray) biostatistics to publicly disseminate these new advances and new challenges. Whether to study a drug's mechanism of action, a disease subtype screening tool or a diagnostic device for a particular individual or population subtype, genomic drug trials have become a part of the nonclinical, clinical pharmacology, and clinical trial evaluations. In therapeutic diagnostic drug combination development, it is critical to make use of the genomic and proteomic expression data generated in the genomic drug trials and to correlate it to the drug treatment outcome. In this presentation, "An Update of Current Advances in Pharmacogenomic and Pharmacogenetic Drug Trials Using SNP Profile and Gene Expression Signature" will be given.

BIOGRAPHY

Sue-Jane Wang joined the U.S. Food and Drug Administration in 1994, where she is currently an expert biostatistician in genomic drug trials. Before joining FDA, she was a senior biostatistician at the medical genetics division, Cedars-Sinai medical center, California. As a steering committee member of the Pharmacogenomic/Pharmacogenetic Working Group at FDA, Dr. Wang is currently involved in planning the third PG workshop on "Pharmacogenomics in Drug Development and Regulatory Decision-Making: Three Years of Promise, Proposals and Progress on Optimizing the Benefit/Risk of Drug Development and Therapy" as a chair for Strategies and Challenges in Retrospective Validation of Genomic Biomarker. Dr. Wang received her master degree from University of California, Los Angeles, CA and Ph.D. from University of Southern California, CA. Her major research and application activities include adaptive (flexible) designs in controlled (genomic) clinical trials; genetic and epidemiologic studies; statistical methods for analysis of microarray data and pharmacogenomics/ pharmacogenetics data in drug/diagnostic test development; and teaching in biostatistics. Her professional activities in the pharmacogenomics/ pharmacogenetics area are mainly chairs and invited speakers. Dr. Wang received FDA Award of Merits, FDA outstanding service awards, FDA/CDER Excellence in communication Award, and FDA/CDER Excellence in Analytical Science Award.

P3 - Plenary Session 3: Bioinformatics

Session Chair

Sue-Jane Wang

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BIOGRAPHY

Sue-Jane Wang joined the U.S. Food and Drug Administration in 1994, where she is currently an expert biostatistician in genomic drug trials. Before joining FDA, she was a senior biostatistician at the medical genetics division, Cedars-Sinai medical center, California. As a steering committee member of the Pharmacogenomic/Pharmacogenetic Working Group at FDA, Dr. Wang is currently involved in planning the third PG workshop on “Pharmacogenomics in Drug Development and Regulatory Decision-Making: Three Years of Promise, Proposals and Progress on Optimizing the Benefit/Risk of Drug Development and Therapy” as a chair for Strategies and Challenges in Retrospective Validation of Genomic Biomarker. Dr. Wang received her master degree from University of California, Los Angeles, CA and Ph.D. from University of Southern California, CA. Her major research and application activities include adaptive (flexible) designs in controlled (genomic) clinical trials; genetic and epidemiologic studies; statistical methods for analysis of microarray data and pharmacogenomics/ pharmacogenetics data in drug/diagnostic test development; and teaching in biostatistics. Her professional activities in the pharmacogenomics/ pharmacogenetics area are mainly chairs and invited speakers. Dr. Wang received FDA Award of Merits, FDA outstanding service awards, FDA/CDER Excellence in communication Award, and FDA/CDER Excellence in Analytical Science Award.

P3 - Plenary Session 3: Bioinformatics

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ABSTRACT

BIOGRAPHY

P3 - Plenary Session 3: Bioinformatics

Challenges and Solutions: Integration of Clinical, Genomic, and Proteomic Data in a High Throughput Environment

Hai Hu, Ph. D.

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ABSTRACT

Windber Research Institute is a high throughput research center employing clinical, genomic, and proteomic platforms to produce terabyte levels of data. A hybrid data warehouse, deploying Teradata's parallel database structure, has been conceived and is currently under development using a Phase II product to integrate clinical, genomic, and proteomic data generated in Walter Reed Army Medical Center and Windber Research Institute, as well as data from selected public sources. The data warehouse can be accessed via different front-end application tools we have developed. This presentation will summarize the challenge we have encountered so far and the solutions we have found in the development of this major project in the last one and a half years. We expect that the final implementation of the data warehouse will greatly facilitate research in the field of biomedical informatics and translational research.

BIOGRAPHY

Dr. Hai Hu is currently Director of Biomedical Informatics at Windber Research Institute, jointly appointed as Research Assistant Professor in the Department of Surgery at USUHS. He has nearly 5 years of direct experiences applying computational and statistical technologies to solving high-throughput biological problems, including developing data mining, data analysis, and data tracking systems. Proceeding to it he conducted research as a molecular biophysicist/biologist for 4 years after obtaining Ph. D. degree. Besides, he had several years of industrial computer engineering experiences. His educational background includes physics, computer engineering, statistics, and biophysics. Currently he is heading the development of the biomedical informatics infrastructure at the Institute, including developing a data warehouse and a clinical laboratory workflow system. At the same time, he is leading several research projects involving human subjects. He has published many peer-reviewed papers, and presented at numerous national and international scientific and business conferences, often as an invited speaker recently. He has also been a key co-organizer in several scientific conferences.

P4 - Plenary Session 4: C4I

Session Chair

Shu-Ping Chang, Ph. D.

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BIOGRAPHY

Shu-Ping Chang is currently a researcher at IBM T.J. Watson Research Center. He works on the research and design for next generation high speed computer cluster technologies for high volume information analysis and decision making system.

In his previous assignment, he was the Manager of Integrated Content Management Solution developing the Media Production Suite (MPS) product which is currently used by CNN Library as their news center archive. He worked with customers to understand their business and technical needs, and developed the turnkey technologies for the overall solution. Shu-Ping worked on this product from 2000 to 2003.

Shu-Ping Chang was awarded his Ph. D. and Master degrees in Computer and Information Sciences by the University of Minnesota. His Bachelor degree is in Communication Engineering from Chao-Tung University, Taiwan, ROC with first-place honor.

He joined IBM T.J. Watson Research Center in 1990 developing microcode for Logical-Link Control in FDDI station. In 1992, he moved to Broadband Networking where he developed high speed memory based packet switch and latter ATM LAN/WAN edge controller. Dr. Chang jointed Industrial Solution Unit in 1996 as senior architect/engineer where he developed several products for Media and Entertainment industries especially in Media Asset Management area.

P4 - Plenary Session 4: C4I

Broadband Video Streaming: Promises and Challenges

Monsong Chen

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ABSTRACT

Broadband video streaming, uniting broadband networks and TVs, holds the exciting promise of fundamentally changing how we work and entertain, but has not yet been able to cross a threshold of critical mass despite numerous and continuous capital and technology investments over years. This is because that the promises of broadband video streaming often intertwine with its challenges. The intent of this presentation is to share our experiences in simultaneously pushing the envelope of technologies and addressing complex business issues over the last 10 years.

BIOGRAPHY

Monsong Chen received his Ph.D. in System Engineering in 1985 from Polytechnic Institute of New York, Brooklyn, New York, Master Degree in Electrical Engineering in 1982 from University of Washington, Seattle, Washington, and Bachelor Degree in Electrical Engineering in 1978 from National Taiwan University, Taipei, Taiwan.

He is presently President/CEO of InfoValue Computing, Inc., experts in broadband video streaming technology and solutions, in Elmsford, New York. InfoValue has been the pioneers and leaders high-quality broadband video streaming since 1994, achieving many record breaking milestones including the world's first Windows based high-performance video-on-demand server software in 1996, Frost & Sullivan's Marketing Engineering Award in 1999, the first military-grade digital video audio system for fighter jet flight simulators in 2000, the world's first high definition TV (HDTV) quality in-room movies-on-demand in 5-star hotels, and many more.

Prior to founding InfoValue, he spent 10 year at IBM Watson Research Center, Yorktown Heights, New York, conducting and managing lead edge researches in broadband networking, optical communications, protocol engineering, and video conferencing.

P4 - Plenary Session 4: C4I

VoIP on Wireless Mobile Communications

Qi Bi, Ph. D.

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ABSTRACT

While voice over Internet protocol (VoIP) on wireline network is maturing, implementation of VoIP on wireless mobile network is still in its infancy. The reason for this disparity is due to the fact that the wireline bandwidth is abundant and can be traded off for delay performance and overhead, whereas bandwidth in wireless mobile network is still a scarce resource that limits the achievable performance.

In this talk, we explore the possibility of implementing VoIP on the state of art high speed packet data wireless system: 1xEV-DO Rev. A. We identify the challenges that hinder the implementation of VoIP on wireless mobile network in general, and investigate possible solutions to meet these challenges.

BIOGRAPHY

Dr. Qi Bi received his BS and MS from the Shanghai Jiao Tong University in 1978 and 1981, and Ph.D. from the Pennsylvania State University in 1986. After joining the Bell Labs as a Member of Technical Staff in 1988, he was awarded the Distinguished Member of Technical Staff in 1995, and became a Technical Manager in 1997.

Dr. Qi Bi was the recipient of numerous honors including *the Advanced Technology Laboratory Award of 1995 and 1996*, *the Bell Labs President's Gold Award 2000 and 2002, The Bell Labs Innovation Team Award of 2003,* and *the guest Professor of Shanghai Jiao Tong University in 2000*. In 2002, he was awarded the prestigious *Bell Labs Fellow* "for his pioneering contributions in analysis, design and optimization of CDMA systems that resulted in Lucent Technologies' global success in digital wireless communications"

Dr. Bi is also an active leader in his areas of expertise. He served in many international conferences including: tech. chair of 3G Wireless Symposium 2000-03, tech. vice chair of IEEE Wireless Communications and Network Conference 2003, tech. chair of Wireless Symposium of IEEE Globecom 2000-02, Organizer of The 1st and the 2nd Lucent IS-95 & UMTS Technical Conference in 1999-2000, Wireless Mobile ATM Conference 1998-99. He also served or is serving as the guest editor of *Wireless Communications and Mobile Computing* from Wiley, Feature Editor of IEEE Communications Magazine, 2001, Editor of IEEE Journal on Selected Areas in Communications and the Editor of IEEE Transaction on Wireless Communications.

Dr. Bi holds more than 25 US patents, and published many Journal and Conference papers. He was listed in Who's who in America, and featured in *Bund Magazine*, Shanghai, in Nov. 8, 2002. He can be reached at qbi@lucent.com

P4 - Plenary Session 4: C4I

Research Challenge: Extending Invention Toward Innovation

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ABSTRACT

What Is Innovation? It's not always about inventing something entirely new. (Sam Palmisano, 2003). Various innovation approaches are being deployed to enhance our innovation ecosystem. Innovative projects, lessons learned in turning invention into innovation and future innovation drivers will be presented.

BIOGRAPHY

Dr. Jen-Yao Chung received the B.S. degree in computer science and information engineering from National Taiwan University and M.S. and Ph.D. degrees in computer science from the University of Illinois at Urbana-Champaign. In 1989, he jointed T. J. Watson Research Center as a research staff member. Currently, he is the CTO for IBM Global Electronics Industry, where he is responsible for identifying and growing new technologies into future businesses for IBM. Before that, he was senior manager of the electronic commerce and supply chain department, and program director for the IBM Institute for Advanced Commerce Technology office. He has been involved in research, development, and customer engagements in business process integration & management, electronic commerce, electronic marketplaces, and Web application systems. Dr. Chung is the co-chair for IEEE technical committee on e-Commerce (TCEC). He has authored or coauthored over 120 technical papers in published journals or conference proceedings. Dr. Chung has participated in several industrial standards and workgroup including: Open buying on internet (OBI, openbuy.org), XML/EDI (xmledi-group.org), CommerceNet eCo framework (eco.commerce.net), RosettaNet.org and ebXML.org and TPC-D. He was awarded an IEEE Outstanding Paper award in 1995, two IBM Outstanding Technical Achievement awards, an IBM Outstanding Contribution award, and three IBM Research Division awards. He is a senior member of the IEEE and a member of ACM. http://www.research.ibm.com/people/j/jychung/

T9 - Technical Session 9: Nanotechnology/MEMS (III)

Session Chair

Darrin J. Young

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BIOGRAPHY

Darrin J. Young received his BS with honors, MS, and PhD degrees from the Department of Electrical Engineering and Computer Sciences at University of California at Berkeley in 1991, 1993, and 1999, respectively. His doctoral dissertation emphasizes on microelectromechanical devices design and fabrication technologies for radio frequency analog signal processing. Between 1991 and 1993, he worked at Hewlett-Packard Laboratories in Palo Alto, California, where he designed a shared memory system for a DSP-based multiprocessor architecture. During the summer of 1997, he worked at Rockwell Semiconductor Systems in Newport Beach, California, where he designed silicon bipolar RF analog circuits for cellular telephony applications. Between 1997 and 1998, he was also at Lawrence Livermore National Laboratory, working on the design and fabrication of three-dimensional RF MEMS coil inductors for wireless communications. Dr. Young joined the Department of Electrical Engineering and Computer Science at Case Western Reserve University as an assistant professor in 1999. His research interests include MEMS and nano-electro-mechanical devices design, fabrication, and integrated analog circuits design for communications, inertial sensing, biomedical implant, and general industrial applications.

T9 - Technical Session 9: Nanotechnology/MEMS (III)

MEMS Based Noninvasive Optical Imaging

Huikai Xie

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ABSTRACT

Cancer accounts for nearly one-quarter of deaths in the United States, exceeded only by heart disease. The high cancer mortality is mainly due to the lack of effective early-stage caner detection modalities. Optical coherence tomography m), which isμ(OCT) can provide cellular or even sub-cellular resolutions (1~10 very suitable for early cancer detection, but the size and imaging speed are big barriers for practical use of OCT for in vivo imaging of human visceral organs. The key to realize a fast and compact OCT imaging probe is to miniaturize its scanning components including mirrors and lenses. Several research groups demonstrated miniature OCT probes using microelectromechanical systems (MEMS) technology. In this talk, various MEMS-OCT designs will be reviewed and a new class of MEMS micromirrors and microlenses will be introduced.

BIOGRAPHY

Huikai Xie is an Assistant Professor at the Department of Electrical and Computer Engineering of the University of Florida. He received his MS in electro-optics from Tufts University in 1998, and PhD degree in electrical and computer engineering from Carnegie Mellon University in 2002. He also holds BS and MS degrees in electronic engineering from Beijing Institute of Technology. From 1992 to 1996, he was a faculty member of the Institute of Microelectronics at Tsinghua University, Beijing, working on various silicon-based chemical and mechanical sensors. He has published over 40 technical papers and has 5 US patents pending. His present research interests include micro/nanofabrication, integrated inertial sensors, optical MEMS and biophotonics.

T9 - Technical Session 9: Nanotechnology/MEMS (III)

Programmable and Autonomous Magnetically-Driven Microfluidic Actuators Using Liquid-Phase Photopolymerization (LP^3)

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ABSTRACT

I present the realization of micro actuators within microfluidic systems that are autonomously controlled by the local environment parameters, such as temperature and pH value. The fabrication process combines IC-derived microelectromechanical systems (MEMS) and polymer-based fabrication technologies. The nickel actuators are driven by an external rotating magnetic field and their actuation are controlled by a built-in clutch-based mechanism through hydrogels that expand or contract, responding to local environment parameters. The response of hydrogel is modified by tuning its chemical property, thus the programmability.

BIOGRAPHY

Hongrui Jiang is an Assistant Professor in the Department of Electrical and Computer Engineering at the University of Wisconsin – Madison. He received his B.S. degree (1995) in physics from Peking University, China, M.S. degree (1999) and Ph.D. degree (2001) in electrical engineering from Cornell University. He was a postdoctoral researcher with Berkeley Sensor & Actuator Center (BSAC) from 2001 to 2002, before joining the faculty of University of Wisconsin – Madison. His current research interests include MEMS sensors and actuators, MEMS based RF passive components and their applications in radio-frequency (RF) IC, on-chip power supply, MEMS packaging technologies, bioMEMS and microfluidics. He received the 2000 Graduate Fellowship Award from IEEE Microwave Theory and Techniques Society.

T9 - Technical Session 9: Nanotechnology/MEMS (III)

Hydrogel-Based MEMS Platforms for Smart Sensing and Active Flow Control

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ABSTRACT

Environmentally sensitive hydrogels offer unique opportunities for smart sensing and active flow control at the microscale. These tangled networks of cross-linked polymer chains, immersed in a solvent, manifest a reversible and abrupt swelling phase transition in response to changes in environmental factors such as glucose concentration, pH, electric field, temperature, and light. This transition often results in an abrupt volume change (swelling or shrinking) that can be as large as 1000 fold or more. Because of this property, hydrogels are attractive candidates as components of microactuators operating in aqueous media such as body fluids. For example, the volume phase transition in these materials can be harnessed in smart microfluidic components used for implantable drug delivery systems. In this talk, I will discuss several hydrogel-actuated MEMS-based microdevices for smart sensing and microflow control developed in my laboratory at the University of Minnesota. These include: 1) a hydrogel-actuated microvalve with a porous back-plate, 2) a hydrogel-gated smart flow controller, 3) a microvalve with double side tethered structure for the entrapment of hydrogel, and 4) a wireless passive glucose transponder.

BIOGRAPHY

Dr. Babak Ziaie is currently an assistant professor of Electrical/Computer and Biomedical Engineering at the University of Minnesota. Dr. Ziaie received his doctoral degree in Electrical Engineering from the University of Michigan in 1994. His dissertation project emphasized the development of an implantable single channel microstimulator for functional neuromuscular stimulation applications. From 1995-1999 he was a postdoctoral-fellow and an assistant research scientist at the Center for Integrated Microsystems (CIMS) of the University of Michigan. In October 1999 Dr. Ziaie joined the Department of Electrical and Computer Engineering of the University of Minnesota. His research group at Minnesota works on a variety of projects mostly related to biomedical applications of MEMS and microsystems. These include implantable wireless microsystems for diagnosis and management of glaucoma, hydrogel-based microsystems for physiological sensing active flow control, multi-channel low-power wideband wireless interfaces for central nervous system (brain/machine interface), and ultra-sensitive detectors for biological (molecular and cellular) applications. Dr. Ziaie is the recipient of the NSF Career award in Biomedical Engineering (2001) and McKnight Endowment Fund Award for Technological Innovations in Neuroscience (2002).

T9 - Technical Session 9: Nanotechnology/MEMS (III)

High-Performance Micro-Electro-Mechanical Strain Sensor Technology

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ABSTRACT

High-performance strain sensing microsystem consisting of sensors and interface electronics are highly critical for advanced industrial applications, such as point-stress and torque sensing for ball-bearings, rotating shafts and blades, etc. Stringent performance requirements with a high sensitivity of 0.1 με over a wide bandwidth of 10 kHz and a large dynamic range of 80 dB are demanded for these applications. Conventional strain sensors made of metal foils and semiconductor piezoresistive elements suffer from a limited sensitivity, large temperature dependence and turn-on drift, and are incompatible to standard CMOS integration, thus inadequate for high-performance and low cost applications In this talk, I will present an MEMS capacitive strain sensor converting an input strain to a capacitance change with a sensitivity of 26.5 aF per 0.1 □□, and low-noise integrated sensing electronics employing a continuous time synchronous detection architecture to convert the capacitive signal to an output voltage for further signal processing. The prototype microsystem achieves a minimum detectable strain of 0.09 □□ over a 10 kHz bandwidth with a dynamic range of 81 dB. The sensing electronics consume 1.5 mA from a 3V supply.

BIOGRAPHY

Darrin J. Young received his BS with honors, MS, and PhD degrees from the Department of Electrical Engineering and Computer Sciences at University of California at Berkeley in 1991, 1993, and 1999, respectively. His doctoral dissertation emphasizes on microelectromechanical devices design and fabrication technologies for radio frequency analog signal processing. Between 1991 and 1993, he worked at Hewlett-Packard Laboratories in Palo Alto, California, where he designed a shared memory system for a DSP-based multiprocessor architecture. During the summer of 1997, he worked at Rockwell Semiconductor Systems in Newport Beach, California, where he designed silicon bipolar RF analog circuits for cellular telephony applications. Between 1997 and 1998, he was also at Lawrence Livermore National Laboratory, working on the design and fabrication of three-dimensional RF MEMS coil inductors for wireless communications. Dr. Young joined the Department of Electrical Engineering and Computer Science at Case Western Reserve University as an assistant professor in 1999. His research interests include MEMS and nano-electro-mechanical devices design, fabrication, and integrated analog circuits design for communications, inertial sensing, biomedical implant, and general industrial applications.

T10 - Technical Session 10: System-on-Chip (III)

Session Chair

Win-Bin See

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BIOGRAPHY

Win-Bin See is currently a Technical Manager of the Aerospace Industrial Development Company (AIDC) in Taichung, Taiwan, R.O.C. He is responsible for the development of avionic system software. His areas of interest include object-oriented technologies, platform-based embedded software development, hardware and software co-design, safety critical software development, system engineering and software engineering.

Win-Bin See joined Aerospace Industrial Development Company (AIDC) in 1984 and conducted research and development in avionics system software since then. In 2000, his research expands to dispatching system development for commercial vehicle operation (CVO) in intelligent transportation system (ITS) domain. AIDC has been deploying very successful real-time packet based mobile dispatching and monitoring system for the vehicle fleet management of several island-wised logistic service companies in Taiwan.

Win-Bin See holds a Ph.D. degree from National Taiwan University, Taipei, Taiwan R.O.C., and a Master degree from National Chung-Kung University, Tainan, Taiwan, R.O.C, both in Electrical Engineering.

T10 - Technical Session 10: System-on-Chip (III)

Custom Instruction Synthesis for Extensible Processor Platforms

Fei Sun

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ABSTRACT

Efficiency and flexibility are critical, but often conflicting, design goals in embedded system design. The recent emergence of extensible processors promises a favorable tradeoff between efficiency and flexibility, while keeping design turnaround times short. Current extensible processor design flows automate several tedious tasks, but typically require designers to manually select the parts of the program that are to be implemented as custom instructions. In this work, we describe an automatic methodology to select custom instructions to augment an extensible processor, in order to maximize its efficiency for a given application program. We have evaluated the proposed techniques using a state-of-the-art extensible processor platform, in the context of a commercial design flow. Experiments with several benchmark programs indicate that custom processors synthesized using automatic custom instruction selection can result in large improvements in performance, energy and energy-delay products while speeding up the design process significantly.

BIOGRAPHY

Fei Sun received the B.S. degree in computer science from Peking University, Beijing, China in 2000 and the M.A. degree in Electrical Engineering in 2002 from Princeton University, Princeton, NJ, USA, where he is currently pursuing the Ph.D. degree in Electrical Engineering.

His research interests include application specific instruction-set processor (ASIP) design, electronic design automation (EDA) methodologies, low power design, high level synthesis, and hardware/software co-design.

T10 - Technical Session 10: System-on-Chip (III)

Design and Implementation of an Embedded Software Development Platform

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ABSTRACT

The demands for new embedded system products that provide new functionality and adopting new hardware are booming. Parallel development in hardware and software is promising in reducing both the time and effort for the design of embedded system. Mostly, the development of embedded system application has been carried out on general purpose computing platform using cross target development tools, includes cross compiler and linker etc. Personal computers are used as cross development environment to host the embedded system software development tool set. We propose a software platform approach that promotes the role of PC based embedded software cross development platform to support the embedded software development even before the real hardware becomes available. Our approach is an embedded software development platform (ESDP) that facilitates more extensive usage of the development platform. ESDP helps in decoupling the hardware and software development while maintaining very close semantic similarity for the function operates on both development and target platforms. The ESDP approach has been adopted in the development of two embedded systems, a car-borne modular mobile data terminal (MMDT), and an air-borne navigation support display system (NSD). MMDT integrates packet based GPRS mobile data communication and global positioning capability for applications in the domain of intelligent transportation system (ITS). NSD is a component in avionics system that provides pilot with graphical flight instrument information to support aircraft navigation. In both our example systems, each target-hardware contains both CPU and programmable logic devices, CPLD and FPGA. Following the proliferation of providing System On Chip (SoC) solution using FPGA, we expect that this embedded system development platform approach can also be used to support the study of embedded system software development with hybrid CPU and FPGA chip.

BIOGRAPHY

Win-Bin See is currently a Technical Manager of the Aerospace Industrial Development Company (AIDC) in Taichung, Taiwan, R.O.C. He is responsible for the development of avionic system software. His areas of interest include object-oriented technologies, platform-based embedded software development, hardware and software co-design, safety critical software development, system engineering and software engineering.

Win-Bin See joined Aerospace Industrial Development Company (AIDC) in 1984 and conducted research and development in avionics system software since then. In 2000, his research expands to dispatching system development for commercial vehicle operation (CVO) in intelligent transportation system (ITS) domain. AIDC has been deploying very successful real-time packet based mobile dispatching and monitoring system for the vehicle fleet management of several island-wised logistic service companies in Taiwan.

Win-Bin See holds a Ph.D. degree from National Taiwan University, Taipei, Taiwan R.O.C., and a Master degree from National Chung-Kung University, Tainan, Taiwan, R.O.C, both in Electrical Engineering.

T10 - Technical Session 10: System-on-Chip (III)

Opportunities and Challenges for Code Compression

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ABSTRACT

Code compression has been a popular technology to reduce both memory size requirement and power consumption by reducing executables size and the amount of memory bus traffic. Many methods have proposed, from different points of view, to compress blocks of executables and to design decompression mechanism to execute the program on the fly. Wolfe et al. propose the first code compression method that Huffman-encodes cache lines of an executable into codewords for MIPS ISA. A LAT table and a cache refill engine are designed for runtime decompression. They report a compression ratio of about 70% and a performance improvement ranging from +10% to -30% depending on different memory models and cache configurations. CodePack, as a commercial representative, uses a similar technique on PowerPC ISA. A compression ratio of 60% and a 14% performance loss (for single-issue rate processor) are reported. Lefurgy et al. propose a selective compression that compresses the least frequently executed instructions or mostly cache-missed instructions into codewords. They report a compression ratio of 72.8% and an 80% performance loss. Xie et al. propose a method called profile-driven selective code compression which tries to compresses a factor number of instructions that are least fetched into CPU to reduce code size while impacting performance least. A report of a 72% compression ratio with a performance penalty of 6% and a 70% compression ratio with almost 8 times of original execution time for Markov V2F compression model is given. Different criteria produce different results and performances. In this talk, we start from examining some commonly used and some aggressive code compression methods, then discuss the opportunities, from the points of view of instructions/fields repetition and other characteristics, for achieving smaller code size, and then the trade-offs between code size and performance.

BIOGRAPHY

Kuang-Bin Kelvin Lin (Kelvin Lin) received the BS degree from the Department of Information and Computer Engineering, Chung-Yuan Christian University, Taiwan in 1993 and MS and PhD degrees from the Department of Computer Science and Information Engineering, National Chiao Tung University, Taiwan, in 1995 and 2002, respectively. He is a visiting research fellow in the Department of Electric Engineering, Princeton University. Before coming to Princeton University, he has been working at VIA technologies, Inc. as a chip designer and a lecturer at the Department of Computer Science and Information Engineering, National Chiao Tung University, Taiwan. His research interests are in all aspects of computer architecture, with special emphasis on embedded systems, low-power applications design and system simulation.

T10 - Technical Session 10: System-on-Chip (III)

RFID ICBiochip and Bioinformatics

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ABSTRACT

Daniel Di is currently president of the PBI Technologies, a technology development and consulting firm focuses on Technology / Pharmaceutical / Biotech / Medical Device / Software / Nanotechnology; and a partner of Vincogen, a RFID Biochip Biopharmaceutical company; and chairman of the National Taipei University of Technology Alumni Association of Greater New York.

Daniel Di has complete operations with business development experience from Systems Engineer (Compaq), Sr. Associate (Coopers & Lybrand), System Architect Manager (AT&T Bell Labs), Director (Chromatis Networks acquired by Lucent with 4.5 Billions), and Vice President (Foxconn).

Daniel Di received his B.S. in Electrical Engineering from National Taipei University of Technology; M.S. in Computer Science from New Mexico Institute of Mining & Technology; and Doctorate Candidate in Electrical Engineering from Louisiana Tech University.

BIOGRAPHY

A proprietary RFID IC Biochip platform can be distinguished from competing biochips by its higher throughput rates and lower cost. Our ICBiochip will be the only micro array platform to use the Electro-Chemiluminescence substrate and transfer the electricity wireless through RF or directly measure the ligand, ligand interaction could be low to the Nano-size. Customers such as consumer, biomedical researchers, physicians, and veterinarians could use ICBiochip to detect and diagnose diseases. Pharmaceutical firms could use this Biochip to screen and test the efficacy of the potentially life-saving drugs. At the same time, by using RFID system, we could download the data to ascertain the presence of disease and profile its particular behavior and build the Bioinformatics database and utilize the data-mining technique.

T11 - Technical Session 11: Bioinformatics (III): Data Mining and Knowledge Base

Session Chair

Zoran Obradovic

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BIOGRAPHY

Zoran Obradovic is Director at the Center for Information Science and Technology, Associate Director at the Center for Quantitative Biology and Biomedical Mathematics and a Professor of Computer and Information Sciences at Temple University. His research interests focus on developing data mining and statistical learning technology for an efficient knowledge discovery at large databases. Funded by NSF, NIH, DOE and industry he contributed to about 160 refereed articles on these and related topics and to several academic and commercial software systems.For more details see www.ist.temple.edu/~zoran.

T11 - Technical Session 11: Bioinformatics (III): Data Mining and Knowledge Base

Data Cleaning and Knowledge Bases

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Comment [u25]: Title

Comment [u26]: The name(s) of the speaker(s).

Comment [u27]: Position, department, institution, contact address, email.

ABSTRACT

As databases become more pervasive through the biological sciences, various data quality concerns are emerging. Biological databases tend to develop data quality issues regarding data legacy, data uniformity and data duplication. Due to the nature of this data, each of these problems is non-trivial and can cause many problems for the database. To improve biological data quality, methods and frameworks must be developed to handle both structural and traditional data. This presentation discusses BIO-AJAX, a framework developed to address such problems and its gives an example of how to apply it in phylogeny.

Comment [u28]: Abstract of the talk. Please do not exceed 200 words.

BIOGRAPHY

Katherine G. Herbert received her PhD is Computer Science from the New Jersey Institute of Computer Science in 2004. She is an Assistant Professor at Montclair State University in New Jersey and a Research Associate at the New Jersey Institute of Technology. Dr. Herbert's primary research interests include applying data quality techniques in bioinformatics and biological databases. Her other research interests include data mining, information retrieval, data cleaning and data integration. She has published a number of papers, most recently "BIO-AJAX for TreeBASE: an Extensible Framework for Biological Data Cleaning" in ACM SIGMOD Record.

Jason T. L. Wang received his BS in mathematics from National Taiwan University, Taipei, Taiwan, in 1980, and his PhD in computer science from the Courant Institute of Mathematical Sciences at New York University in 1991. He is a full professor of computer science in the College of Computing Sciences at New Jersey Institute of Technology and director of the university's Data and Knowledge Engineering Laboratory. Dr. Wang's research interests include data mining and databases, pattern recognition, bioinformatics, Web information retrieval and integration.

T11 - Technical Session 11: Bioinformatics (III): Data Mining and Knowledge Base

Biological Name Entity Tagging

Hongfang Liu

University of Maryland at Baltimore County

ABSTRACT

As the pace of biological research expedites, computers have been used to manage the explosive amount of biological information. Much of information relevant to biological research is recorded either as coded data in genetic databases (e.g., GenBank) or as free text in journal articles and in annotation fields of genetic databases. The excessive volume of information propagating in free text has prompted researchers to explore natural language processing (NLP) techniques to make the task of managing all the relevant information more feasible. One requirement for NLP in biology text is the ability to accurately recognize biological entity name terms in free text. Other requirements include an accurate part-of-speech tagging and a set of relational pattern templates. In this talk, we will discuss some previous work as well as an ongoing project on developing a common NLP platform for NLP tools in the biological domain which includes a biological entity dictionary by mining genomic databases and free text in the domain and a biological entity tagger where the entities considered here are gene and gene products.

BIOGRAPHY

Hongfang Liu, Ph.D., is currently an assistant professor in Information Systems department of University of Maryland at Baltimore County (UMBC). Liu received a B.S. degree in Applied Mathematics and Statistics from University of Science and Technology of China in 1994, a M.S. degree in Computer Science from Fordham University in 1998, a PhD degree in computer science at the Graduate School of City University of New York in 2002.

Before coming to UMBC, Liu spent four years as research assistant at the Department of Biomedical Informatics at Columbia University. While at Columbia University, Liu conducted research on biomedical language processing under the supervision of Prof. Carol Friedman with the support of multiple NLM R01 grants and NSF grants. Following this experience, Liu spent one year at the Center for Advanced Technology at Columbia University as Senior Analyst and Technology Translation Researcher.

One of Liu's main areas of expertise is the development of natural language processing (NLP) systems in the biomedical domain. Unlike text in novels or newspapers, where lay people can understand it without any difficulty, text in biomedical domain requires domain-specific knowledge. The objective of Liu's research is to use corpus-based machine learning techniques and online resources (e.g., genetic databases, or machine readable dictionaries etc.) to acquire domain-specific knowledge for the construction of natural language processing (NLP) systems in the biomedical domain and therefore to decrease the difficulty of managing information in biomedical free text.

T11 - Technical Session 11: Bioinformatics (III): Data Mining and Knowledge Base

Data Mining Approach to Study of Protein Disorder

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ABSTRACT

The next generation data mining challenges considered in this presentation include: (i) mining of heterogeneous distributions; (ii) learning from biased labeled samples; and (iii) enhancing predictive modeling by exploiting unlabeled data. The aim of the talk is to describe our fairly general methodology for addressing these challenges and to demonstrate its applicability in bioinformatics. The applications will be illustrated on the problem of determining the commonness, type and functions carried by intrinsic disordered proteins that fail to fold to a fixed 3D structure on their own. The results will be reported providing strong evidence that: (1) disorder is a very common element of protein structure; (2) eucaryotes may have a higher fraction of intrinsic protein disorder than eubacteria or archaebacteria; (3) at least three different types of protein disorder exist in nature; (4) functions of disordered proteins can be studied more efficiently by reranking PubMed retrieved articles based on their relevance to this topic that is difficult to express as a query; and (5) a cost-effective enlargement of a disordered proteins database is possible by using unlabeled data to improve classification and outliers detection as compared to learning from small and possibly biased labeled samples alone. The reported data mining methods and bioinformatics results were obtained through a collaboration with C.J. Brown, A.K. Dunker, B. Han, K. Peng and S. Vucetic funded by NSF-CSE-II-9711532, NSF-CSE-IIS-0196237, NIH-R01-LM06916 and NIH-R01-LM007688-01A1 research grants.

BIOGRAPHY

Zoran Obradovic is Director at the Center for Information Science and Technology, Associate Director at the Center for Quantitative Biology and Biomedical Mathematics and a Professor of Computer and Information Sciences at Temple University. His research interests focus on developing data mining and statistical learning technology for an efficient knowledge discovery at large databases. Funded by NSF, NIH, DOE and industry he contributed to about 160 refereed articles on these and related topics and to several academic and commercial software systems.For more details see www.ist.temple.edu/~zoran.

T11 - Technical Session 11: Bioinformatics (III): Data Mining and Knowledge Base

PIRSF Protein Classification System and Sequence Annotation

Hongzhan Huang

Georgetown University

ABSTRACT

Classification of protein sequences is very important for large-scale functional characterization of genes. The PIRSF protein classification system provides classification of whole proteins and domains to reflect their evolutionary relationships. At the basic level of the classification are homeomorphic families consisted of full-length proteins that have detectable sequence similarities and believed to share a common ancestor. The domains in these proteins are in turn classified into domain superfamilies. The resulting classification is reflected in the PIRSF structure in the form of a network classification system based on the evolutionary relationships of whole proteins and domains. Classification of PIRSF includes two steps: automatic classification and manual curation. An integrated classification tool, which includes database management, retrieval, analysis and visualization has been developed for PIRSF classification. As part of the UniProt project, we have developed PIR site rules and name rules based on PIRSF for protein annotation.

BIOGRAPHY

Hongzhan Huang Graduated from Zhongshan University and taught mathematics at South China Agricultural University for seven years in 1980's. Studied population and quantitative genetics in University of California, Davis from 1989 to 1993 and received MS and PhD in genetics. From 1994 to 1998, post doc researches on genetics and bioinfomatics in UC Davis and University of Texas Health Center at Tyler. Since 1998, at PIR, Georgetown University Medical Center as a senior bioinformatics scientist, currently an assistant professor at Georgetown University and the bioinformatics team lead at PIR. Research interests: Protein databases, Protein classification, Bioinformatics

T12 - Technical Session 12: C4I (III): Embrace Internet - The King of Future Communication Network?

Session Chair

C. J. (Charlie) Liu

AT&T Labs

BIOGRAPHY

Dr. Chia J. (Charlie) Liu served as President and Chairman of the Board of CIE-USA/GNYC in 2001, Vice President and Convention Chair in 2000. During his tenure at the helm of the Institute, Dr. Liu revived the organization with 83+ years of long and proud tradition. Membership of the Institute is more than doubled under Dr. Liu's leadership.

Dr. Liu earned his Ph.D. (1988) in Physics from Yale University, and B.S. (1979) in Physics from National Taiwan University. Dr. Liu's expertise is in the area of Accelerator Based Atomic Physics, and optically pumped polarized atomic beam. His pioneer work in production of electron-polarized beams of multiply-charged ions opened a new frontier to test fundamental atomic physics. After his postdoctoral appointment at Argonne National Laboratory in Chicago, Dr. Liu joined AT&T Bell Laboratories in 1991. Dr. Liu published 16 major papers in internationally recognized journals, such as Physical Reviews, Physical Review Letters, Modern Physics Letters, J. Opt. Soc. Am., and etc..

Dr. Liu was instrumental for AT&T IP POP architecture and design at PuDong in Shanghai, China. The IP POP will allow AT&T reach the enormous China market and serve the need of multi- national customers. Dr. Liu's work in VPN router configuration template and policy control enable AT&T offering MPLS VPN services.

Among his major contributions within AT&T, Dr. Liu, as the Feature Sponsor, lead a cross process team to establish the feasibility, impact assessment, and the benefit of introducing SONET gears into AT&T transport network. The work fundamentally changed AT&T's old DS3 transport network into modern OC-N transport network to meet the demand of ever increasing high bandwidth telecommunication world.

T12 - Technical Session 12: C4I (III): Embrace Internet - The King of Future Communication Network?

Internet Cyber Security

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ABSTRACT

As the need for cost-effective, ubiquitous secure communications continues to rise, corporations are turning to virtual private networks (VPNs) to eliminate expensive leased lines to provide secure access of sensitive data for both intra and inter-agency/organization communications. As these institutions increasingly rely on web-based applications to interface to other collaborating agencies, clients, or customers, they also place their sensitive information and databases at greater risk of attack at the web application level. Conventional solutions such as firewalls, VPN gateways and intrusion detection systems do not completely solve the problem. They only analyze packet headers and cannot detect threats embedded in network content, because they lack the processing power necessary to analyze content in real time to detect viruses, worms, or inappropriate content – and therefore leave the network edge open to a wide range of costly, content-borne threats. In this talk, we describe the architecture of a Cyber-Security Processor (CYSEP) that can serve as a key module for enhancing security for high-speed networks and systems. The CYSEP supports, at wire-speed, four major functions, namely, firewall/intrusion detection, encryption/decryption, message authentication, and distributed denial of service (DDoS) attack protection. The CYSEP can be deployed at various places in the network, e.g., at high-performance end-systems, data centers, enterprise networks, and the core backbone network to enhance cyber security and to increase bandwidth efficiency of the network.

BIOGRAPHY

H. Jonathan Chao is Head of Department of Electrical and Computer Engineering at Polytechnic University, New York, NY, where he joined in January 1992. He has been doing research in the areas of terabit switches/routers, quality of service (QoS) control, optical networking/switching, and network security. He holds more than 20 patents and has published over 100 journal and conference papers in the above areas. He has also served as a consultant for various companies, such as Lucent, NEC, and Telcordia. He has been giving short courses to industry people in the subjects of SONET/ATM/IP/MPLS networks for over a decade.

During 2000–2001, he was Co-Founder and CTO of Coree Networks, NJ, where he led a team to implement a multi-terabit MPLS switch router with carrier-class reliability. From 1985 to 1992, he was a Member of Technical Staff at Telcordia, where he was involved in transport and switching system architecture designs and ASIC implementations, such as the world's first SONET-like Framer chip, ATM Layer chip, Sequencer chip (the first chip handling packet scheduling), and ATM switch chip. From 1977 to 1981, he was a Senior Engineer at

Telecommunication Labs of Taiwan performing circuit designs for a digital telephone switching system. He coauthored two networking books, *Broadband Packet Switching Technologies* (New York: Wiley, 2001) and *Quality of Service Control in High-Speed Networks* (New York: Wiley, 2001).

Prof. Chao is a Fellow of the IEEE for his contributions to the architecture and application of VLSI circuits in high-speed packet networks. He received the Telcordia Excellence Award in 1987. He is a co-recipient of the 2001 Best Paper Award from the IEEE Transaction on Circuits and Systems for Video Technology. Prof. Chao received his B.S. and M.S. degrees in electrical engineering from National Chiao Tung University, Taiwan, and his Ph.D. degree in electrical engineering from Ohio State University.

T12 - Technical Session 12: C4I (III): Embrace Internet - The King of Future Communication Network?

VoIP on 1xEVDO Wireless Network

Pi-Chun Chen

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ABSTRACT

1xEVDO system is a data only CDMA system that provides high speed packet data services such as web browsing, file transfer, email, streaming video, image, and short messages. In its newest revision (Rev A), it can achieve peak data rate of 3Mbps on forward link and of 1.8Mbps on reverse link. As wireless network is converging to IP-based network, the QoS control of real time traffic such as VoIP on radio access network has become very critical. In this study, we will first describe the general technical challenges in supporting VoIP on wireless network such as End-to-End delay, packet error rate, IP Overhead Compression/Removal, and voice frame bundling. Secondly, we will describe the new technologies features introduced in Rev A such as Hybrid ARQ and MAC layer design to effectively reduce transmission delay and enhance system capacity. Finally we will discuss the specific design and solutions to support VoIP service on 1xEVDO systems, and provide simulation results on VoIP capacity.

BIOGRAPHY

Pi-Chun Chen received her MS and Ph.D. in Electrical Engineering from Wireless Information Laboratory (WINLAB), Rutgers University, New Jersey in 1996 and 1999 respectively. Upon her graduation, she joined Applied Research, Telcordia Technologies, as a research scientist conducting research in the area of advanced wireless technology analysis. She was responsible for the packet data protocol design to provide the evolution path of PACS (the Personal Access Communications Systems) to 3G system. She also work on analytical models and algorithms for network deployment and cell site planning.

Since November 2000, she has become a Member of Technical Staff of the Wireless Technology Performance Group in Mobility Solution, Lucent Technologies, Whippany. She is responsible for system level performance analysis and algorithm design for 3G communication systems. Her research projects include performance analysis of scheduler algorithm, capacity and performance analysis of overhead channels, inter-modulation interference between UMTS and cdma2000-3G1, system performance with transmit diversity, and VoIP over 3G packet data channels etc. Her current focus is on QoS control of wireless network, radio resource optimization analysis, power control with bursty traffic.

T12 - Technical Session 12: C4I (III): Embrace Internet - The King of Future Communication Network?

Wireless Broadband - A Third Wave For Broadband Access

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ABSTRACT

Although broadband services based on DSL and cable access are growing rapidly, many regions around the globe are still underserved, especially those that lack telecom infrastructure to start with. Advances in broadband wireless access technology now pose as an attractive third alternative to DSL and cable in supporting increasingly popular triple-play bundled services to underserved customers. Advantages of this approach include rapid deployment, ubiquity, and potentially much lower cost.

A number of wireless broadband technologies are leading candidates for next generation mass-market wireless broadband access infrastructure: 3G, EV-DO, WiFi, WiMAX, and predictably some hybrids. The market is still evolving and many consumer services and technological opportunities are opening up. This talk will examine some of the opportunities from the perspective of a service provider.

T13 - Technical Session 13: Nanotechnology/MEMS (IV)

Session Chair

Shuiqin Zhou

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BIOGRAPHY

Shuiqin Zhou was born in Zhejiang, China. She received her B.S. (1988) and M.S. (1991) degrees from Department of Chemistry, Xiamen University, P.R.China, and the Ph.D. (1996) degree from The Chinese University of Hong Kong. She worked as a Postdoctoral Research Associate in SUNY at Stony Brook with Professor Benjamin Chu during 1996-2000, and a Senior Chemist in Union Carbide/The Dow Chemical Company during 2000-2002 before she joined to CUNY-CSI.

Shuiqin Zhou is currently an Associate Professor of the Department of Chemistry, College of Staten Island and Graduate Center, City University of New York. Her group is currently focusing on the researches of (1) nanostructured functional materials from fullerene derivatives, fullerene-polymer composites, and conjugated polymers; (2) supramolecular assembled polymer-lipid complexes as well as polyelectrolyte-surfactant complexes for personal care products; (3) microcapsules and thin films from smart polymer hydrogels for drug delivery. Her researches are currently supported by the National Science Foundation and The Dow Chemical Company. She has published 60 research papers and book chapters.

Shuiqin Zhou is a member of American Chemical Society and American Association for the Advancement of Science.

T13 - Technical Session 13: Nanotechnology/MEMS (IV)

Molecularly-Engineered Assemblies of Nanoparticles

Jin Luo and Chuan-Jian Zhong *

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ABSTRACT

We have been exploring a general bottom-up pathway constructing nanostructures from metal, alloy and oxide nanoparticles for catalysis and sensors. This pathway entails molecularly-engineered processing of nanoparticles in terms of size, shape, composition and surface properties and molecularly-mediated or mediator-template assembly of nanoparticles with controlled spatial properties via hydrophobic, covalent, hydrogen-bonding, or multidentate coordination. Recent results on the size and spatial dependence of interparticle electronic conductivity, ligand-framework binding, biomimetic ion gating, catalytic, and chemical/biological sensing properties will be presented. Findings from an atomic force microscopic and transmission electron microscopic characterizations of both bottom-up assembled and top-down patterned nanoparticle structures under various chemical/physical manipulations will be discussed. will be presented. Kinetic and thermodynamic assessments will also be discussed.

BIOGRAPHY

Dr. Jin Luo is a senior associate scientist working in the Department of Chemistry at SUNY-Binghamton. He received his Ph.D. in Physical Chemistry at Xiamen University and the University of Tokyo where his thesis research involved photoelectrochemistry and spectroelectrochemistry. He was an associate professor at Xiamen University and a visiting scientist at SUNY-Potsdam. His research interest involves interfacial electrochemistry, fuel cell catalysis, chemical sensors, scanning probe microscopy, and spectroelectrochemistry. His early research work on organic molecular monolayers and novel chemical systems using a new three-dimension microfabrication technology were funded by the National Natural Science Foundation of China. He is currently developing advanced nanomaterials for nanotechnological applications, focusing on fuel cell catalysis which is supported by both federal and industrial funding.

Dr. Chuan-Jian Zhong is an associate professor at State University of New York at Binghamton. During his graduate study at Xiamen University and early postdoctoral and associate researcher appointments at Fritz-Haber-Institute, University of Minnesota and Iowa State University, he had received advanced trainings in many fields including materials chemistry, analytical chemistry, physical chemistry, surface chemistry, catalysis, electrochemistry, and nanotechnology. His research interests cover a wide range of interdisciplinary areas including nanoparticles, nanostructures, catalysis, sensors, molecular assemblies, microfluidics, conducting polymers, microfabrication, nanofabrication, and miniaturized analytical instrumentation. His research work is funded by National Science Foundation, NSF-CAREER, Department of Energy-NNSA Program, American Chemical Society Petroleum Research Fund, World Gold Council, 3M, and Honda.

T13 - Technical Session 13: Nanotechnology/MEMS (IV)

Probing Bacteria Adsorption on Planar and Nanoparticle-Patterned Surfaces using Atomic Force Microscopy

Jin Luo and Chuan-Jian Zhong

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ABSTRACT

The ability to probe the adsorption of bacteria on surfaces is important for understanding the bacteria-surface interactions. This presentation reports findings on the use of atomic force microscopy (AFM) to probe the adsorption of Pseudomonas aeruginosa on atomically-smooth substrates of two different surface properties (hydrophilic and hydrophobic surfaces). Our aim is to demonstrate the viability of AFM in probing the bacteria-substrate interaction, which may have important implications to the understanding of biofilm formation. It is revealed that Pseudomonas aeruginosa had different shapes on the hydrophilic or hydrophobic surface. These two distinctive types of surface adhesion and interaction are discussed in terms of the structures and properties of lipopolysacchride at the bacteria out membrane. Nanoparticle-Patterned surfaces have been developed for probing bio-affinity of bacteria, controlled release of reagents, and chemical reactivities.

BIOGRAPHY

Dr. Jin Luo is a senior associate scientist working in the Department of Chemistry at SUNY-Binghamton. He received his Ph.D. in Physical Chemistry at Xiamen University and the University of Tokyo where his thesis research involved photoelectrochemistry and spectroelectrochemistry. He was an associate professor at Xiamen University and a visiting scientist at SUNY-Potsdam. His research interest involves interfacial electrochemistry, fuel cell catalysis, chemical sensors, scanning probe microscopy, and spectroelectrochemistry. His early research work on organic molecular monolayers and novel chemical systems using a new three-dimension microfabrication technology were funded by the National Natural Science Foundation of China. He is currently developing advanced nanomaterials for nanotechnological applications, focusing on fuel cell catalysis which is supported by both federal and industrial funding.

Dr. Chuan-Jian Zhong is an associate professor at State University of New York at Binghamton. During his graduate study at Xiamen University and early postdoctoral and associate researcher appointments at Fritz-Haber-Institute, University of Minnesota and Iowa State University, he had received advanced trainings in many fields including materials chemistry, analytical chemistry, physical chemistry, surface chemistry, catalysis, electrochemistry, and nanotechnology. His research interests cover a wide range of interdisciplinary areas including nanoparticles, nanostructures, catalysis, sensors, molecular assemblies, microfluidics, conducting polymers, microfabrication, nanofabrication, and miniaturized analytical instrumentation. His research work is funded by National Science Foundation, NSF-CAREER, Department of Energy-NNSA Program, American Chemical Society Petroleum Research Fund, World Gold Council, 3M, and Honda.

T13 - Technical Session 13: Nanotechnology/MEMS (IV)

Phases and Phase Transitions in a Coil-Coil-Disk Triblock Oligomer

Comment [u29]: Title

Lei Zhu

Comment [u30]: The name(s) of the speaker(s).

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ABSTRACT

In this work, an asymmetric coil-coil-disk triblock oligomer, namely, polyethylene-*block*-poly(ethylene oxide)-*block*-pentakis(pentyloxy)triphenylene - (PE-*b*-PEO-*b*-P5T) was successfully synthesized by coupling a hydroxyl-terminated PE-*b*-PEO-OH (EEO) diblock oligomer and 2-hydroxy-3,6,7,10,11-pentakis(pentyloxy)triphenylene using oxalyl chloride. The number-average molecular weights for the PE and PEO blocks are *ca.* 800 g/mol and 800 g/mol. The molecular weight of P5T was 731 g/mol. The self-assembled structure and morphology in bulk EEO-P5T were studied using differential scanning calorimetry (DSC), two-dimensional (2D) small- and wide-angle X-ray scatterings (SAXS and WAXD), and transmission electron microscopy (TEM). The PE block was crystalline and had a melting temperature (T_m) of 95 °C. Unlike in the EEO Diblock oligomer, the PEO block was amorphous, probably due to the fact that both its ends were tethered to other blocks. Intriguingly, the P5T showed an isotropic to discotic liquid crystalline phase transition only during the crystallization of the PE blocks. A nematic columnar ($N_{\square}$) to nematic discotic (N_D) transition was observed at *ca.* 25 °C.

BIOGRAPHY

Lei Zhu was born in Shanxi Province, China (02/07/1972). He obtained his B.S. degree in Materials Chemistry (1993) and M.S. degree in Macromolecular Chemistry and Physics (1996) from Fudan University, Shanghai, China. In 2000, he earned his Ph.D. degree in Polymer Science from University of Akron, OH.

He currently is an assistant professor at Institute of Materials Science and Dept. of Chemical Engineering, University of Connecticut, Storrs, CT 06269. He has (co)-authored 34 peer-reviewed journal publications, one book chapter [*Polymer Handbook* (4th ed.), Wiley : New York, 1999, pp. V1-V19], and 14 conference proceedings and preprints. His research focuses on discotic liquid crystalline oligomers and their supramolecular self-assemblies on nanometer scales. Other research activities include study of biodegradable block copolymers and organic/inorganic nanocomposites.

Dr. Zhu was awarded NSF CAREER award in 2004. He is also members of ACS, APS, MRS, and NATAS.

Comment [u31]: Biography, IEEE style. The guideline here is adapted from "Preparation of Papers for IEEE TRANSACTIONS and JOURNALS (March 2004)".

T14 - Technical Session 14: System-on-Chip (IV)

Session Chair

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BIOGRAPHY

Xun Liu (M'03) received the B.S. degree from the Tsinghua University, Beijing, China, in 1996, the M.S. degree in electrical engineering from the University of Rochester, Rochester, NY, in 1998, and the Ph.D. degree in electrical engineering and computer science from the University of Michigan, Ann Arbor, in 2003.

He is currently an Assistance Professor in the Department of Electrical and Computer Engineering, North Carolina State University, Raleigh. His areas of research interests include timing optimization, power estimation and optimization for VLSI circuit and system designs.

Xun Liu received several academy awards, including two Tsinghua-IBM scholarships, a fellowship from the University of Rochester, and the Rackham Predoctor Fellowship from the University of Michigan.

T14 - Technical Session 14: System-on-Chip (IV)

Interconnect Optimization with Repeater Insertion for IP-based SOCs

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ABSTRACT

.Intellectual property based systems-on-chips (IPSOCs) are designed by combining components from possibly different .Intellectual property (IP) vendors. Once its architecture is chosen, the speed and power of an IPSOC are largely determined by the global interconnects among all IP blocks, since the IPs are pre-designed and, therefore, cannot be modified. Furthermore, the dominance of global interconnects has been evidenced by current industrial design experiences. For VLSI designs of 90-nanometer or less, more than 80% of the critical paths and 20% of total chip power dissipation may be due to global interconnects. Consequently, the optimization of global interconnects is crucial for high-speed and low-power IPSOC designs.

We perform global interconnect optimization for IPSOCs by combining IP placement and repeater insertion. Specifically, we integrate a highly accurate interconnect macromodel into the IP placement procedure. Our macromodel is derived using an optimal discrete repeater insertion technique that models detailed circuit physics such as leakage and short circuit power dissipation and takes into account design issues like repeater location deviation. Our model not only provides accurate power estimates of interconnects with optimal repeater insertion but also reveals several insights into global bus design. Consequently, instead of using geometric metrics such as wire length or cut number, we guide our placement solution exploration by the power estimates of global interconnects, resulting in designs with high speed and low power.

We have applied our scheme to several designs and compared it with conventional approaches, in which the placement and repeater insertion are performed sequentially. Experimental results have shown that our scheme reduces the number of timing violations by more than 80% on average, when timing budgets are tight. Under loose timing targets, our approach achieves up to 11.1% power consumption reduction.

BIOGRAPHY

Xun Liu (M'03) received the B.S. degree from the Tsinghua University, Beijing, China, in 1996, the M.S. degree in electrical engineering from the University of Rochester, Rochester, NY, in 1998, and the Ph.D. degree in electrical engineering and computer science from the University of Michigan, Ann Arbor, in 2003.

He is currently an Assistance Professor in the Department of Electrical and Computer Engineering, North Carolina State University, Raleigh. His areas of research interests include timing optimization, power estimation and optimization for VLSI circuit and system designs.

Xun Liu received several academy awards, including two Tsinghua-IBM scholarships, a fellowship from the University of Rochester, and the Rackham Predoctor Fellowship from the University of Michigan.

T14 - Technical Session 14: System-on-Chip (IV)

Thermal-aware Network-on-chip Design

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ABSTRACT

Networks-on-Chip (NoC), a new SoC paradigm, has been proposed as a solution to mitigate complex on-chip interconnect problems. NoC architecture consists of a collection of IP cores or processing elements (PEs) interconnected by on-chip switching fabrics or routers. Hardware virtualization, which maps logic processing units onto PEs, affects the power consumption of each PE and the communications among PEs. The communication among PEs affects the overall performance and router power consumption, and it depends on the placement of PEs. Therefore, the temperature distribution profile of the chip depends on the IP core virtualization and placement. In this paper, we present an IP virtualization and placement algorithm for generic regular Network on Chip (NoC) architecture. The algorithm attempts to achieve a thermal balanced design while minimizing the communication cost via placement. Our framework can also realize hardware virtualization which can further accomplish better performance. A case study on Low Density Parity Checks (LDPC) decoder is presented to evaluate our algorithm.

BIOGRAPHY

Yuan Xie received his B.S. degree from Electronics Engineering Department, Tsinghua University in Beijing, China, his M.S. and Ph.D. degrees in computer engineering from Electrical Engineering Department, Princeton University. After graduated from Princeton, he worked for IBM Microelectronics Division's Worldwide Design Center, SOC Design and Methodology group. In Fall 2003, Dr. Xie left IBM and joined Pennsylvania State University to be a faculty member in Computer Science and Engineering department. Dr. Yuan Xie's research interests include VLSI Design, Computer Architecture, Embedded Systems Design, Electronics Design Automation.

T14 - Technical Session 14: System-on-Chip (IV)

Multilevel Routing with Jumper Insertion for Antenna Avoidance

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ABSTRACT

As technology advances into nanometer territory, the antenna problem has caused significant impact on routing tools. The antenna effect is a phenomenon of plasma-induced gate oxide degradation caused by charge accumulation on conductors. It directly influences reliability, manufacturability and yield of VLSI circuits, especially in deep submicron technology using high density plasma. Furthermore, the continuous increase of the problem size of IC routing is also a great challenge to existing routing algorithms. In this talk, we propose a novel framework for multilevel full-chip routing with antenna avoidance using built-in jumper insertion approach. Compared with the state-of-the-art multilevel routing, the experimental results show that our approach reduces 100% antenna-violated gates and results in fewer wire length, vias, and delay increase.

BIOGRAPHY

Sao-Jie Chen received the B.S. and M.S. degrees in electrical engineering from the National Taiwan University, Taipei, Taiwan, ROC, in 1977 and 1982 respectively, and the Ph.D. degree in electrical engineering from the Southern Methodist University, Dallas, USA, in 1988.

Since 1982, he has been a member of the faculty in the Department of Electrical Engineering, National Taiwan University, where he is currently a full professor. From 1985 to 1988, he was on leave from National Taiwan University and working toward his Ph.D. at Southern Methodist University. During the Fall of 1999, he was a visiting scholar in the Department of Computer Science and Engineering, University of California, San Diego. During the Fall of 2003, he was an academic visitor at IBM TJ Watson Research Center, Yorktown Heights. During the Fall of 2004, he is currently an Honorary Fellow in the ECE Department, University of Wisconsin, Madison. His current research interests include: VLSI physical design automation, Wireless LAN and Bluetooth IC design, and SOC hardware/software co-design and system-level design.

Dr. Chen is a member of the Chinese Institute of Engineers, the Chinese Institute of Electrical Engineers, the Association for Computing Machinery, and a senior member of the IEEE Computer and IEEE Circuits and Systems Societies.

T14 - Technical Session 14: System-on-Chip (IV)

Statistical Timing Analysis for Global Interconnect Wires

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ABSTRACT

Due to environmental noises, process variations, and power delivery fluctuations, design uncertainties in on-chip global interconnect systems rise sharply with deep-sub-micron (DSM) technology. It is becoming increasingly difficult to assume deterministic and error-free signal transmission over global wires. Instead, on-chip global interconnect wires must be analyzed as an error-prone communication channel characterized by probability of bit error, and statistical timing distributions. In this presentation, we provide an overview of our recent work in advancing the state-of-the-art of statistical timing analysis with specific focus on global interconnect wires. First, we present a recent result showing that even the design parameter variation can be modeled as normal random variables; the statistical distribution of the wiring delay over a long wire will have a non-Gaussian distribution. Next, we present a novel statistical timing analysis approach to analyze the behavior of two important pipelined architectures for multiple clock-cycle global interconnect, namely, the flip-flop inserted global wire and the latch inserted global wire. We present analytical formula that is based on parameters obtained using Monte Carlo simulation. These results enable a global interconnect designer to explore design trade-offs between clock frequency and probability of bit-error during data transmission.

BIOGRAPHY

Yu Hen Hu is a faculty member at the Department of Electrical and Computer Engineering, University of Wisconsin, Madison. He received BSEE from National Taiwan University, and MSEE and PhD degrees from University of Southern California. Prior to joining University of Wisconsin, he was faculty in the Electrical Engineering Department of Southern Methodist University, Dallas, Texas. His research interests include multimedia signal processing, artificial neural networks, fast algorithms and design methodology for application specific micro-architectures, as well as computer aided design tools. He has published more than 200 technical papers in these areas.

Professor Hu has been an associate editor (1988-1990) for the IEEE Transaction of Acoustic, Speech, and Signal Processing in the areas of system identification and fast algorithms, the European Journal of Applied Signal Processing, the IEEE Signal Processing letters (2002-2003), and Journal of VLSI Signal Processing. He is a founding member of the Neural Network Signal Processing Technical Committee of IEEE Signal Processing Society and served as chair from 1993-1996. He has been a member of VLSI Signal Processing Technical Committee of the Signal Processing Society. He served as the secretary of the IEEE Signal Processing Society (1996-1998), a board member at IEEE Neural Network Council, and is currently a steering committee member of the International Conference of Multimedia and Expo on behalf of IEEE

Signal Processing Society, and chair of IEEE Signal Processing Society Multimedia Signal Processing Technical Committee (2004-2005).

Professor Hu is a fellow of IEEE.

T15 - Technical Session 15: Bioinformatics [IV]

Session Chair

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BIOGRAPHY

T15 - Technical Session 15: Bioinformatics [IV]

Transcriptional Regulation: Signals, Interactions and Modules

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ABSTRACT

Biological processes are controlled at various levels in the cell and while these mechanisms are poorly understood, transcriptional control is widely recognized as an important component and a better understanding of which will provide an efficient means for the therapeutic intervention in disease processes. We have been focusing on various computational problems pertaining to transcriptional regulation, namely, 1) computational identification of transcription factor binding sites (TFBS), 2) PolII promoter prediction, 3) Predicting interaction among transcription factors (TF), 4) Transcriptional modeling, i.e. identifying arrangements of TFs that co-regulate a set of transcripts.

Besides giving an overview of the field using our work as the reference, we will also briefly some of the current lines of investigation we are involved in. This includes enhancing the TF binding specificity description and predicting conditional binding of TFs dependent upon other TFs in the vicinity.

BIOGRAPHY

Sridhar Hannenhalli received his B.Tech degree in Computer Science from the Institute of Technology, Varanasi, India, in 1990, and the Ph.D. degree in Computer Science from the Pennsylvania State University, State College, in 1995 under the supervision of Dr. Pavel Pevzner. After his postdoctoral training at the University of Southern California, he has worked as senior scientist in Bioinformatics Research at SmithKline Beecham pharmaceuticals (1997-2000), and at Celera Genomics (2000-2003).

He joined the department of Genetics at the University of Pennsylvania in Sep, 2003 as an Assistance Professor. His areas of research interests include various algorithmic problems in computational biology and bioinformatics, with special emphasis on Eukaryotic transcriptional control and large scale genome rearrangements.

T15 - Technical Session 15: Bioinformatics [IV]

An *in silico* Analysis of Human Cytomegalovirus Coding Potential

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ABSTRACT

The AD169 strain of human cytomegalovirus (HCMV) is the standard strain used for laboratory experimentation. It has been extensively passaged in human fibroblasts and as such has become tissue culture adapted. The consequence of tissue culture adaptation is that the virus has undergone genomic substitutions and deletions resulting in the inability of AD169 to effectively establish an infection in cells of origin similar to those where it replicates in an infected host. Additionally, the original annotation of the viral genome was performed at a time of limited computing ability. We have recently revisited the sequence of the AD169 strain of HCMV utilizing the Bio-Dictionary-based Gene Finder (BDGF) algorithm was used to reassess the coding potential of the AD169 laboratory strain of human cytomegalovirus. The analysis indicates that 37 previously annotated open reading frames ought to be discarded whereas at least 9 previously unrecognized open reading frames with relatively strong coding potential should be added. Additionally, we have sequenced several other clinical isolates of the virus and have identified several potential open reading frames. A total of 252 open reading frames have been identified that are conserved in all four clinical isolates of the virus sequenced, but it is not yet clear how many encode polypeptides. Currently, analysis of the expression profile of these transcripts are being pursued.

T15 - Technical Session 15: Bioinformatics [IV]

Mathematical Programming Approaches to Side-Chain Positioning

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ABSTRACT

A central challenge within bioinformatics is to develop computational methods for predicting and designing protein structures. I will discuss the side-chain positioning problem, a central component of both protein structure prediction and design. I will present an integer linear programming formulation of the problem, and then show empirically that, surprisingly, in many interesting cases the linear program relaxation finds optimal solutions to the integer program. Our analysis demonstrates that LP-based approaches are highly effective in finding optimal (and near-optimal) solutions for the side-chain positioning problem.

T15 - Technical Session 15: Bioinformatics [IV]

Accurate Identification of Chromosomal Copy Number Changes on a Genomic Scale

Olga Troyanskaya

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ABSTRACT

Chromosomal copy number changes (aneuploidies) are common in cell populations that undergo multiple cell divisions including yeast strains, cell lines, and tumor cells. Identification of aneuploidies is critical in evolutionary studies, where changes in copy number serve an
adaptive purpose, as well as in cancer studies, where amplifications and deletions of chromosomal regions have been identified as a major pathogenetic mechanism. Aneuploidies can be studied on whole-genome level using array CGH (a microarray-based method that measures DNA content), but their presence also affects gene _expression. We have developed a robust and accurate expectation-maximization based method for identification of segmental aneuploidies (partial chromosome changes) from gene _expression and array CGH microarray data. Using our approach, we identify known chromosomal changes and predict novel potential segmental aneuploidies in commonly used yeast deletion strains and in breast cancer. Our methodology is sensitive enough to detect statistically significant and biologically relevant aneuploidies even when _expression or DNA content changes are subtle as in mixed populations of cells.

T16 - Technical Session 16: C4I [IV]: On-Demand Distributed Computing

Session Chair

Rong Chang

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BIOGRAPHY

Dr. Rong Chang is Manager of Quality Assured E-Utilities at the IBM T.J. Watson Research Center. He has received several awards at IBM, including an Outstanding Technical Achievement Award and a Technical Excellence Award. He is a leading contributor to IBM's (1) service level agreement (SLA) management component in IBM Universal Management Infrastructure, (2) real-time credit card processing and software download service at ibm.com, (3) common registration infrastructure for IBM's Internet Web sites, (4) first hyperlink-aware search engine (named WebCat), etc. His research interests include quality-assured on demand services, distributed computing systems, workflow-centric computing, and Grid license and resource management.

Dr. Chang received the B.S. degree with honors in computer engineering from the National Chiao Tung University, Taiwan, in 1982, and the Ph.D. degree in computer science and engineering from the University of Michigan, Ann Arbor, in 1990. From 1990 to 1993, he was Member of Technical Staff in Bellcore's Applied Research Area developing ATM-based multimedia computing & communication services and personal mobile/nomadic/pervasive application services.

Dr. Chang is a member of Tau Beta Pi and Eta Kappa Nu honor societies. He is a member of ACM, IEEE, and Chinese Institute of Engineers---USA.

T16 - Technical Session 16: C4I [IV]: On-Demand Distributed Computing

Modular Sensor Architecture (MSA) Design for On-Demand Sensor Based Distributed Computing

Shu-Ping Chang*(Speaker), Naga Ayachitula

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ABSTRACT

With need to process increasing discrete amounts of sensor data and operation workload, traditional proprietary solutions for the sensor data processing systems are no longer adequate. Business/IT clients need open and standards based solutions to protect their investment. This paper provides modular sensor architecture (MSA) design for sensor based data processing on demand for distributed systems. Through this modulated system architecture, we have created a solid and stable foundation for rapid evolution of system capabilities; synthesize best practices, design patterns, concepts, implementations and leverage existing infrastructure to avoid costly system reimplementation. This talk aims at describing a generic sensor based architecture and provides an example implementation of the architecture in the security industry taking into account its visibility in today's environment. However, MSA is not specific to IT security environments alone and can be generalized to other environments as well. MSA defines functionality (functions) in a layered approach of the system as a design and implementation model for generic sensor system development and deployment in distributed systems.

BIOGRAPHY

Shu-Ping Chang* is currently a researcher at IBM T.J. Watson Research Center. He works on the research and design for next generation high speed computer cluster technologies for high volume information analysis and decision making system. In his previous assignment, he was the Manager of Integrated Content Management Solution developing the Media Production Suite (MPS) product which is currently used by CNN Library as their news center archive. He worked with customers to understand their business and technical needs, and developed the turnkey technologies for the overall solution. Shu-Ping worked on this product from 2000 to 2003.Shu-Ping Chang was awarded his Ph. D. and Master degrees in Computer and Information Sciences by the University of Minnesota. His Bachelor degree is in Communication Engineering from Chao-Tung University, Taiwan, ROC with first-place honor. He joined IBM T.J. Watson Research Center in 1990 developing microcode for Logical-Link Control in FDDI station. In 1992, he moved to Broadband Networking where he developed high speed memory based packet switch and latter ATM LAN/WAN edge controller. Dr. Chang jointed Industrial Solution Unit in 1996 as senior architect/engineer where he developed several products for Media and Entertainment industries especially in Media Asset Management area.

Naga Ayachitula (Arun) - is currently a Senior Software Engineer of the IBM Research (Autonomic Computing) division in Thomas J Watson Research Center, Hawthorne, NY. Arun is currently involved in developing innovative approaches to automating management of Information Technology systems, designing strategies and workflows to evaluate and implement response and recovery actions, and provide architectures for scalable distributed solutions for response and remediation in IT security events. These events include security scan non-compliance, intrusion detection, and out-of-band notifications. In particular, these

approaches are based on control theoretic and planning technologies. Arun has 6+ years of leadership, architectural and development experience in the roles of an Architect and Team Leader at IBM. Arun has architected, led the development of IBM products like Media Production Suite, Digital Library Connection for Avid and several content management solutions for the media industry. Arun holds a Masters degree in Technology from D.A. University – Indore, India and Masters Degree in Science from Nagarjuna University - Vijayawada, India. He has four patents pending and several publications in the field of databases, application servers, content management, records management and on-demand computing.

T16 - Technical Session 16: C4I [IV]: On-Demand Distributed Computing

Ad hoc Networking with Swarm Intelligence

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ABSTRACT

Swarm intelligence refers to complex behaviors that arise from very simple individual behaviors and interactions, which is often observed among social insects such as ants. Although each individual (an ant) has little intelligence and simply follows basic rules using local information obtained from the environment, such as ant's pheromone trail laying and following behavior, (globally) optimized behaviors,
such as finding a shortest path, emerge when they work collectively as a group. In this talk, I will present our research on adapting swarm intelligence as a distributed adaptive control mechanism to design multicast routing and topology control protocols for mobile ad hoc networks.

The designed multicast protocol adapts a core-based approach which establishes multicast connectivity among members through a core node. An initial multicast connection can be rapidly setup by having the core flood the network with an announcement so that nodes on the reverse paths to the core will be requested by group members to serve as forwarding nodes. In addition, each member who is not the core periodically deploys a small packet that behaves like an ant to opportunistically explore different paths to the core. This exploration mechanism enables the protocol to discover new forwarding nodes that yield lower total forwarding costs. I will present simulation results to demonstrate the performance of the proposed approach and to compare it with certain existing multicast protocols.

The designed topology control protocol employs a distributed approach where each node asynchronously collects local information from neighbor nodes to determine its appropriate transmission power. Its operations do not require any location, angle-of-arrival, topology, or routing information. In particular, the protocol attempts to minimize the maximum power used by any node in the network, or minimize the total power used by all of the nodes in the network. By balancing the positive feedback and the exploration capability of swarm intelligence, the protocol converges quickly to good power assignment with respect to minimization objectives, while adapts well to mobility. In addition, the protocol may achieve common power, or properly assign power to nodes with non-uniform distribution. I will present animations to demonstrate the performance of the protocol for different mobility speed, various density, and diverse node distribution.

BIOGRAPHY

Chien-Chung Shen received his B.S. and M.S. degrees from National Chiao Tung University, Taiwan, and his Ph.D. degree from UCLA, all in computer science. He was a research scientist at Bellcore Applied Research working on control and management of broadband networks. He is now an assistant professor in the Department of Computer and Information Sciences of the

University of Delaware, and a recipient of the National Science Foundation CAREER Award. His research interests include ad hoc and sensor networks, control and management of broadband networks, distributed object and peer-to-peer computing, and simulation.

T16 - Technical Session 16: C4I [IV]: On-Demand Distributed Computing

Policy Management and Analysis

Comment [u32]: Title

Nam Hong Cheng

Comment [u33]: The name(s) of the speaker(s).

(joint work with Kong Eng Cheng, Joe Lin)

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ABSTRACT

Policy based management systems have been increasingly gaining popularity and being applied to various management areas. As the scale and scope of applications of policy based management systems increase, a new class of problems begins to arise concerning the management and analysis of policies itself. We discuss some of the challenges in this area, and present a framework we developed to address these issues. In particular, we discussed a disconnect we identified between policy based management systems and the corporate business operation.

BIOGRAPHY

Nam Hong Cheng is currently a Senior Scientist in the Emerging Technologies and Services Research Department, Telcordia Technologies (formerly Bellcore). He joined Telcordia in 1998. His recent work includes managed multimedia group collaboration and communication systems for various wired and wireless networks and dissimilar radio systems, policy management and analysis, and policy based network management for mobile ad-hoc networks. He has been a Technical Lead and/or Project Manager for a number of research and development efforts, including resource management and integrated assurance for mobile networks, integrated fault and performance analysis, service and network management for Voice over IP (VoIP) systems, and content delivery infrastructure and management.

He received his Ph.D. in Communication Engineering from the Royal Melbourne Institute of Technology (RMIT), Australia. Prior to joining Telcordia, he was with Ericsson Australia.

T16 - Technical Session 16: C4I [IV]: On-Demand Distributed Computing

Proactive SLA Management and License-Aware Resource Management for On Demand IT Services

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ABSTRACT

A service level agreement (SLA) is a service contract that includes the evaluation criteria for one or more agreed service quality standards (with business rules for adjudicating "raw" quality measures) and may explicitly specify the ramifications of missing or exceeding the standards. A Gartner report shows over 80 percent of the established SLAs before 2003 would likely be breached by 2005 while the complexity of managed IT services and related service level management (SLM) processes keeps growing exponentially in an unmanageable manner. Besides SLA management issues, the growth of application-level IT services (e.g., commercial Grids) are being hampered by the lack of license-aware resource management technologies. Large companies are spending millions of dollars in using license-controlled software each year (more than 10 times of its annual IT hardware expenses), and are seeking innovative software license management technologies and services to reduce the cost. This talk will elaborate on some key technical issues in proactively managing SLAs and licenses based upon business objectives. It will also illustrate an integrated set of technologies that facilitate the development of competitive SLA and license management solutions.

BIOGRAPHY

Dr. Rong Chang is Manager of Quality Assured E-Utilities at the IBM T.J. Watson Research Center. He has received several awards at IBM, including an Outstanding Technical Achievement Award and a Technical Excellence Award. He is a leading contributor to IBM's (1) service level agreement (SLA) management component in IBM Universal Management Infrastructure, (2) real-time credit card processing and software download service at ibm.com, (3) common registration infrastructure for IBM's Internet Web sites, (4) first hyperlink-aware search engine (named WebCat), etc. His research interests include quality-assured on demand services, distributed computing systems, workflow-centric computing, and Grid license and resource management.

Dr. Chang received the B.S. degree with honors in computer engineering from the National Chiao Tung University, Taiwan, in 1982, and the Ph.D. degree in computer science and engineering from the University of Michigan, Ann Arbor, in 1990. From 1990 to 1993, he was Member of Technical Staff in Bellcore's Applied Research Area developing ATM-based multimedia computing & communication services and personal mobile/nomadic/pervasive application services.

Dr. Chang is a member of Tau Beta Pi and Eta Kappa Nu honor societies. He is a member of ACM, IEEE, and Chinese Institute of Engineers---USA.